



The framing of antimicrobial use and resistance by Irish agricultural newspapers during a period of key European Union policy changes

Addiena Luke-Currier¹ · Trevor R. Hodkinson² · Elaine Moriarty¹

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Abstract

Antimicrobial resistance (AMR) is a societal problem which is often linked to agricultural use of antimicrobials in addition to human medicine. This has resulted in the development of policies at the European Union and Member State level to regulate farmers' antimicrobial use (AMU) practices. Our aim is to understand how AMU, AMR, and related policies are framed within agricultural newspapers in Ireland and how this may have changed over time. A total of 2,019 articles from 2014 to 2024 were analyzed using Matthes and Kohring's (2008) mixed methods approach. Four frames emerged: 1) Agricultural Community Action Against AMR, 2) Imposition of Legal Action on Antimicrobials, 3) AMU on the Farm, and 4) Addressing the AMR Threat Together. Frames vary in their inclusion of the issue of AMR, related policies, and actors across different levels of the agricultural sector. The different frames reflect the conflicting values, including One Health concerns for animal, human, and/or environmental health as well as economic interests, that drive proposed solutions to AMR. Frame 2 gained prominence from 2020 to 2022 after key EU regulations on AMU were signed. Following these changes, the way the issue was framed shifted and the relationships of farmers to other agricultural actors and their significance within the wider rural community came to the fore of the discussion. These results highlight the impacts that policy changes to farming practices can have on the wider society and the social factors which underly them.

Keywords Antimicrobial resistance · Agricultural regulations · Farming practices · Framing · One health · Rural communities

Introduction

Farming can be understood as a social practice in which decisions are made within a socio-material context (Vanclay 2004). Within this context, many regulations exist around farming practices, although their impact is affected by how farmers perceive and are willing to implement changes required by these regulations (Sutherland and Darnhofer 2012). One such practice is the use of antimicrobials including antibiotics, antiparasitics, antivirals, and antifungals. These are important medicines used in animals, humans, and plants against infectious diseases caused by

such microorganisms (World Health Organization 2023). Beginning in the 1950s, antimicrobials in agriculture were increasingly used to support the intensification of production through their growth-promoting capabilities and ability to compensate for disease pressures and poor animal welfare (Kirchhelle 2018). The misuse and overuse of antimicrobials, in both human and animal health, are key drivers of the development of antimicrobial resistance (AMR) (World Health Organization 2023). AMR occurs when pathogens no longer respond to antimicrobials and diseases in humans, animals, and plants can become more difficult or impossible to treat. This also poses a global threat to our future food security and the sustainability of livestock production (Boeckel et al. 2019; World Health Organization 2023). The extent of the threat of AMR, the mechanisms by which it develops, and the proposed ways to address the problem are a matter of contention across the medical and agricultural sectors (Dean and Scott 2005; Morris et al. 2016).

The European Union (EU) has taken measures to address antimicrobial misuse and AMR (Kirchhelle 2018). The

✉ Addiena Luke-Currier
Lukecura@tcd.ie

¹ Sociology, School of Social Sciences and Philosophy, Trinity College Dublin, Dublin, Ireland

² Botany, School of Natural Sciences, Trinity College Dublin, Dublin, Ireland

EU's introduction of the Veterinary Medicinal Products and Medicated Feed regulations (EU 2019/6 and EU 2019/4) has further limited antimicrobial use (AMU) and prohibited related practices (European Parliament and Council of the European Union 2019a, 2019b). This is a significant shift for farmers and the complexity of AMR further necessitates an examination of how these changes are communicated and may be perceived and responded to (Sutherland and Darnhofer 2012). It is important to understand the dominant narratives within the farming community, which is the social context in which AMU decisions are made. This analysis should be done at the Member State level, as EU level policies and the meanings behind them are re-interpreted on a national scale in a process mediated by key agricultural stakeholders (Lenihan and Brasier 2009).

Frame analysis of agricultural newspapers can be used to understand how AMR is communicated to the farming community and provide insight into how it may be interpreted at this level. Agricultural news has been found to influence support for policies and encourage the uptake of specific practices through its role in spreading awareness and shaping discourse on which issues are seen as important (Obwegger et al. 2024; Rust et al. 2021). There is a large body of literature on the frames used by mainstream newspapers on AMR (Collins et al. 2018; Degeling et al. 2021; Steede et al. 2019), though only a few studies have included farming newspapers specifically and these are predominantly from the United Kingdom (UK) (Morris et al. 2016; Scott et al. 2025). Key findings from these studies have indicated the presence of contentious frames on AMR with varying priorities, prognoses, and diagnoses of the issue (Morris et al. 2016; Steede et al. 2019).

Seminal work by Morris et al. (2016) included a comparison of the agricultural and mainstream media in the UK and identified one frame that was used predominantly in the farming press. This frame was referred to as the "Voluntary Action" frame, which encouraged farmers to take up preventative practices and responsible antibiotic use on their own farms to address the issue (Morris et al. 2016). Scott et al. (2025) took a similar approach to Morris et al. (2016), though their article focused on smallholder farming in the UK. Similarly they identified a frame they called "Antibiotic Stewardship" in which preventative and prudent use practices are promoted (Scott et al. 2025). Additional themes identified in their research reflect common arguments in the literature; that antimicrobials are needed for animal health and the idea that other actors, such as human medicine or intensive farms, contribute more to the issue of AMR (Morris et al. 2016; Scott et al. 2025). These findings demonstrate the complexity and diverse views of AMU and AMR, and the actors involved both within and outside of the farming community.

Further research in this area is warranted. Morris et al. (2016) emphasized the need for researchers to analyze media targeted at specific professional communities who are strong voices within policy debates. Additionally, there is a lack of longitudinal analyses on how frames change over time within the farming media, despite the ongoing developments in AMR policy (Steede et al. 2019). This is important given the relationship between media and policy, and the role media can have in framing policy priorities and communicating dominant discourses around an issue (Chiles 2017). Recent developments in policy, such as the introduction of EU legislation, warrant a contemporary analysis of this issue. Additionally, Morris et al. (2016) suggests further investigation into the framing of AMR as a threat to animal health, as opposed to the dominant prioritization of human health. This ultimately recognizes the importance of a One Health approach in the discussion of AMR which acknowledges the intersections and dependencies between animal, human, and environmental health (One Health High-Level Expert Panel et al. 2022). The One Health agenda has developed greatly since 2016, with the publication of international and national One Health strategies against AMR, further supporting the need for a more up-to-date analysis (European Commission 2017; Government of Ireland 2021).

Ireland provides an optimal context for undertaking such an analysis due to the significance of the farming community and the agricultural media's influence on their information awareness and decision making. Analyzing newspapers for the frame analysis is appropriate in the Irish context. It has been reported to be the most trustworthy source for Irish consumers and agricultural newspapers specifically have been included in several other content analyses done in Ireland (Javornicky et al. 2021; Cormack et al. 2022, 2026). The agricultural media in Ireland has a long history, with the predominant source, the Irish Farmers Journal (IFJ) having been established in 1948 with an audience of over 379,000 readers (Irish Farmers Journal n.d.-a; Morrissey 2023). This number exceeds the 300,000 individuals reported to work on farms in Ireland and suggests the newspaper's reach to those more broadly associated to the agricultural sector (Central Statistics Office 2024). The significance of these agricultural newspapers as a source of information has been recognized by the government, as an awareness campaign through this medium was included in the previous Irish National Action Plan against AMR (iNAP) (Government of Ireland 2021). Further, a study by Regan et al. (2023) identified that Irish agricultural stakeholders largely support targeting how AMU is framed as an AMU behavior change intervention.

Understanding the way in which this issue is communicated to the farming community has important policy

implications. Farmers are integral to rural areas and have significant relationships with other actors in rural communities. Ireland's Rural Development Plan for 2021–2025 specifically states “Agriculture is both a primary economic driver and a critical component of the social fabric which sustains rural communities” (Department for Rural and Community Development and the Gaeltacht 2021, p. 78). It has been acknowledged in the literature that the new EU regulations on AMU require practice change from farmers as well as other rural actors, such as vets, and may lead to changes in the roles and relationships between these actors (More et al. 2022). The importance of agriculture and farmers' issues is well supported and communicated by several well-established and politically active farming representative bodies (Murphy 2002). Many of these bodies have been integral to the development of AMU policies, such as the iNAP, of which two of these organizations are a part of the consultative committee (Government of Ireland 2021, 2025). This frame analysis is timely for the Irish context as the third iNAP has recently been published (Department of Health 2025).

The aim of this paper was thus to analyze the frames utilized by the agricultural newspapers on AMU, AMR, and related policies over time, within the context of relevant policy changes at the EU and Irish level. To achieve this, the Matthes and Kohring (2008) mixed method approach was used to conduct the frame analysis. This method overcomes the “methodological black box” of traditional content analyses, in which the development of the frames is not clearly defined (Matthes and Kohring 2008, p. 260). It is founded on the definition of frames by Entman (1993), “To frame is to select some aspects of a perceived reality and make them more salient in a communicating context, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described” (p. 52 original emphasis). This paper aimed to extend the Matthes and Kohring (2008) approach by collecting additional qualitative data throughout to triangulate these findings and provide further depth.

Methods

Data collection

In order to capture possible differences in perspective, three Irish farming newspapers were selected for this analysis: The IFJ, Agriland.ie, and the Farming Independent. The Farming Independent is a specific supplement of the Irish Independent, one of two main national broadsheets. As a subsection of a larger mainstream newspaper, it may not be perceived to have the same biases as agricultural specific

newspapers (Reisner and Walter 1994). The IFJ is a well-established agricultural newspaper available both in a traditional paper-based format and online. It advertises a number of incentives for farmers, such as the opportunity to claim back approximately half of the newspaper subscription on their taxes as a business expense (Irish Farmers Journal n.d.-b). The IFJ and Farming Independent were previously used in content analyses to represent Irish agricultural newspapers (Cormack et al. 2022, 2026). Agriland.ie provides a novel perspective to the two other traditional newspapers, as it is the primary digital agricultural news publisher in Ireland (Agriland n.d.). While it is only available in digital format, it has comparable reach with a reported 450,000 weekly users (Agriland Media n.d.). The inclusion of this source acknowledges the changing ways in which people are receiving their news and the general increase in use of technology by Irish farmers (Dillon and Moran 2022).

The time frame chosen for this analysis is from the start of 2014 to the end of 2024. Like previous studies, which have used policy events to determine their time frame, we chose the EU 2019/6 and EU 2019/4 legislation as an anchor for our analysis (Kelleher et al. 2021; Scott et al. 2025). Our analysis started with 2014, because it was the year when this legislation was first proposed by the Commission (European Commission 2014). While the EU legislation officially came into effect in 2022, it was relevant to include up to the year 2024, as the Irish legislation enforcing this regulation became law in 2023, and a key related Statutory Instrument was passed in 2024 (McConalogue 2024).

The search strategy adapted the terms used by Morris et al. (2016) to fit the context of agricultural newspapers. Additional search terms focusing on specific AMU practices and the EU regulations were piloted to see if they returned results not otherwise identified. This resulted in the following search string: “antimicrobial* or antibiotic* or AMR or “veterinary medicines regulation*” or “veterinary medicinal product*” or “veterinary medicinal regulation*” or pre-mix¹ or “dry cow therapy²” or “antiparasitic*.”

All articles which discussed antimicrobials, AMR, and/or related policy (at any level) were included. Articles which discussed AMU/AMR in humans and the environment

¹ Medicated premixes are included within the EU Veterinary Medicines regulations and are defined in EU 2019/6 as, “products intended for incorporation into medicated feedingstuffs” (European Parliament and Council of the European Union 2019b, p. 36).

² Dry Cow Therapy (DCT) refers to the use of antibiotics to prevent and/or treat infections during the dry period in which cows are not milked. Blanket Dry Cow Therapy (BDCT) was a common preventative practice and included treating all animals in the herd. Selective Dry Cow Therapy (SDCT) is a prudent AMU practice and refers to identifying and treating specific animals. This practice was identified as an important practice in the context of the regulations by More et al. (2022).

were also included in order to incorporate the One Health approach and address the call for this inclusion in research by Morris et al. (2016). Foreign editions and advertisements were excluded.

The search resulted in a total of 3,693 articles. Due to limitations in the search capabilities of Agriland and the IFJ archives, it was possible to exclude some articles prior to reading, while others underwent full review. In total, 2,728

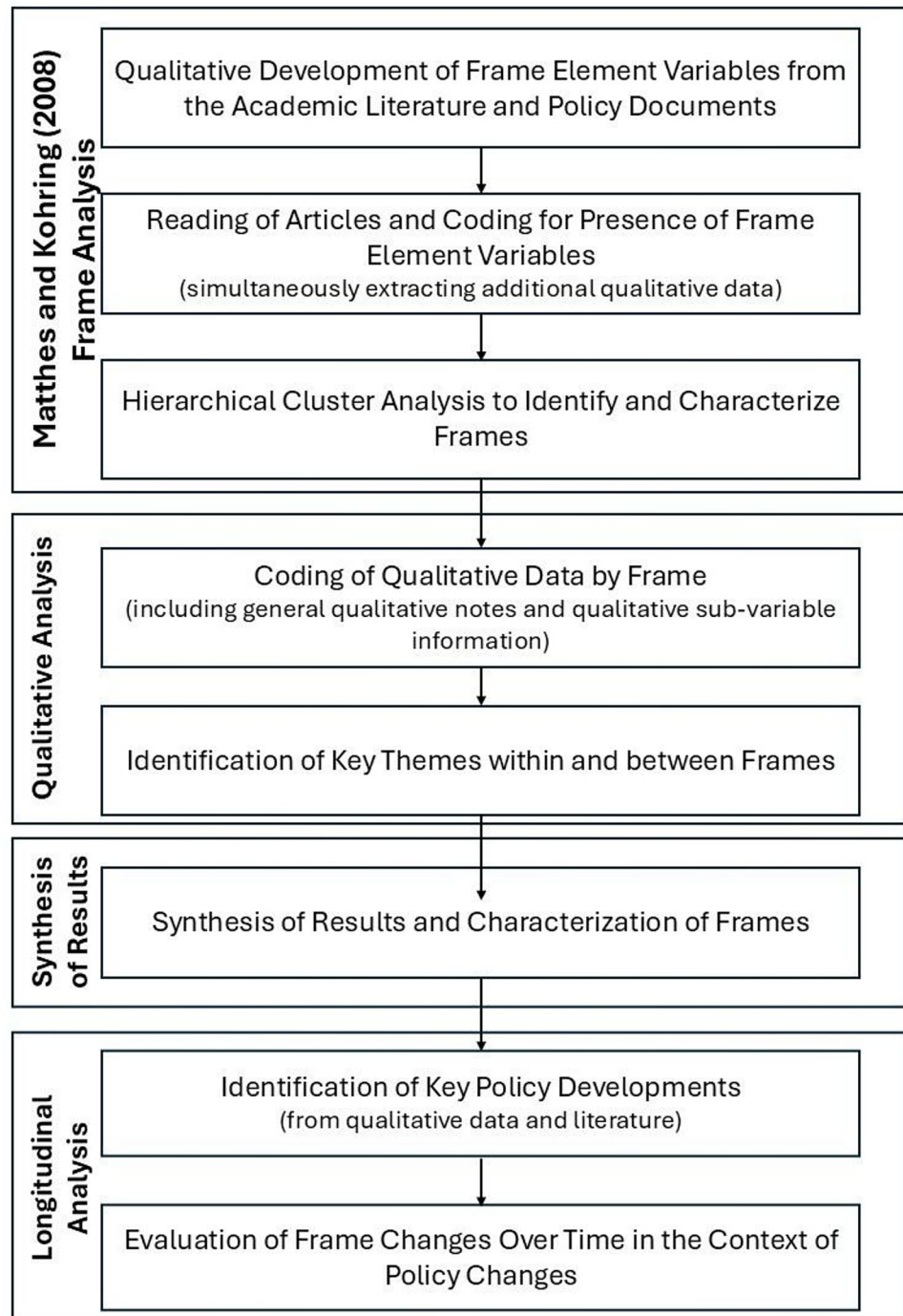
articles were read and 2,019 were included in the final review.

Data extraction

The methodology workflow is summarized in Fig. 1.

The Matthes and Kohring (2008) approach proposes that frames consist of a configuration of frame elements. These frame elements are based on Entman's (1993) definition

Fig. 1 Methodology outline. Figure chronologically details the steps taken during data extraction and analysis. Figure developed in Microsoft PowerPoint



of frames and include problem definition, causal interpretation, moral evaluation, and treatment recommendation (see Supplementary Materials 1). Matthes and Kohring (2008) suggest that each frame element has several potential options (operationalised as variables) and these group together systematically into patterns (frames) which can be identified across texts.

Frame element variables for this study were developed qualitatively from the academic literature and policy documents (see Supplementary Materials 1). The frame element variables have been developed specifically for the Irish context as done in the existing literature (David et al. 2011). The original list of variables derived from the literature was 140, which then went through two rounds of consolidation. Ten articles were pilot tested using the identified frame element variables. The final list included 41 variables, which is a larger number of variables than other studies though expected due to the need to incorporate a One Health and multi-level (EU and national) approach (Essary et al. 2022; Matthes and Kohring 2008). See Supplementary Materials 1 for further details.

Frame element variables were then used for data extraction. Newspaper articles were read sequentially from 2014 to 2024 publication dates, with each year broken up into quarters. Within each quarter, articles from each journal were reviewed as a group. Each article was carefully read and coded by one author to identify the presence (1) or absence (0) of each variable of each frame element. To provide further depth, for each frame element variable that was marked present, a qualitative description was included. For example, if the “Irish Agricultural Government” variable was marked present in an article for the “Causal Attribution” frame element, further details such as the “Department of Agriculture, Food and the Marine (DAFM)” were included; these types of further details are hereon referred to as qualitative sub-variables. Additionally, more general qualitative notes on the topic were taken throughout the process to provide a holistic view and triangulate the quantitative findings. Each piece of qualitative information was cited to the specific Article ID.

Data analysis

A hierarchical cluster analysis (HCA) was then conducted to see how frame element variables co-occur within articles and group together systematically into patterns (frames) (Matthes and Kohring 2008). HCA has also been used in previous content analyses focused on the agricultural literature (Essary et al. 2022). The level of analysis was at the article level, which is consistent with the type of analysis chosen. The frame element variables which had a frequency of less than five percent were excluded from the study or

grouped into more broadly defined variables (Matthes and Kohring 2008). The Ward method of HCA was conducted using R to identify clusters. To determine the appropriate number of clusters both the elbow method and the assessment of the Agglomeration Schedule Coefficients were used (Essary et al. 2022; Matthes and Kohring 2008). Both methods resulted in the same number of clusters. The mean value for each variable was calculated to see which variables within each cluster were the most important (Matthes and Kohring 2008).

Following the HCA, a textual search was conducted on the qualitative sub-variables to identify frequent occurrences and provide further detail for key quantitative frame element variables (see Supplementary Materials 1). The frequency of these qualitative sub-variables by frame was then determined and the most prominent ones within each frame were identified.

The general qualitative data was coded in NVivo14 by frame then analyzed inductively to define qualitative characteristics of each frame. Open coding using inductive analysis has been used in other content analyses investigating AMR (Davis et al. 2020). Codes were identified both within and across different frames.

The longitudinal analysis was conducted by plotting the percentage of articles within each year that belonged to each frame. Additionally, from the qualitative data and literature, a key timeline of policy events at the EU, Irish, and non-governmental levels was created and used to contextualize the changes in frames over time.

Results

Descriptive data

Of the 2,019 articles included in the analysis, most were from Agriland ($n=961$) and the fewest were from Farming Independent ($n=339$). This is to be expected given that the former is available in a digital format and the latter is a weekly sub-section of a newspaper. The highest number of articles was published in 2021 ($n=333$) and the lowest number in 2015 ($n=103$) (see Supplementary Materials 2 for further descriptive information). 2021 is the year prior to the implementation of the EU veterinary medicines legislation.

Matthes and Kohring frame analysis results

Prior to the HCA, variables which appeared in less than five percent of the cases were deleted or merged (see Supplementary Materials 1). A key finding here is that AMR was not often attributed to any specific category of actor (Frame Element: Causal Interpretation- Risk Attribution), which led

to the exclusion of this variable from the study and a focus on actors involved in any capacity in AMU, AMR, or policies. The total number of variables after this process was 25, which is more consistent with the existing literature (Essary et al. 2022; Matthes and Kohring 2008).

The Agglomeration Schedule Coefficient Line graph and the elbow method determined that four was the appropriate number of clusters, from now on referred to as *frames*. Additional validity checks were also conducted (see Supplementary Materials 3 for further details).

As previously done by Essary et al. (2022), the means and standard deviations of the variables were calculated. Frames can be characterized by the variables within them with the highest means. Influential variable means have been highlighted per frame in Table 1 and further definition of each variable can be found in Supplementary Materials 1.

Most articles fall under Frame 3 ($n=970$), while the smallest number of articles falls under Frame 4 ($n=294$). Frames 1 and 4 often discuss AMU and AMR, while Frames 2 and 3 rarely include a discussion of AMR. Frames 2 and 4 are dominated by the discussion of policies which impact AMU. From the HCA we can characterize the frames as follows.

Frame 1 Agricultural Community Action Against AMR

Frame 1 is characterized by discussing both AMU and AMR. It identifies Irish agricultural government, farmers, vets, the industry (broadly including agricultural and pharmaceutical industry actors), and other actors as the primary actors. This frame also includes a discussion of the One Health risks of AMR, and the recommended solutions to the issue are voluntary action or external solutions (e.g. further research). Given the multi-actor on-the-ground action focus, this frame is given the label “Agricultural Community Action Against AMR.”

Frame 2 Imposition of Legal Action on Antimicrobials

Frame 2 is characterized by a discussion of antimicrobials and related policies, but little inclusion of the topic of AMR. Many actors are commonly identified as being involved, including Irish non-agricultural government actors and international actors. The policy risks are often included within this frame, emphasizing the risks to farmers. There is also some discussion of the potential non-health related benefits of policies. Antimicrobials are viewed as a legal matter within this frame. This frame is therefore labelled “Imposition of Legal Action on Antimicrobials,” as the reason behind these policies (AMR) is not discussed and the risks of the policy dominate.

Frame 3 AMU on the Farm

Frame 3 is the most common frame, and it refers to articles where AMU is discussed, without reference to policy or AMR. AMU is primarily seen to be within the domain of farmers, and occasionally their vets. This frame is therefore labelled “AMU on the Farm.”

Frame 4 Addressing the AMR Threat Together

The fourth frame discusses AMU, AMR, and related policies and is very comprehensive in terms of frequent inclusion of most of the actors. This includes higher level actors, such as non-agricultural government and international actors. The frame further discusses the One Health threats of AMR and the potential benefits of the AMU policies. AMR is frequently framed as a legal matter, though this is complemented by the inclusion of high-level and non-binding solutions such as action plans. This frame is labelled “Addressing the AMR Threat Together” due to the nature of varied actors and solutions.

Overall qualitative results

Qualitative data within each frame were reviewed and the codes were inductively determined. It became apparent that some codes were shared across frames. Originally the total number of codes included was 27, and several sub-codes, which were further consolidated into 24 qualitative codes. Definitions of these codes and key quotations and examples can be found in Supplementary Materials 4.

Overall, qualitative results pointed to many overlaps between frames, though a few key defining features of the frames were identified. One common theme throughout all frames was the focus on the complex relationships between the different agricultural actors. These relationships were not stagnant, and actors could be in conflict with or support each other depending on the context. Negative relationships could include farmers and merchants perceiving vets as having improper economic interests, given their ability to both prescribe and sell antimicrobials. Positive relationships could be the acknowledgement of the importance of these actors or their knowledge or availability to farmers. These relationships could be mentioned in a personal context or at a group or institutional level, such as referring to “vets” in general or “Veterinary Ireland” (the representative group for vets in Ireland). The distinctive feature of this is the idea that these relationships can change and vary depending on the situation.

Another qualitative finding recorded across frames was the emphasis on the emotional aspects of this issue. Fears and the idea of a “threat” are common, especially in relation

Table 1 Frames elements and frames for AMU/R and policy. The means and standard deviations are displayed for each frame element variable across all frames. The table cells with the highest frame element variable means within each frame are highlighted

Frame Element	Frame Element Variable	Frame 1	Frame 2	Frame 3	Frame 4
Problem Definition	Antimicrobial Use	0.78 (0.41)	0.85 (0.36)	1 (0)	0.89 (0.31)
	Antimicrobial Resistance	0.81 (0.39)	0.1 (0.29)	0 (0.05)	0.84 (0.36)
	Policy related to AMU/R	0.17 (0.38)	1 (0)	0.01 (0.1)	0.97 (0.16)
Causal Attribution (Actors Involved)	Irish Agricultural Government Actors	0.34 (0.47)	0.47 (0.5)	0.06 (0.25)	0.63 (0.48)
	Irish Non-Agricultural Government Actors	0.07 (0.26)	0.16 (0.37)	0.01 (0.08)	0.17 (0.38)
	International Actors	0.28 (0.45)	0.45 (0.5)	0.08 (0.27)	0.64 (0.48)
	Farmers	0.77 (0.42)	0.88 (0.32)	0.83 (0.38)	0.82 (0.38)
	Vets	0.34 (0.48)	0.42 (0.49)	0.27 (0.44)	0.62 (0.49)
	Industry	0.32 (0.47)	0.46 (0.5)	0.14 (0.34)	0.41 (0.49)
	Other	0.34 (0.47)	0.12 (0.32)	0.08 (0.28)	0.36 (0.48)
Moral Evaluation: AMR	Risk to Animal Health	0.38 (0.49)	0.01 (0.1)	0 (0.03)	0.45 (0.5)
	Risk to Human Health	0.36 (0.48)	0.02 (0.14)	0.01 (0.1)	0.5 (0.5)
	Risk to Environmental Health/Other Risks	0.37 (0.48)	0.04 (0.19)	0.01 (0.08)	0.35 (0.48)
Moral Evaluation: Policy Risks	Risk to Farmers	0.01 (0.1)	0.28 (0.45)	0 (0.03)	0.14 (0.35)
	Risk to the Availability of Medicines	0.01 (0.09)	0.18 (0.38)	0 (0)	0.12 (0.32)
	Other Risks	0.02 (0.13)	0.31 (0.46)	0 (0)	0.18 (0.39)
Moral Evaluation: Policy Benefits	Human Health Benefits	0.05 (0.22)	0.06 (0.24)	0 (0)	0.41 (0.49)
	Animal Health Benefits	0.02 (0.14)	0.08 (0.26)	0 (0)	0.51 (0.5)
	General Health Benefits	0.02 (0.15)	0.14 (0.34)	0 (0)	0.34 (0.47)
	Benefits to Farmers	0.01 (0.1)	0.16 (0.36)	0 (0)	0.34 (0.47)
	Other Benefits	0.05 (0.21)	0.28 (0.45)	0 (0)	0.35 (0.48)
Treatment Recommendation	Legal Matter	0.08 (0.28)	0.88 (0.33)	0 (0.03)	0.72 (0.45)
	Voluntary Solution	0.53 (0.5)	0.11 (0.31)	0 (0.06)	0.19 (0.4)
	External Solutions	0.25 (0.44)	0.04 (0.21)	0.01 (0.08)	0.11 (0.31)
	High-Level or Non-Binding Solutions	0.18 (0.39)	0.07 (0.26)	0 (0.06)	0.44 (0.5)
Total		369	386	970	294

to regulations and potential penalties. There was also some idea of community norms around AMU, with a few examples of poor AMU practices being referred to as “a sin” or “shameful.”

Synthesis of qualitative and quantitative data

To further develop the understanding of each frame, the qualitative findings and HCA results were synthesized to find overlaps and key differences in frames. Additionally, key qualitative sub-variables were analyzed to identify which of these were common within each frame. The synthesis of these results is presented in Fig. 2. The different frames are shaded as done in Table 1 and the font represents the type of data. Qualitative findings indicated that there are many similarities between Frames 2 and 4. This is supported by the HCA dendrogram (see Supplementary Materials 3) in which the first higher order clustering indicates that Clusters 2 and 4 are more closely related, as are Clusters 1 and 3.

Frame 1 Agricultural Community Action Against AMR

The qualitative results support the proposition that this frame discusses agricultural community action against AMR. Teagasc and Animal Health Ireland (AHI), organizations which support farmers and have advisory roles, are prominent in this frame. Additionally, from the qualitative sub-variables, the industry actors were often found to be general references to industry or to processors. The qualitative results provide further depth to the finding that voluntary solutions to AMR tend to be proposed. They emphasize the practical focus of this frame, with specific suggestions for farmers to trial practices and build confidence in these procedures. There is also a recognition of farmers’ concerns and the practicalities of making AMU changes. Furthermore, there is an acknowledgement that these are necessary changes from how things were previously done. The qualitative sub-variable data explained that the “Other Actors” identified in the HCA were primarily academia. This also provides insight into the

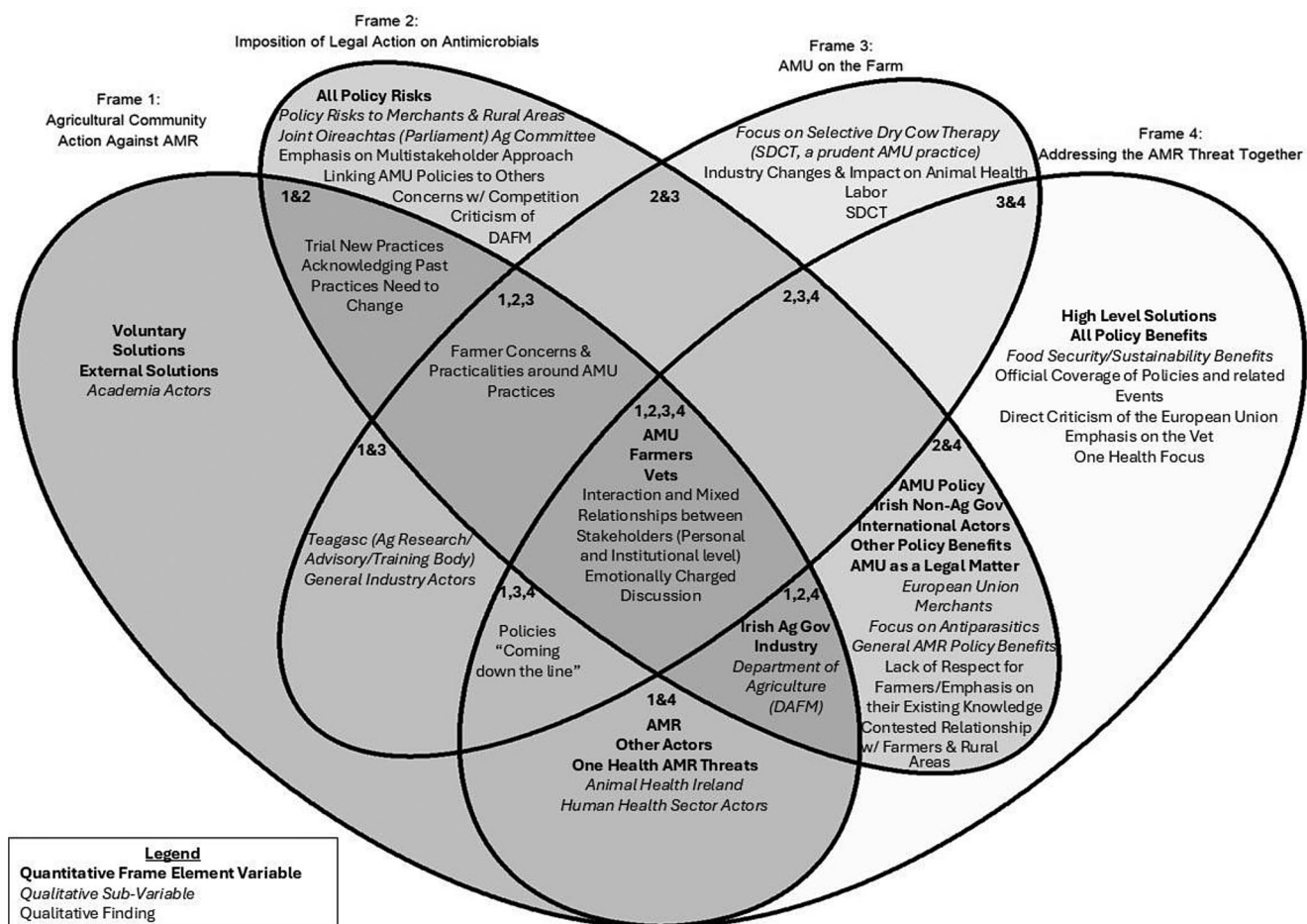


Fig. 2 Synthesis of qualitative and quantitative evidence. The figure does not include all findings and the presence of a finding within a frame (or multiple frames) does not indicate its absence in the other

frames; it indicates that it is a dominant theme in that frame. Figure developed in R and Microsoft PowerPoint

proposed external solutions identified in the HCA, which may be more research oriented.

Frame 2 Imposition of Legal Action on Antimicrobials

The characterization of “Imposition of Legal Action” is strengthened by the qualitative analysis of this frame. This frame often refers to the requirement for antiparasitics to be available by prescription only, a change associated with the new EU regulations. The Joint Oireachtas (Irish Parliament) Committee on Agriculture, Food, and the Marine was often included as an actor in this frame. This Committee had an important role in the debate of the regulations and produced reports on the matter. Furthermore, specific policy risks to competition, merchants, and rural areas are often discussed in relation to this requirement as it raises concerns about where farmers will source these medicinal products.

Many of the articles within this frame also tend to include the work of industry in communicating to farmers about policy or taking related action. For example, articles discussed industry actors’ provision and incentivization of practical supports and services for farmers to help them reduce their AMU. This is consistent with another feature of these articles, which frames AMU as a multi-stakeholder issue and argues for the inclusion of various actors within the policy discussion. The policy benefits that are brought up tended to be general reductions in AMR without specifics on animal or human health. This may support the idea that the reasons for the urgency behind the policy are poorly communicated in this frame.

This frame includes many further criticisms of the policy, which were not captured within the HCA, but became apparent in the qualitative analysis. For example, it includes criticism of DAFM in not addressing the farming community’s concerns with the legislation at the EU policy level. There is also criticism of other national level agencies, such as Revenue, for their inconsistent legislation. This refers particularly to the issue of a tax change on milk recording at the time when farmers needed the service to reduce their AMU.

Another feature of this frame was several articles discussing the required AMU changes in conjunction with other requirements around agricultural inputs. For example, articles discussing the EU Farm to Fork Strategy and concerns over its requirement to reduce fertilizer usage also covered the strategy’s related goals to reduce antimicrobial and pesticide use. AMU change was situated within the overwhelming requirements on farmers to continue to reduce their inputs and concerns about threats to their CAP payments. Additionally, new obligations around fertilizer use arose at a similar time as the restrictions on AMU. Both changes were related to EU requirements and were implemented together

in the Irish legislation under the Veterinary Medicinal Products, Medicated Feed and Fertilisers Act 2023. Throughout newspaper articles it was evident that similar arguments were being used against both changes. The restrictions on antimicrobials and fertilizers were framed as stricter in the Republic of Ireland compared to Northern Ireland. This led to a push against the increased restriction and for an “All-Island” approach in legislation. Additionally, record keeping requirements increased for both antimicrobial and fertilizer use, which led to similar concerns regarding access to and use of farmers’ data. Overall, coverage of the AMU regulation was embroiled within the larger debates on the increasing requirements and demands put on farmers.

Frame 3 AMU on the Farm

The qualitative findings provide more depth to the results of the HCA which characterize this frame as being primarily about AMU on the farm. Articles’ coverage of AMU included considerations of the practical changes needed on farms to meet the new regulations and to reduce AMU. Structural drivers, such as the modernization and expansion of the agricultural sector, were discussed in the context of related changes in animal health and AMU practices. Within the practical challenges there is an emphasis on the need for skilled labor when completing tasks related to AMU, such as the drying off practice in dairy. This practice now requires prudent AMU and was commonly discussed in this frame. The emphasis on the on-the-ground considerations within the frame suggests the drying off practice is framed more as a change that farmers (with vets and occasionally industry) need to make and are making. This may also suggest that it was not as much of a politically salient issue at the time as for example the restriction of access to antiparasitics.

Frame 4 Addressing the AMR Threat Together

The analysis of the qualitative findings supports the HCA and adds further depth to the inclusion of the One Health approach, by the human (medical) sector often being identified as an actor. Further analysis showed that this frame is dominated by news coverage of the development of policies and non-binding proposals, guidelines, and best practice documents, as well as direct quotes and information from government actors. There is a clear emphasis on vets: their role in policy, how they might be impacted by policy, and the relationship between vets and farmers. It also includes some criticisms of vets, particularly the perceived competitive advantage and potential financial gain they can achieve due to their role in prescribing and supplying antimicrobials. The prominence of vets is confirmed by the HCA. News articles in this frame also included criticisms of the

veterinary medicines regulations. The direct criticism of the EU is uniquely frequent in this frame, as opposed to Frame 2 where the criticism appears to be more directed towards the DAFM.

Cross frame themes

Several cross-frame themes were identified through the qualitative analysis which strengthen the quantitative findings and provide further insights into the general framing of AMU, AMR, and policies in Ireland as well as into how frames may differ due to their lack of inclusion of a topic.

On the ground considerations (1,2,3)

Frames 1–3 include practical considerations of AMU practices and what implementing changes would involve. This includes the stated need of farmers for antimicrobials to treat disease, as well as doubts or concerns about the impact of these AMU practice changes on their animals' health. It further encompasses the day-to-day considerations of costs (financial and time), withdrawal times of antimicrobials³, paperwork/bureaucracy challenges, and knowledge. An important note here is the inclusion of factors outside of farmers' control, such as lack of skilled labor, infrastructural issues, or product availability. It is noteworthy that this important cross-cutting theme has negligible presence in articles in Frame 4. This is concerning as Frame 4 includes the most comprehensive framing of AMR and articles within this frame are often official communications about policies or government events. It is possible that there is a disconnect within Frame 4, so that AMU changes may be presented without due attention to farmers' concerns. Also of interest is that Frames 1 and 2 share the idea that these policies are "coming down the line" and new practices should be trialed. This is often linked with the idea that farmers should build confidence in the practice over time. This is contrary to the nature of the legislative changes which aspire to bring about direct and immediate change.

Acknowledging the necessity of change (1,2,3) and recognizing the potential benefits of policy (2,4)

These are important cross-cutting themes which show that newspapers are communicating to farmers about the need to change. There is an acknowledgement of the benefits of

policy changes, despite there being criticism and hesitation. This is reflected in the qualitative findings, as well as in the HCA, where Frames 2 and 4 cover both the positives and the negatives of policy. Acknowledging farmers' need to change was often framed by considering previous behaviors as a norm or part of previous best practice. It was also sometimes framed within larger industry changes and learnings. It is possible this may deflect individual farmers' responsibility and have overall implications for future behavior change interventions.

Government criticism and disrespect of farmers (2,4)

As has been established by the HCA, Frames 2 and 4 are the most important for discussion of AMU policy and present AMU as a legal matter, differing largely in their incorporation of AMR. The qualitative findings show that both frames include government criticisms, though in Frame 2 they are primarily aimed at the national level while in Frame 4 they are directed at the EU. These criticisms are accompanied by a notion of perceived disrespect towards farmers and other members of the agricultural community such as merchants. There is a general idea that further farmer regulation is insulting in that it disregards their knowledge and experience. This on-the-ground knowledge is valued by those in the agricultural sector, while the government/bureaucrats are criticized for not having or respecting this knowledge.

Contested relationship with farmers and rural areas (2,4)

There appears to be a contestation regarding the roles of vets and merchants within rural communities and their relationships with farmers. These relationships embody both the vets' and merchants' roles as advice givers and information sources (despite vets having power over prescriptions) as well as social connections for farmers. The possible changes in supply of antiparasitics associated with the AMU regulations were framed as threats to both vets' and merchants' incomes and jobs, as well as to the livelihood of rural communities. Both actors asserted that the rural community would suffer from their absence or fall in numbers as well as the potential subsequent increase in costs.

One Health nature of AMR (1,4)

It is important to acknowledge that in the frames which do predominantly discuss the issue of AMR (which importantly does not include Frame 2), the One Health nature of AMR and the risks to both humans and animals are acknowledged. This is confirmed in the HCA results for AMR risks, policy benefits, and due to the inclusion of non-agricultural actors as key actors within the debate. Qualitative findings

³ A withdrawal period is defined in EU 2019/6 as "... the minimum period between the last administration of a veterinary medicinal product to an animal and the production of foodstuffs from that animal which under normal conditions of use is necessary to ensure that such foodstuffs do not contain residues in quantities harmful to public health" (European Parliament and Council of the European Union 2019b, p. 58).

also reveal that this discussion includes risks within the context of food systems issues such as sustainability and security. While the exact mechanisms might not be explained throughout, it is key to see that the complex impacts are a part of the dominant discourse around AMR in the agricultural news.

Longitudinal analysis of frames

The proportion of articles using each frame across the years 2014–2024 is shown in Fig. 3. Of specific interest is the change in 2020, where Frame 3 becomes less dominant and Frame 2 takes up a larger proportion of the total number of articles that year. In 2021, the proportions of frames change further, with an increase in the relative use of Frame 4. The proportion of frames remains relatively stable from 2021 to 2023 and in 2024, the dominance of the third frame recovers. Figure 3 additionally presents a timeline of key policy events, as informed by the qualitative findings and policy documents.

Taking everything into consideration, the following narrative presented by the farming newspapers over time can be understood within the context of policy developments, though no causal relationships can be determined. Despite the introduction of the EU Commission Proposal and the development of the National Consultative Committee on AMR in 2014, the news frame around antimicrobials which dominated was Frame 3 (AMU on the Farm), primarily viewing AMU within the realm of farmers and potentially their vets. Frame 1 (Agricultural Community Action Against AMR) gradually increased from 2015 to 2018, corresponding to a decrease in Frame 3. This potentially indicates a growing inclusion of AMR in the discussion around the time the EU and Irish One Health Action Plans Against AMR and related legislation were published. From 2014 to 2018, Frames 1 and 3 dominate, indicating a more local focus on AMU primarily with farmers, vets, and occasionally industry (such as processors) or advisory/support services. In 2018, community actors, such as vets and AHI, launched AMU programs and best practices which also might have supported the use of these frames.

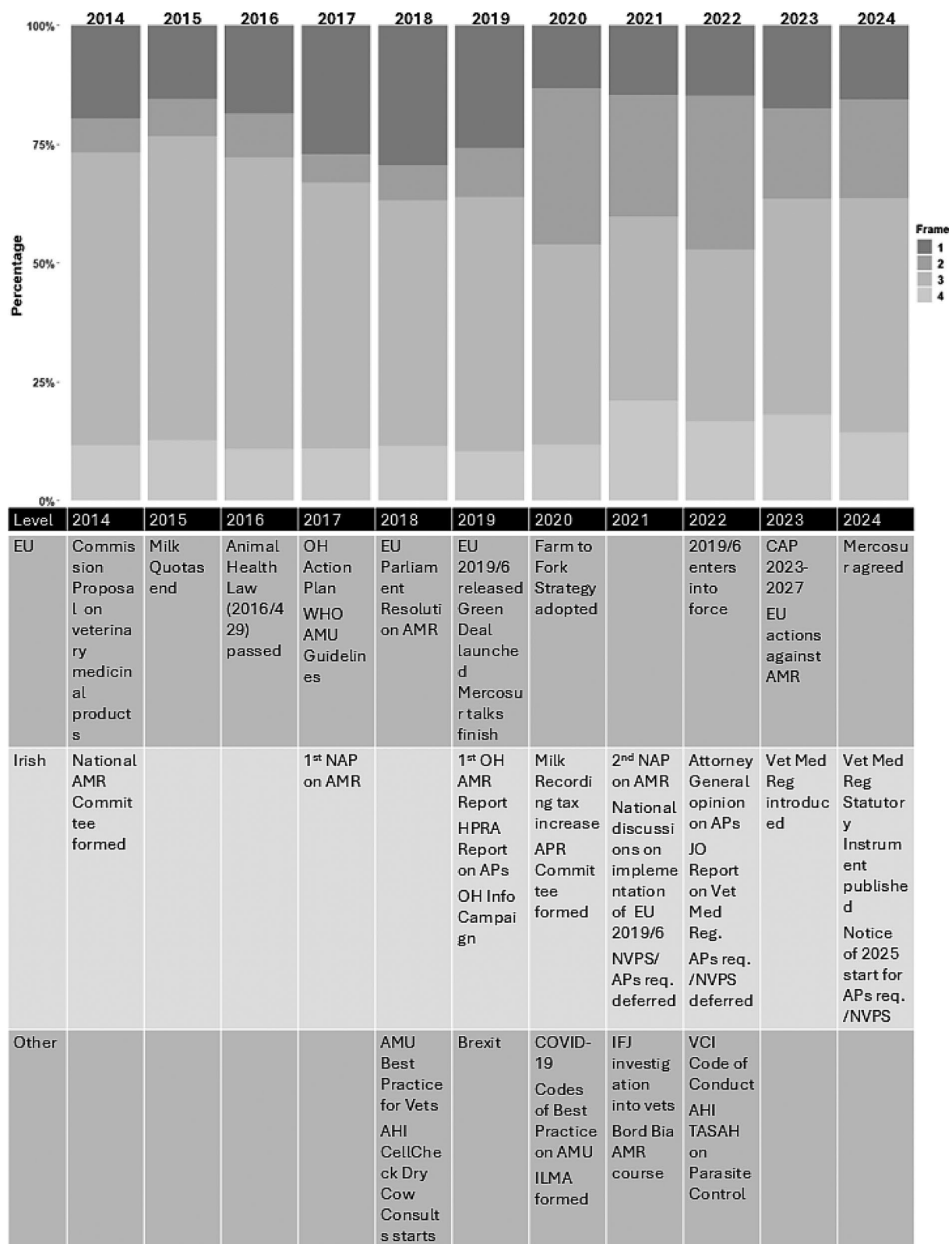
We can see a drastic change in the proportion of frames used in 2020, with a major increase in Frame 2 (Imposition of Legal Action on Antimicrobials) and a drop in Frame 1. Contextually, major changes and upsets, such as Brexit and COVID-19 occurred. At the EU level, the Farm to Fork strategy was launched which raised the above-mentioned concerns about increasing requirements. The Mercosur deal, facilitating import of meat from countries with looser AMU regulations, and the milk recording tax in Ireland were both met with heavy criticism. At the Irish level, the debate surrounding antiparasitics began to escalate after

the publication of the key HPR report indicating that prescriptions were required under EU 2019/6 and Ireland could no longer avail of a previous derogation (Health Products Regulatory Authority 2019). In 2020, we can see that the actors involved in this discussion changes, with the development of the Independent Licensed Merchants Association (ILMA) and the Antiparasitic Stakeholder Committee (Department of Agriculture Food and the Marine 2020; Phelan 2020). Frame 2's inclusion of industry actors and the concerns for merchants, competition, and the need for a multi-stakeholder approach are coherent with the arguments often made by these actors.

In 2021, Frame 4 (Addressing the AMR Threat Together) is at its highest proportion while the use of Frame 2 slightly decreases. Politically, we can see that there have also been further developments in the antiparasitics issue from 2021 to 2022. With Frame 4 predominantly being used to describe official government actions and publications, it is possible that the competing sides to this debate are the focus of 2021, with increasing coverage on the reasoning behind the legislation (as Frame 4 is characterized by many articles comprehensively discussing AMR). Frame 4 also focuses on the vets' role, so the discussion of the NVPS and its requirements for vets at this time may also help to understand the rise of this frame. From 2023 to 2024, Frame 3 again gains dominance, though Frame 2 is still present. Frame 2 decreases in its popularity from 2022. On the policy side, a decision around the key issue within Frame 2, the antiparasitics legislation, was deferred until the Irish veterinary medicines legislation process was completed (Department of Agriculture Food and the Marine 2025). Despite these changes, it is still clear that 2020 marks a shift in the framing of this topic, with Frame 2 gaining popularity and maintaining it even after the antiparasitics debate is stalled. As the issue became more politicized, with the larger proportion of Frames 2 and 4, there was a shift in the framing of AMU from being primarily within the realm of farmers, vets, and other close contacts to a more complicated political issue involving industry, Irish non-agricultural government actors, and international government actors (such as the EU).

Discussion

Four frames used by agricultural newspapers on the topic of AMU, AMR, and related policies were identified. Frame 3 (AMU on the Farm) was dominant and included articles about farmers using antimicrobials on the farm, without discussing policies or the risk of resistance. Frame 2 (Imposition of Legal Action on Antimicrobials) was the second most dominant narrative and included a discussion of AMU



AHI = Animal Health Ireland, AP= Antiparasitics, APR = Antiparasitic Resistance, APs Req = Requirement for a prescription for antiparasitics, HPRA = Health Products Regulatory Authority, ILMA = Independent Licensed Merchants Association, JO= Joint Oireachtas (Irish Parliament) Committee on Agriculture and Food, NAP = National Action Plan, NVPS= National Veterinary Prescription System, OH = One Health, TASA= Targeted Advisory Service on Animal Health, VCI = Veterinary Council of Ireland, Vet Med Reg. = Veterinary Medicinal Products Regulation 2024

Fig. 3 Longitudinal analysis of frames. Proportion of articles within each frame shown by year, along with a timeline of events split at the EU, Irish, and other levels. Figure developed in R and Microsoft PowerPoint

policies without addressing the issue of AMR. It is clear that AMU practices and related policies are framed across articles as something which has a much larger impact than on just farmers, but involves vets, merchants, industry actors, government at the national and international level, and more. This emphasis on the role of other actors, as opposed to farmers and their closer contacts, became more prominent over time as the issue became more politicized. Additionally, beyond the concerns for human and animal health, the issue of AMU and AMR broadens to encompass economic interests and the value of rural communities and the social relationships within them.

This work builds on the seminal work of Morris et al. (2016) and their similar evaluation of AMR in UK newspapers (from 1998 to 2014). Our Frame 1 (Agricultural Community Action Against AMR), is very similar to the “Voluntary Action” frame found in the farming press in the UK by Morris et al. (2016). Morris et al. (2016) found that the risk to animal health and the concern for consumer confidence were motivational elements for the agricultural industry to address the issue of AMR. The qualitative sub-variables show that the “Consumer” doesn’t play as heavy a role in Frame 1 of this study, as in their “Voluntary Action” frame. However, in our findings, we can see that there is similarly a larger emphasis on the animal health threat of AMR in this frame. This is different from Frame 4 (Addressing the AMR Threat Together) which focuses more on the human health threat.

Animal health was identified as a novel inclusion in AMR framing by Morris et al. (2016), as newspaper frames primarily revolved around human health. The fact that the human and animal health threats are commonly acknowledged across the frames including AMR identified in this analysis suggests that the One Health nature of AMR has become part of the general discourse. Morris et al. (2016) also indicates that the voluntary action prognosis used predominantly by the agricultural press is reflective of the general trend in which farmers are critical of government interventions. This notion is certainly true within Frame 2 and slightly true in Frame 4 within this study. However, within Frame 1, the discussion of voluntary actions does not typically include a discussion of policy interventions, possibly indicating that this is not always in direct response to government actions.

Morris et al. (2016) also identified a frame labelled “Maintaining the Status Quo”, primarily within the mainstream newspapers, of which some elements appear within the newspapers included in this study. Within the “Maintaining the Status Quo” frame there is the notion that the existing legislation is already stringent and sufficient and further legislation wouldn’t be successful. The pushback against the government regulation is a common theme in

Frame 2 of this study. However, a more nuanced image is provided, as while these articles are against further regulation, they do recognize the fact that practices need to change and that these legislative changes are eventually going to come in (i.e. the “coming down the line” finding).

The recent analysis of smallholder farm newspapers by Scott et al. (2025) found a similar sub-frame on general antibiotic use to Frame 3 in this study. They indicated that this sub-frame “Instances of ABU [Antibiotic Use] on Smallholdings” would have been more popular if they had included all articles on general antibiotic use, which is the method which was taken in this paper. Their frame is similarly characterized by coverage of incidents of AMU on the farm and related recommendations which take into account similar practical considerations as identified in this study, such as withdrawal periods (Scott et al. 2025). Frame 3 is also defined by the lack of a proposed solutions, which is similar to other frame analyses (Degeling et al. 2021).

Other frame analyses of newspaper articles’ coverage of AMR often do not include the agricultural dimension and farming-specific newspapers. However, there are interesting parallels and contrasts between frame analyses of mainstream and agricultural newspapers. For example, Dreser et al. (2012) found in their study of regulation of antibiotics for human use that pharmaceutical companies were able to quickly organize and push their agenda in the media. This parallels the work by the licensed merchants in Ireland politically (e.g. through the development of ILMA) and the growth in the use of Frame 2, which largely reflects their position. Additionally, similar arguments are used by the Irish agricultural merchants and the private businesses in Dreser’s article, which turns the debate into one about business and economic interests, over health (Dreser et al. 2012).

One contrasting finding from studies focused on the mainstream press is the framing of individuals as not having an active role in addressing AMR and the need for further information to be available to the public to enable action (Catalán-Matamoros et al. 2019; Collins et al. 2018; Davis et al. 2020). Conversely, agricultural newspapers in this study often provided recommendations as to how AMR could be prevented on farms (e.g. Frame 1) and in some cases action by farmers was framed as a solution over external intervention.

Another interesting finding is the low number of articles that assign blame for the issue of AMR or which identify actors directly who might be misusing/overusing AMR. This is inconsistent with the general literature on AMR, where blame is often put on the “Other”, such as the human health sector, intensive farms, consumers/industry, etc (Bouchoucha et al. 2019; Davis et al. 2020; Morris et al. 2016; Scott et al. 2025). While very few articles do include these ideas, it

doesn't dominate the discussion. This suggests that research into why this is, and who farmers in Ireland find responsible, could be needed. The lack of specific groups to blame for the issue may also play a part in obscuring responsibility and limiting momentum for solutions, similar to what placing the blame elsewhere might do (Morris et al. 2016). This vagueness may also relate to the generalizations made in some frames about the benefits of taking action, such as a broad reduction in AMU or AMR, lacking specifics. This is similar to other findings about the superficial coverage of AMR and the lack of risk contextualization of AMR in mainstream articles, which can hinder the audience's understanding of an issue (Boklage and Lehmkuhl 2019; Catalán-Matamoros et al. 2019).

The longitudinal analysis of frames within the context of policy changes aided in understanding the changes in popularity of different frames. This is consistent with the literature, which emphasizes that policy developments and media coverage of related issues over time are closely interlinked (Degeling et al. 2021; Dreser et al. 2012). Dreser et al. (2012) found that the number of articles about antibiotics and related regulation increased at two points during the policy process, when it was announced that an antibiotic policy would start to be enforced and when this decision was implemented. Our findings mirror the increase in attention at the start of implementation (2022), though differ in that most of the articles were from 2021, the year before the key EU regulations came into force and after they were announced and passed. It could be possible that due to the long legislative process of these EU regulations, the significance of the initial discussion in 2014 is diluted.

These results also inform recommendations for policy makers and other key actors around the communication of AMU and AMR. It indicates that the year before the changes arise is an important time period for farmers and the media. This information could be used to inform the timing of proactive communication strategies and meet the call for more collaboration on AMR between the media and public health (or veterinary public health in this case) professionals (Catalán-Matamoros et al. 2019). This would also follow recommendations from other research focusing on agricultural press, which encourages direct engagement with these media sources in order to reinforce the rationale for policies (often not included in Frame 2) and increase acceptability (Ehlers and Sutherland 2016). Improving awareness around AMR, and the link between usage and resistance, has also been suggested to have an effect on farmers' perceptions of policy (Vischers et al. 2015).

Direct engagement could also be helpful in situations like the debate around the antiparasitics legislation (particularly included within Frame 2). Previous frame analyses on antibiotics legislation have also indicated that the focus on one

aspect of the policy detracts from the aims of the overall policy and hinders the ability to generate a larger public debate (Dreser et al. 2012). Steering of the policy conversation by public/One Health officials could help to communicate a broader policy view. Relatedly, within our findings there is an underlying tension around EU policies and their implementation, and frustration with the EU and with Irish governmental actors. Much of this criticism comes from a perceived lack of coherency between policies (e.g. Merco-sur or the tax on milk recording services). There is a need to ensure solutions that are coherent across different policy areas as well as to communicate these clearly and provide insight into the larger picture (Moschitz et al. 2021). Additionally, policy makers should make an effort to incorporate local knowledge and values into the decision-making process and use this to mediate the effects of the top-down policies (Adams et al. 2025).

This work builds on a strong literature base, though further investigation is needed both within and outside of Ireland and the EU. Many of the newspaper articles included in this study were written by farmers. Utilizing these sources could help to access this population, who might be more difficult to reach using traditional methods (Scott et al. 2025). Further work should be done focusing on other media for farmers such as social media, podcasts, or videos. Within these sources, and newspapers, farmers are often directly communicating to a farming audience. These are very important sources of information as farmers tend to value the advice that comes from other farmers (Rust et al. 2022). Additionally, similarly to what was done by Scott et al. (2025), it would be useful to further triangulate these findings in the Irish setting by comparing them to other methods of investigation, such as direct interviews with farmers, in light of the policy and practice changes that have been occurring recently. This is particularly important due to the influence media coverage can have on decision-making and support for policies (Ehlers and Sutherland 2016).

Furthermore, findings in this study regarding the contested relationships between farmers and other actors, and the related connection to the potential harm to rural communities should be further investigated. These findings can be seen as examples of Woods (2006) findings asserting that rural identity and the framing of rural communities has become central within political debates. He emphasizes the symbolic power of services (public and private) in the countryside and how threats to them can be framed and perceived as threats to rurality and traditional ways of life (Woods 2006). This underlying theme is present in the arguments used by vets and merchants around the legislation and further work should be done to study how other regulations impacting farming practices are framed within the context of rurality and the importance of rural communities.

In general, the similarities between the frames identified in this article and in similar literature, which predominantly used qualitative analysis, support the validity of this mixed methods approach. As well, similar to our own findings, Scott et al. (2025) found a number of relationships between the framing themes that were identified. This indicates the complexities present in the framing of AMU and AMR to the farming community. To our knowledge, this article also provides a unique contribution by including a longitudinal analysis of the framing of AMU, AMR, and policies across multiple newspapers targeted specifically at farmers and the agricultural sector. The robustness of the results is supported by the large number of articles included in the analysis and its longitudinal nature. Additionally, the combination of qualitative and quantitative methods helped in the triangulation of the findings, as well as more nuanced understanding of the different frames.

This article is limited in that only one author conducted the data extraction, so it lacks the reliability of multiple authors. There is also potential for bias as many of the newspaper articles included were written by farmers. Additionally, this study is limited to agricultural newspapers and may only represent the frames present in this media source. Other sources of information for the agricultural community could be investigated in the future, such as social media, radio, or official communications and policies. Additionally, a comparison to the frames used on this issue by mainstream newspapers was outside of the aims and scope of this project. Despite the primary focus on changes in EU level policies, a further limitation is the restricted generalizability of these findings beyond Ireland and on a more global scale.

Conclusion

This article has identified four dominant frames utilized by the agricultural newspapers in Ireland to describe AMU, AMR, and related policies. The popularity of these frames changed from 2014 to 2024, reflecting major policy changes and an overall shift in the discourse of AMU. It became a more politically charged debate through this period, moving away from the ground level to include industry and international government actors, such as the EU, as well as concerns ranging beyond health threats. The findings demonstrate how changes in farming practices are significant to the wider rural community and can lead to debates on the roles of agricultural actors and their relationships to farmers. These complexities and patterns in how AMU is framed should be considered by policy makers in their communication strategies and work with agricultural newspapers. Future researchers should further explore the possibilities of this methodology and the use of newspapers, and other

media, to understand the framing of important agricultural practices over time.

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Data availability Data for this analysis is not available, as it is all publicly available data.

Declarations

Ethical approval This analysis uses publicly available data and has received ethics approval from the Trinity College Dublin School of Social Sciences and Philosophy Research Ethics Committee (REAMS No: 3879).

Competing interests All authors declare no competing interests.

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Addiena Luke-Currier is a PhD candidate in the Department of Sociology at Trinity College Dublin. Her research interests include One Health, antimicrobial use and resistance, and agricultural practices.

Trevor Hodgkinson is a Professor in Botany at the School of Natural Sciences, Trinity College Dublin. His research interests include agriculture, antimicrobial resistance, herbicide resistance, crop breeding, plant microbe interactions and biodiversity research.

Elaine Moriarty is an Associate Professor in the Department of Sociology at Trinity College Dublin. Her research interests include mobility and migration, race and ethnicity, employment and labor markets, qualitative longitudinal research methods, gender and identity.