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Shaping Tomorrow: How Collective Future Scenarios Influence Perceptions and Behaviour Toward AMR

A thesis

submitted in fulfilment

of the requirements for the degree

of

Master of Science (Research) in Psychology

at

The University of Waikato

by

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THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

2026

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Acknowledgements

I am very grateful for all the support and contributions that have been made and I have received along my journey to complete this thesis. First and foremost, I would like to express my gratitude to my supervisor Professor Taciano Milfont, for his guidance, encouragement and patience throughout this research and all the generosity of his time throughout. His expertise and insightful guidance played a crucial role in shaping this thesis and my development as a researcher.

I would also like to acknowledge Nathan Gray for his contribution in Study 1 and the foundation of the Study 2 through the ethic process. Nathan played a significant role in Study 1 sourcing and identifying the 226 articles as well as summarising the media articles that were summaries in this Study 1 of this thesis. Combined with this his experience within Māori research contexts, provided valuable support during my ethics and creation of my survey for Study 2 to strengthen the foundational robustness. This support was instrumental in shaping our thinking around culturally appropriate and respectful research practices. I am very appreciative for his diligence in supporting the reliability in this project and high standards he set for this research.

I am thankful for Associate Professor Susan Bull (The University of Auckland) and her involvement in the wider research programme funded by the British Academy. I am grateful for her taking time out of her busy schedule to have a zoom meeting and send relevant articles to support my understanding of AMR. She helped build my knowledge by explaining her qualitative work exploring how AMR is perceived in Aotearoa New Zealand, and her engagement with Māori communities through hui.

Tomás Gago, a PhD student supervised by Professor Taciano Milfont, has provided invaluable support throughout this research process. He was consistently generous with his time; he was always happy to jump on zoom or come into university to assist. Particularly

with learning how to use NVivo and the setup of my survey in Qualtrics. His patience, expertise, and willingness to help were greatly appreciated.

I would also like to extend my gratitude to my dad who has always been a huge support throughout not only this research but all my university career. Even though he has a busy life he always found the time to carefully read my work and provide suggestions and feedback and always offered encouragement and supported me through the drafting process. His time, patience, and belief in me made a genuine difference. I also need to thank my mum for her support and belief in me throughout this process. I am grateful for her constant emotional support she has provided throughout and simply always being there encouraging and reassuring me.

To my husband Josh, I want to thank him for his patience and never complaining about the late nights of me studying and all the extra help he offered while I juggled working and studying. His unwavering support, understanding, and reassurance during the highs and lows of this journey has not gone unnoticed.

Finally, I want to thank everyone else that has contributed their time or perspective to this research. There have been many conversations and guidance throughout which have given me new perspectives and helped contribute to shaping my research.

Abstract

Antimicrobial resistance (AMR) makes infections harder to treat due to developing resistance to the antibiotics, and it is a growing global threat in modern society. What once would have been easily managed and treatable illnesses, are now becoming increasingly difficult to manage via antibiotics and having prolonged and more complicated illnesses. Emerging research suggests challenges in addressing AMR extend beyond scientific and medical factors, but also how the issue is framed and communicated to the public. Therefore, this thesis aims to investigate and understand how AMR has been portrayed and communicated in the media to the public of Aotearoa New Zealand and examine how different future-oriented narratives influence public attitudes and affect behavioural intentions towards addressing the AMR issue.

Study 1 employed a quantitative thematic media analysis grounded in agenda-setting theory to examine how AMR was portrayed in New Zealand media over a 15-year period (2010–2024). An analysis of 226 media summary articles was conducted to reveal that coverage was largely reactive and episodic, with fluctuating salience over time. While crisis framing was prominent, particularly during periods of heightened coverage, the media narratives often lacked sustained local accountability and clear calls to action, potentially hindering for long-term public engagement with AMR in New Zealand.

Building on from these findings, Study 2 was pre-registered using an in between-subjects experimental survey design to assess how different future framings of AMR (crisis, hopeful, and neutral) influenced public attitude and engagement. A nationally representative sample of New Zealand adults ($N = 1,648$) was randomly assigned to one of three future scenario conditions set in New Zealand 2060. Results indicated that the crisis framed condition reported significantly stronger collective action intentions and more supportive attitudes toward addressing AMR than hopeful framings, while private-sphere behavioural intentions did not differ across conditions.

Together, these findings demonstrate that future-oriented and credible communication plays a critical role in shaping sustained public engagement with AMR as a long-term societal health challenge in Aotearoa New Zealand.

Introduction

Today's modern society is increasingly being confronted with challenges that gradually unfold over extended periods of time, making these impacts difficult to recognise in real time, eroding the foundations of social, economic, and health systems. When threats evolve slowly, such as long-term environmental and public health issues, society often underestimate the severity of the issue, a pattern observed in research on temporal discounting and creeping crises (Boin, Ekengren, & Rhinard, 2020; Fimreite et al., 2025). Moreover, pressing complex health issues can no longer be understood solely as a biomedical phenomenon. Instead, understanding societal health issues are shaped by everyday behaviour, policy decisions, and collective action, and require a nuanced understanding of human behaviour and systemic interactions to effectively address their long-term implications.

Antimicrobial resistance (AMR) represents one such slow-moving and systemic health challenge. AMR refers to the ability of microorganisms, such as bacteria, viruses, fungi, and parasites, to evolve and build resistance to antimicrobial medicines, therefore reducing the effectiveness of medications used to treat infections, including antibiotics, antivirals, antifungals, and antiparasitic, treatments that have been foundation for the modern healthcare system (Tang, 2023; World Health Organization, 2023). AMR is widely recognised as a significant and increasingly global public health threat, with projections indicating significant future impacts on morbidity and mortality, as well as growing strain on health system capacity if current AMR patterns persist (Naghavi et al., 2024). AMR challenges extended beyond medical settings of just how we take antibiotics. In Aotearoa New Zealand, as in many countries, AMR overlaps into agricultural practices, pharmaceutical regulation, environmental systems and everyday behavioural intentions. Therefore, addressing the nuances of AMR requires more than just scientific and medical responses, factors such as coordinating societal change over time, collective responsibility, and public engagement with uncertain future risks. These factors position AMR as a

challenge that raise important questions about how societies understand and communicate the issue, highlighting the need for frameworks capable of addressing long-term systemic societal change.

Emerging evidence indicates that difficulties in shaping public engagement with AMR extend beyond the low awareness and includes the ways in which the challenge is being communicated and framed (Joubert & Botes, 2025). Grailey et al. (2025) demonstrates that the terminology used when describing AMR plays a significant role in shaping the public comprehension, attitudes, and behavioural intentions. These findings highlight the need to understand how AMR is framed within broader societal contexts and examine these effects beyond assumptions of information provision alone is sufficient.

Given that AMR is a long-term, systemic, and socially distributed in nature, a useful framework for understanding and examining these issues is Just Transition, which was developed to address large-scale societal change. Grounded within the context of environmental and energy transitions, the Just Transition framework refers to a set of approaches that aim to manage large-scale societal changes in a manner that prioritises fairness, inclusivity, and consideration towards social consequences (Stark, Gale & Murphy-Gregory, 2023). Just Transition extends beyond focusing exclusively on technical or policy responses, by emphasising the importance of systemic approaches that foregrounds collective responsibility, public engagement, and the equitable distribution of costs and benefits across societal groups and generations (Heffron & McCauley, 2018). At the core of this framework is an explicit concern with the future, and understanding that transitions happen over time, and therefore require societies to anticipate long-term consequences while still preserving legitimacy and public trust (Newell & Mulvaney, 2013). Therefore, Just Transition provides a valuable conceptual lens for analysing how slow-moving, systemic challenges like AMR are framed, interpreted and navigated at both a societal and individual levels.

The core principles of the Just Transition framework are highly relevant to exploring a deeper understanding to AMR and the implications as a long-term societal challenge. AMR represents a long-term, systemic issue that relies on cross-sectional behavioural change and sustained public engagement. To address AMR entails transforming established antibiotic-use practices across healthcare, agriculture, institutional and everyday settings, while also navigating complex broader questions of responsibility, equity and public trust. Effective responses to AMR looking through a Just Transition lens involves not only relying on technical solutions, but understanding how the issue is communicated, framing of responsibilities, and how future consequences are being portrayed and understood by the public. This underscores the importance of understanding the narratives being portrayed to the public around AMR, as these narratives play a critical role in shaping how one perceives a threat and the need to change collective and private behavioural intent and willingness to engage in current day behavioural change for long-term benefits.

How the public understand and act on societal challenges is strongly shaped by the way the issue is communicated. The media plays a key role in how the public interpret these complex challenges by shaping perceptions of importance, through agenda-setting processes, which involves the frequency and framing of how the issue is framed, which aspects are emphasised, where responsibility is placed and how the public imagine future consequences (McCombs & Shaw, 1972). In context when a systemic challenge unfolds slowly, the media narratives contribute significantly to influencing public expectations about the future and perceptions of urgency and the legitimacy of collective action. From a Just Transitional framework perspective, media narratives around AMR can either strengthen or hinder societal readiness for change. Depending on whether the AMR issue is framed as a collective long-term responsibility or as a distant, technical or individualised problem. Understanding how AMR is portrayed in the media is critical for assessing how societies are being influenced in preparing readiness for navigating a long-term transition associated with AMR.

Guided by this perspective and aligned with the broader British Academy funded Just Transitions for AMR initiative, (British Academy, n.d.), this thesis investigating how AMR is communicated and understood in Aotearoa New Zealand. This thesis comprises two complementary studies, examining different communication of AMR may shape the New Zealand public perception on the issue. Within Study 1, we analysed how AMR has been portrayed in the New Zealand published media over the last 15 years (2010-2024).

Grounded in Agenda-Setting Theory (McCombs & Shaw, 1972) as the theoretical framework, Study 1 employs a quantitative thematic media analysis to investigate dominant narratives of how AMR was being communicated, with a particular focus on framing, tone, responsibility, future impacts, and calls to action. Using a longitudinal analysis of media representation of coverage allows for a richer evaluation of how consistently AMR is being framed as a long-term societal issue over time. This approach also enables an examination on whether AMR narratives align with the collective, future-oriented principles implied by the Just Transition framework, through understanding and identifying emerging pattern in AMR salient for the New Zealand public. Study 1 established critical insight into the communicative context within how AMR has been positioned and therefore how it may influence the New Zealand public, and providing the descriptive foundation for the subsequent empirical study.

Study 2 builds on the patterns that emerged in Study 1, by examining how different future-oriented narratives informed by reviewed media representations shape public engagement and current behavioural intents. Guided by the Collective Futures Framework (Bain et al., 2013), Study 2 used an experimental between subject's design to assess the effects of different future framing of New Zealand society scenarios of AMR (crisis, hopeful, and neutral). Participants were randomly allocated one of the future scenario conditions, then completed an online survey answering questions to assess their collective, private-sphere intentions and general attitudes towards AMR. By manipulating the exposure to participants, a one-way ANOVA was used to examine what condition produced the most significant effect in communicating the threat of AMR.

Together, these two studies enabled an integrated examination of how AMR is communicated in New Zealand, capturing the nuances of media portrayals and understand the implications involved to gaining more effective engagement. By conducting rigours analyse of how AMR has been portrayed in the publish media over the last 15 years and combining an experimental investigation of future-oriented narratives, this thesis contributes to further understanding the role communication plays in influencing public perceptions, future thinking and behavioural intent around complex long-term societal challenges. The research highlights the importance of how narrative framing influences the publics' understanding of a complex issue affecting their understanding and perspective of responsibility, urgency, and future consequences, and affect their motivation to act based on the severity they place on the issue. The findings produced from these two studies offer both theoretical and applied contributions and provides evidence-based insights to inform more effective, future-focused strategies for addressing the AMR challenge within New Zealand.

Study 1: Media Framing and Salience of Antimicrobial Resistance in New Zealand

Despite growing concern about antimicrobial resistance (AMR) both locally and globally, there is little known about how this issue has been portrayed in the New Zealand media. As briefly noted above, media coverage plays a critical role in shaping public awareness, perceived importance, and influences collective and emotional responses to complex societal issues (Shah et al., 2020; Khanya, 2024). Study 1 examined how AMR was portrayed in the New Zealand media over a 15-year period (2010-2024). The analysis focused on identifying dominant frames and considering how these narratives could shape the New Zealand public's perceptions and emotional responses towards AMR. This study was grounded in agenda-setting theory and informed by a quantitative thematic analysis (TA) to capture the full nuance of how AMR was represented. By analysing longitudinal media patterns, Study 1 provides valuable insight into dominant narratives used to portray AMR New Zealand, highlighting frames that could potentially influence public knowledge and perceptions towards this issue.

Agenda-Setting Theory

Agenda-Setting Theory was developed to describe how the information shared by the media affects how the public think and behave (McCombs & Shaw, 1972). The theory distinguishes between two levels of media influence. First-level agenda-setting is based on the frequency and prominence of an issue as it appears in the media, and how this influences the importance the public perceives an issue (McCombs & Shaw, 1972). Secondary-level agenda-setting investigates how the issue is presented and framed to the public and how this affects the public's emotional and cognitive perception (McCombs et al., 1997). These two levels of media influence are described in more detail next.

First-Level Agenda-Setting

First-level agenda setting refers to how often and how prominently an issue appears in the media, therefore shaping how important the public perceives the issue (McCombs & Shaw, 1972). In McCombs and Shaw (1972) foundational study of the 1968 U.S. presidential campaign, initially demonstrated the connection between media frequency and public response, reporting a finding of a strong correlation ($r = .97$) between the issues emphasized in the media and those that the voters perceived as most important. Since this seminal study, there has been other extensive empirical research supporting this relationship seen through first-level agenda-setting across diverse domains. For example, Dudo et al. (2007) research found that the U.S. newspapers coverage of avian influenza outbreak frequently dramatic and concerning content, elevating public perceptions of risk and elevating the salience of the issue. Similarly, Corrigan et al. (2005) findings illustrated that the frequency of media coverage around mental health topics significantly influenced the public's awareness and concern. Another similar pattern was conveyed by Jang and Baek (2019) reporting that increased media coverage of the Ebola outbreak in South Korea heightened the public's perception influencing the perceived threat and behavioural responsiveness.

Although first-level agenda-setting provides a robust framework for observing media salience and public concern influenced by the media, alone is limited in its ability to capture how complex public health issue such as AMR is interpreted. Factors to capture the full nuance of AMR and the multidimensional nature of this issue are not considered including framing, tone, or responsibility attribution. This is due to the level of analysis focusing on only frequency rather than the full content such as the framing of the issue or tone. This gap is where second-level agenda-setting emerged to address these limitations, considering how specific attributes of the media content potentially shapes the public's interpretation and influencing current behaviour and concerns.

Second-Level Agenda-Setting

Second-level agenda-setting goes beyond issue salience by examining the attributes used to frame an issue in the media. This level of analysis investigates how specific framing of an issue can shape the public's interpretation, through emotional tone, contextual cues and the attribution of responsibility (McCombs et al., 1997). These attributes are important to consider as they influence the public's cognitive evaluations and emotional responses, shaping their attitudes and behavioural intentions towards an issue.

Research shows that the way an issue is framed significantly influences the public's attitude and behaviour in many domains. For instance, Nisbet (2009) found that when the media portrayed climate change with a narrative of public health or moral responsibility it increased public engagement and support for policy action, compared to a narrative of scientific uncertainty. Boomgaarden and Vliegenthart (2009) showed that when the media framed immigration as a cultural threat, rather than an economic benefit, heightened negative attitudes and increased the public's demand for restrictive immigration policies. Rećio-Román et al. (2023) found the way the media framed information, influenced behavioural change and shaping vaccine hesitancy, affecting a vaccine uptake, demonstrating how framing influences public compliance with health behaviours. These

studies reinforce that it is not only the frequency of an issue in the media but how an issue is framed can influence the public's engagement. Second-level agenda-setting offers a critical framework for analysing how the media shapes public understanding and response to complex health challenges such as AMR.

As second-level agenda-setting focuses on how specific attributes, such as tone, emotional response and responsibility, play a part in shaping the public's interpretation, it requires an analytic approach capable in capturing these nuances. Thematic analysis (TA) complements second-level agenda as it helps to systematically identify and interpret recurring patterns that emerge in media discourse. Using TA within this study enabled a more in-depth analysis of how key themes were constructed and portrayed over the 15-year period.

Thematic Analysis

Thematic Analysis (TA) is a widely used method in qualitative research, due to its flexible systematic approach in identifying, analysing and interpreting patterns and meaning in a dataset (Braun & Clarke, 2006). TA is compatible with both inductive (data-driven) and deductive (theory-driven) approaches, making it well suited to mixed-method research (Nowell et al., 2017). This approach allows researchers to develop deeper interpretations of key features within the data and their relationship to a broader social context.

Braun and Clarke's (2006) conceptualisation of TA as a six-phase process involving familiarisation with the data, code generation, theme development, theme review, defining and naming themes, and final reporting (Braun & Clarke, 2006). These phases are conceptualised as flexible and recursive rather than linear or mechanical, this allows researchers movement back and forth between stages as analytic understanding evolves.

The familiarisation with the data phase involves the researcher immersing themselves within the data, this engagement includes repeatedly reading and actively taking notes, establishing close engagement with the content. This enables the researcher to gain

an in-depth understanding of the content they are reviewing and develop initial analytic ideas (Braun & Clarke, 2019). Within this stage of the process, the researcher begins to form early observations and potential patterns that are emerging. These patterns are recorded and reflected upon; this process lays the foundation for subsequent coding.

During the next phase of code generation, the data is examined to systematically identify of meaningful features relevant to addressing the research question. Within this phase codes are assigned analytic labels, capturing salient aspects and patterns that emerge in the data, rather than objective or inherent units of meanings, this process is reflected and shaped by the researcher's engagement and analytic perspective of the dataset (Braun & Clarke, 2019).

Within the theme development phase, relationships between codes are interpreted and examined to construct broader patterns of shared meaning. The themes are constructed by defining their conceptual relevance and analytic significance to the research question rather than by frequency alone (Braun & Clarke, 2019).

During the theme review phase, themes are iterative refinement, evaluating for internal coherence and distinctiveness, ensuring for alignment within the whole dataset (Braun & Clarke, 2019). To enhance analytic clarity and conceptual consistency, this phase can involve themes being refined through merging, dividing, or removing to strengthen the clarity within the pattern meaning.

The defining and naming themes phase involves clearly articulating the scope of each of them, this is done through identifying the focus and conceptual boundaries. Braun and Clarke (2006) emphasise the researcher's role in identifying the specific analytic story conveyed within each theme and what the narratives contribution is to the overall analysis.

The final reporting phase focuses on the integration of the themes and organizing them into a coherent analytic narrative that situates the findings within existing theory and

literature. Braun and Clarke (2019) emphasise that this phase should foreground interpretive argumentation, rather than present themes as definitive truths.

Study 1 follows Braun and Clarke (2019) reflexive thematic analysis, recognising the researcher's active role in developing themes and acknowledging that the interpretive lens can shape the analytic process. Reflexive TA is distinguished from coding-reliability and codebook-driven approaches by prioritises foregrounding interpretation, reflexivity, and analytic judgement (Braun & Clarke, 2019). Adding TA to this study complemented agenda-setting by providing a flexible yet rigorous method for examining AMR media coverage summaries and capturing the evolution of framing patterns within the dataset.

The Present Study

This study applied agenda-setting theory to examine how AMR was framed in the New Zealand media narratives over a 15-year period (2010-2024). It focused on identifying dominant narratives, tones, attributions of responsibility and calls to action. A mixed method approach combined quantitative content analysis with thematic analysis (TA), providing a comprehensive understanding of media portrayals.

Method

Sample

The data for Study 1 was collected and summarised by a Research Assistant. The articles were collated using a systematic search strategy to capture mainstream New Zealand media coverage of AMR over the 15-year period (2010-2024). Initial searches were conducted via Google using keywords, "antibiotic," "resistance," "New Zealand," and "media". To enhance a comprehensive coverage, the search was expanded by including specific media outlets (e.g., "Otago Daily Times"), allowing to discover and identify additional relevant articles to the dataset inclusion. This process resulted in identifying 226 articles, each summarised in a Word document for analysis.

Procedure

Data Preparation and Organisation

To begin the analysis and an initial understanding of the data, article summaries were imported into NVivo 14 (QSR International, 2023) for data organisation and exploration. NVivo's auto-coding tool was used to generate preliminary codes and themes. Each of the 226 article summaries were imported into NVivo 14 as separate cases. This process allowed for a more detailed and rigorous data analysis. Articles were organised by year using file classifications, enabling examination of temporal trends across the dataset.

Data Analysis

A combined qualitative–quantitative thematic analysis guided by agenda-setting theory, was used to analytically identify, interpret and quantify the core themes across the media articles. While TA is traditionally a qualitative method, it can also be adapted and used within in a mixed-methods analytic framework, such as assessing the salience and prevalence of themes (Joffe, 2012) as was undertaken in this study. This approach involved coding and categorising the content of the 226 article summaries to determine the frequency, prominence of specific frames, tones and attributions of responsibility.

The initial familiarisation of the data involved reviewing all summaries to identify repeated patterns and salient features. To ensure accuracy, full articles were chosen from reoccurring themes to verify the summaries were showing a true reflection of the original content. Guided by NVivo's auto-coding output, I conducted my own independent manual coding to gain a deeper understanding of data and features relevant to AMR portrayal in the media. To capture both surface-level content and a deeper underlying meaning, this study incorporated both semantic (explicit) and latent (underlying) coding, as recommended by Clarke and Braun (2014). Codes included framing, tone, responsibility, call to action, and future projections.

Themes were then developed by organising the broader parent themes (e.g., framing, tone, responsibility) with associated child nodes (e.g., policy & regulation, behavioural change, public awareness) allowing to capture more specific dimensions. To ensure transparency and retain complexity in the analysis, some article summaries were coded under multiple codes, allowing for a more nuanced reflection of how AMR was portrayed across context.

To examine shifts over time, the thematic structure was grouped into three time periods: Early (2010-2014), Middle (2015-2019), and Current (2020-2024). Themes were reviewed against the full dataset to ensure the analysis was consistent and accurately captured the evolving representation of the media narratives over time. This step ensured that thematic map reflected the full evolving media narrative.

Each theme and subtheme were clearly defined and labelled with operational definitions and examples (Table 1). The unit of analysis for this study was the individual media article. For example, tone related themes such as “urgent & cautionary”, “factual & neutral”, “hopeful & optimistic”, and “provocative & engaging” were identified. Defining and naming these themes within time frames helped for a clear comparison and helped capture the media narrative evolution over time. The AMR framing was completed by determining the articles category of crisis, scientific & innovation, behavioural & individual responsibility, global coordination & policy, educational & awareness, or personal narrative.

Descriptive statistics were generated using NVivo and Excel to quantify the frequency and proportion of different codes and themes. This process allowed for detection of portrayal shifts over time, such as identifying different peaks in specific tones (e.g., a spike in urgency in 2017), and detecting changes in where the emphasis of AMR was framed. The analysis provided insight into media narratives and agenda-setting of AMR across the 15 years.

Following the quantitative analysis, a qualitative analysis was then conducted to identify any latent themes and identifying recurring narrative structures. This mixed-method approach allowed for both the frequency of themes and underlying implications to be captured. To enforce reliability, ChatGPT was used as a complementary tool for cross-checking coding consistency and reduce bias. ChatGPT prompts included “Based on the following code descriptions, do these codes align appropriately with their assigned themes?” and “Can you identify any overlap or misalignment in how these themes are applied?”.

Table 1

Coding Scheme used in Study 1, Including a Description of the Code, Categories Used and Verbatim Examples

Code	Description	Categories	Example Quotes
Framing of AMR	The main narrative used to present AMR	Crisis, Scientific & Innovation, Behavioural & Individual Responsibility, Global Coordination & Policy, Educational & Awareness, Personal Narrative	“The ‘apocalyptic scenario’ of the health system falling back two centuries... if we don’t act now.” (NZ Herald, 2013) “Antimicrobial resistance is already here, already hurting people and will only get worse if we don’t act now.” (The Conversation, 2024)

Tone	Emotional framing of the content	Factual & Neutral, Urgent & Cautionary, Hopeful/Optimistic, Provocative & Engaging	“Scientists are warning New Zealand is near a tipping point for the spread of a superbug.” (RNZ, 2017), “Antibiotic resistance could cause over 39 million deaths by 2050.” (NZ Herald, 2024)
Responsibility	Who is portrayed as responsible for causing or solving AMR	Government & Policymakers, Healthcare Sector, Scientific Community, Public, Agricultural sector, Natural Evolution	“Te Whatu Ora and the GP College should set goals to reduce inappropriate prescribing.” (RNZ, 2024), “New Zealand has one of the highest rates of

			antibiotic resistance in the world.” (Stuff, 2024)
Future Impacts	Projected outcomes of AMR as portrayed in the article	Threat to Health & Medicine, Causes & Risk Factors, Preventative Measures, Solutions & Innovations, Communication & Awareness Gaps	“Antibiotic usage must be dramatically reduced, or we will see increased death and disability.” (RNZ, 2024), “The more resistance we encounter, the greater the length of hospital stays and the burden on our healthcare system.” (The Spinoff, 2023)
Call to Action	Recommended strategies to address AMR	Behavioural Change, Policy & Regulation, Public Awareness,	“Health officials must urgently devise a national response plan.” (RNZ,

		Research & Innovation Support, Agricultural Practice, NA (no calls to action)	2017), “GPs need to stop prescribing antibiotics when they aren’t needed – we are fuelling the fire.” (Otago Daily Times, 2024)
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Study 1 Results and Discussion

First-level agenda-setting analysis examining patterns in New Zealand media coverage of AMR over time revealed inconsistent and largely reactive portrayals of the issue (Figure 1). Two overarching temporal themes emerged: in the earlier years, media salience was low with minimal local accountability; however, from 2015 onwards, coverage shifted towards more active engagement with addressing the AMR challenge.

Quantitative Content Analyses

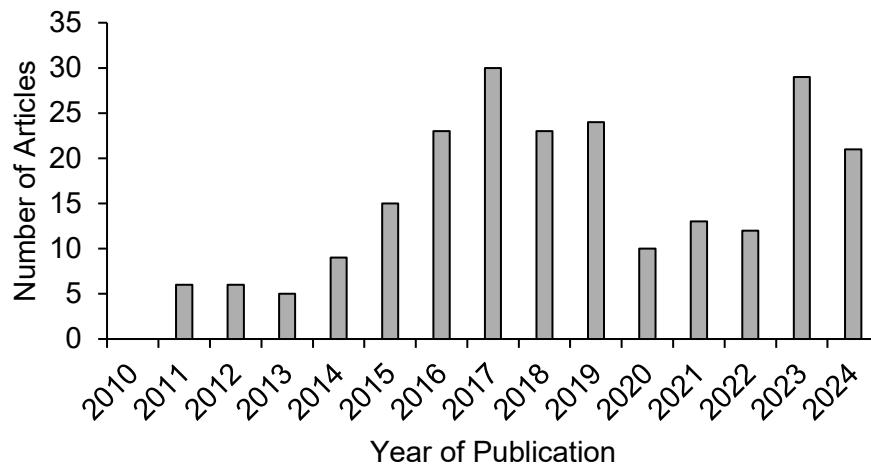
To identify trends in AMR coverage over the 15-year period, the data was grouped into three timeframes: Early (2010-2014), Mid (2015-2019) and Recent (2020-2024). Within each period, the frequency of each code category was calculated.

Frequency of Coverage

There were no articles on AMR found in 2010. While coverage began emerging from 2011 it remained low during this earlier period (2010-2014), with only 26 articles identified in this period. AMR media coverage increased substantially during the mid-period 2015-2019 ($n = 115$), peaking in 2017 ($n = 30$). Although a dip occurred in 2020-2021, this was likely due to the COVID-19 pandemic, and AMR coverage rebounded back in 2023-2024 (total for 2020-2024: $n = 85$). Overall, media coverage of AMR increased over time, characterised by periods of heightened attention and subsequent decline (see Figure 1).

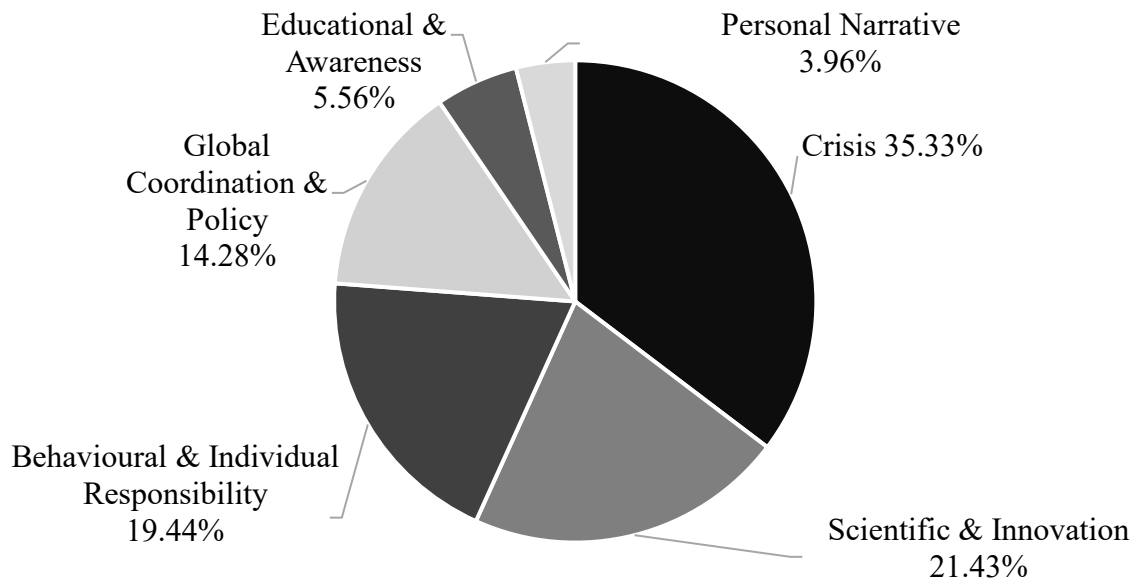
Figure 1

Number of Media Articles on AMR Over the Last 15 Years (2010–2024)



Framing of AMR

Articles were often assigned multiple code when they included more than one framing of AMR within a single publication (Figure 2). The analysis indicates that the most frequent framing across the dataset was crisis ($n = 89$), with a notable spike in 2018 ($n = 49$). Over time, there was a shift in how AMR was framed. In the earlier years AMR was portrayed as an abstract global threat. This framing gradually evolved into a more responsibility-oriented narrative, culminating in recent years an increased emphasis on solutions and accountability. Other prominent frames included scientific & innovation ($n = 54$), behavioural & responsibility ($n = 49$), and global coordination & policy ($n = 36$). In contrast, educational and personal narrative frames were relatively sparse throughout the 15 years period.

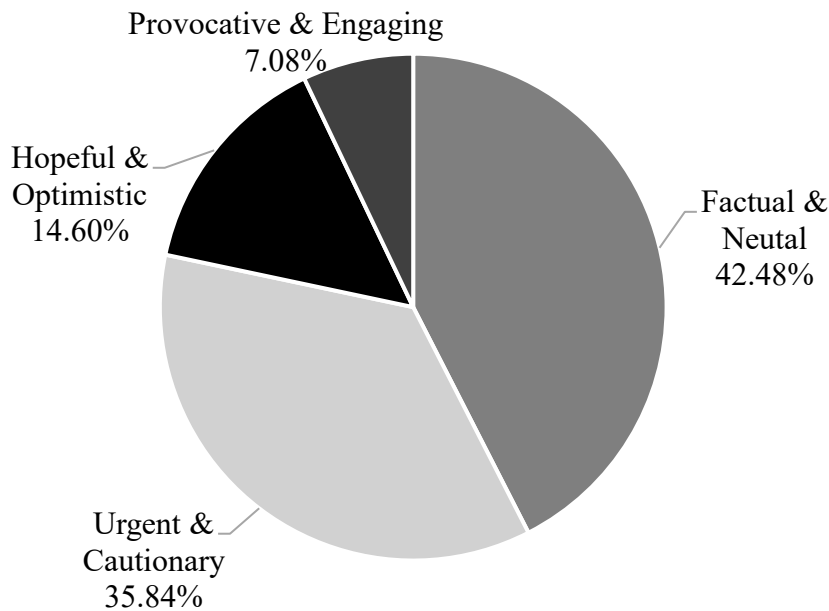
Figure 2.*Distribution of AMR Framing in Media (2010–2024)****Tone***

The dominant tone across the 15-year period was factual/neutral ($n = 96$), which was consistently represented across all three time periods, with a slight increase in the recent period (47%). These findings indicate that overall, the media tended to portray AMR in a factual narrative rather than emphasising public concern or prompting behavioural change.

The second most common tone was urgent/cautionary ($n = 88$), which peaked in 2017 ($n = 20$). This tone featured evocative language, with emphasis of instilling fear, frequently using phrases like “ticking time bomb” and “silent pandemic” along with keywords like “deaths” and “superbug”. In the more recent years, there was a noticeable rise in hopeful/optimistic and provocative/engaging tones. Particularly seen in articles with a focus on scientific innovation and research or community-driven responses. This shift reflects a gradual diversification in how the tone of AMR was communicated to the public (see Figure 3).

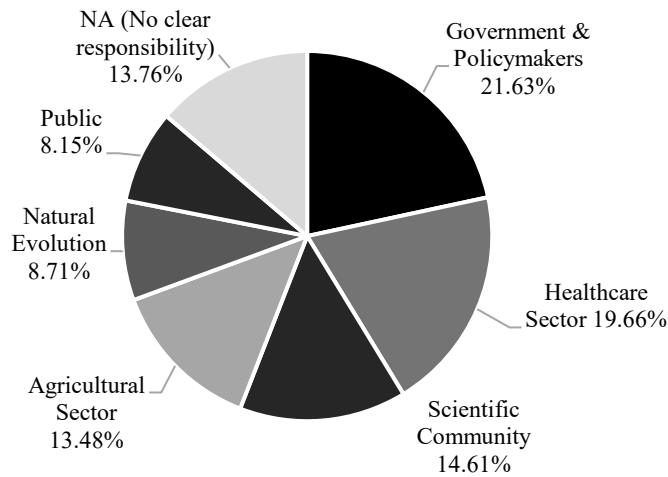
Figure 3.

Distribution of AMR Media Tone Categories (2010–2024)



Responsibility

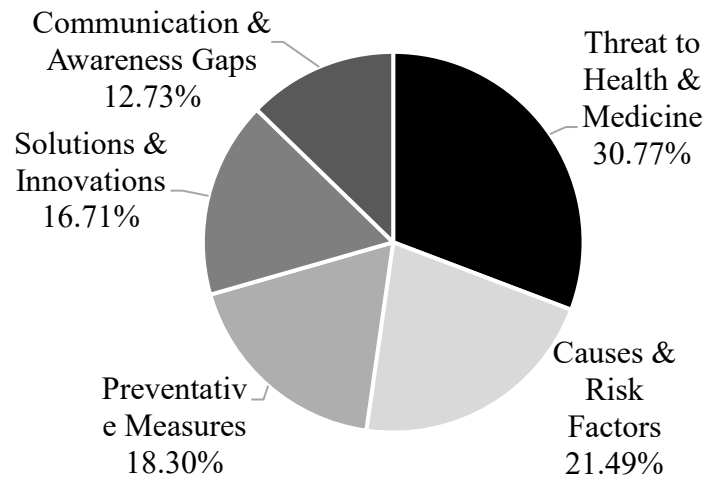
Responsibility for AMR was most commonly attributed to the healthcare sector ($n = 61$), followed by government/policymakers ($n = 55$), the scientific community ($n = 39$), and public and individual behaviour ($n = 38$). Over time, a shift in responsibilities was observed. In the early years, coverage had a more passive narrative, framing AMR as the result of natural microbial evolution ($n = 11$). In contrast, recent coverage shifted towards active attributions, directly assigning responsibility to systemic actors within New Zealand emphasising the need for changes to be made (see Figure 4).

Figure 4.*Distribution of Responsibility of AMR Categories (2010–2024)****Future Impacts***

Global consequences of AMR were consistently featured in the media coverage throughout the period (Figure 5). The most frequently highlighted impact was the threat to health/medicine ($n = 51$), followed by causes/risk factors ($n = 38$), preventative measures ($n = 32$), solutions/innovations ($n = 27$), communication/awareness gaps ($n = 18$). These themes that emerged reflects a growing concern about the long-term implications of AMR, including the potential to undermine modern medicine, the factors driving the spread, and the importance for coordinate efforts in managing the threat. The results also highlight the increasingly importance innovation and public communication as key components of future response strategies.

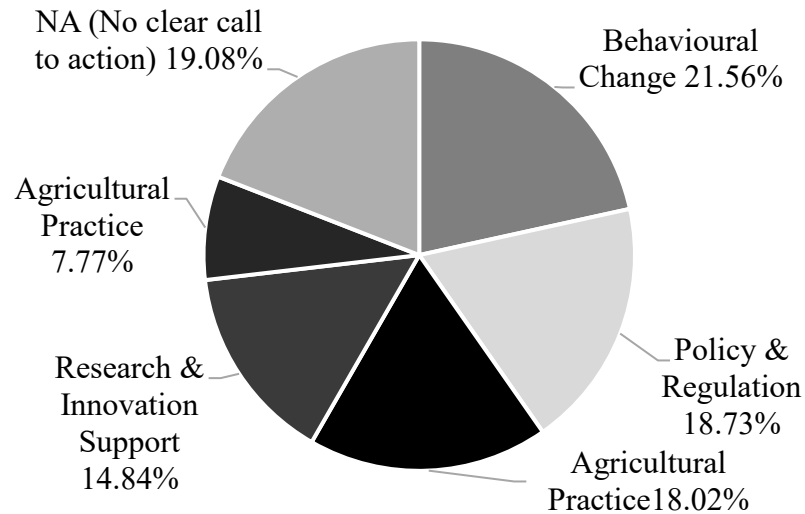
Figure 5

Distribution of Future Impacts of AMR Categories (2010–2024)



Call to Action

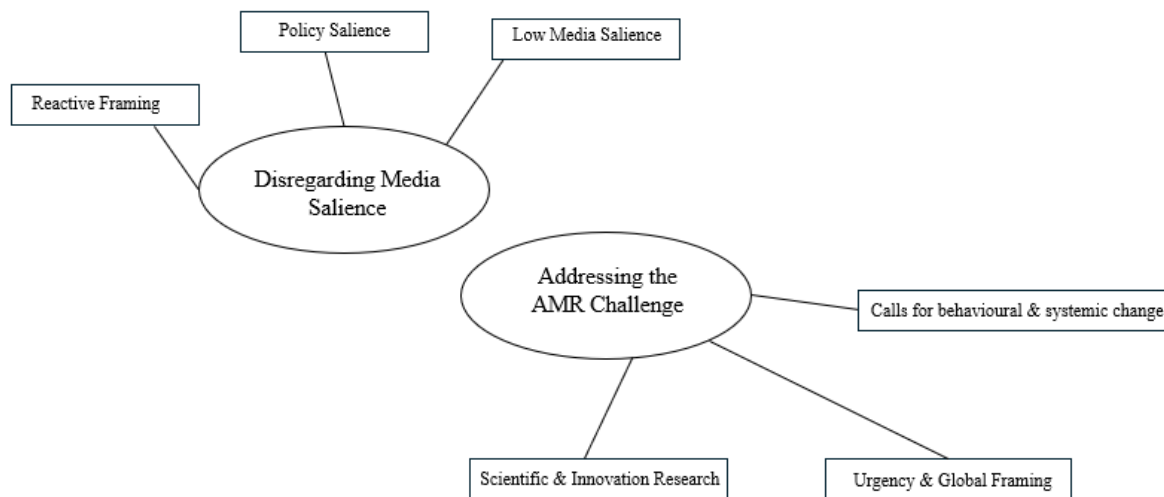
The analysis revealed a clear increase in calls to action (Figure 6), with a notable rise from 2017 onwards and peaking in 2024. The strongest calls to action focused on behavioural change ($n = 41$), policy change ($n = 36$), public awareness ($n = 29$), and research funding ($n = 25$). Although messages for antibiotics misuse and over-prescribing were seen throughout the period, their frequency increased significantly in the 2020s. This reflects a growing urgency in prompting change at individuals, institutional, and policy levels.

Figure 6*Distribution of Call-to-Action Categories (2010–2024)***Overarching Themes**

Reflexive thematic analysis identified two overarching themes and six associated subthemes (see Figure 7). These two themes were present across the full dataset, although their prominence shifted across the periods. In the earlier period of 2010–2014, only 29 AMR-related articles were published. However, coverage significantly increased between 2015–2019 ($n = 127$) before slightly declining in the recent years 2020–2024 ($n = 97$).

Figure 7

Thematic Map of Media Representation of AMR in New Zealand across 2010-2024



**Note. Main themes represented by the two ovals and the six sub-themes by rectangles.*

Disregarding the AMR Threat

Between 2010 and 2014, AMR had low media salience in New Zealand, with no articles published in 2010 and a peak of nine articles in 2014. Coverage of AMR during this period was largely framed as a global or technical/scientist issue, highlighting overseas experts, new antibiotic development, and infection control rather than local New Zealand urgency. While AMR was portrayed as a crisis, it was often embedded in a broader health narrative, with responsibility deflected to microbial evolution or international misuse, limiting perceived salience for the New Zealand public.

Within the earlier coverage of AMR, low policy salience was reflected. The New Zealand government's role in tackling AMR was rarely addressed in articles, instead the focus saw warnings from international bodies such as the World Health Organizations and British health officials. When national health institutions were mentioned, the coverage was framed in a descriptive tone and lacked a strong call for leadership, regulation or investment.

The absence of policy framing suggests that AMR was not positioned as a pressing national issue during this earlier period. Although crisis metaphors such as “ticking time bomb” were common, these were framed in a global context and not typically accompanied with reference to New Zealand or a strategic plan preparedness. From an agenda-setting perspective, this omission likely reinforced perceptions of AMR as a distant problem requiring international rather than local intervention or current behaviour change. As a result, early coverage conveyed a passive observation narrative, deflecting accountability away from New Zealand and reducing the sense of local urgency needed to motivate behavioural change.

From 2015 onwards, AMR media coverage became more frequent but remained largely reactive. Keywords began emerging such “deaths” and “antibiotic resistance” “AMR to kill millions”, yet these were typically sourced from overseas and rarely linked local responsibility or action. Although crisis framing peaked in 2018 ($n = 39$), and urgent or cautionary tones peaked in 2017 ($n = 20$), these narratives still saw a reactive framing, lacking strong calls for New Zealand-specific responses. Prior to 2020, phrases such as “raising awareness,” “supporting innovation,” or “global cooperation” were common but often vague, offering little directive guidance. This weak narrative scaffolding reducing the sense of urgency to motivate behavioural change among the New Zealand public.

Addressing the AMR Challenge

From 2015 onwards, AMR grew in prominence within the New Zealand media. AMR was increasingly portrayed as a global health emergency, with keywords such as “superbug crisis” and “silent pandemic” becoming more prevalent. This reflects a broader agenda-setting process in which coverage expanded not only in frequency but also accompanied by a shift in tones of urgency and crisis. The media narrative highlighted the risk of AMR while beginning to emphasise behavioural and systemic solutions required to address this

challenge. In later years, optimistic trends emerged through hopeful framing, centred on innovation, local research efforts and scientific progress.

Appeals to individual responsibility, particularly around antibiotic misuse, were consistent across the 15-year period, though framing shifted over time. In the earlier years, the calls for behavioural and systemic change were subtle, often limited to vague appeals for appropriate antibiotic use. However, over time, coverage became more direct, with calls for a need to make behavioural and systematic changes. Themes of broader systemic factors emerged, including healthcare stewardship initiatives, national policy interventions, and accountability within the veterinary and agricultural sectors highlighting the need for stronger regulation and coordinated action.

Scientific and innovation were a consistent theme across the 15-year period. Media coverage frequently highlighted alternative treatments such as phage therapy, and advancements being developed for new antimicrobial agents, and the importance of supporting investment in scientific progress to combat the AMR challenge. This coverage was typically framed in an optimistic, solution-oriented light, emphasising the responsibility of the scientific community and the need for funding for the innovation. This framing reinforces perception that scientific and innovation research advancement is a critical component of addressing the AMR challenge.

From 2015 onwards, AMR was increasingly framed with urgency, having a global and local view. Media coverage portrayed AMR as an imminent threat that required immediate action in New Zealand, adopting alarming messages about catastrophic future outcomes if no action is taken. Headlines such as “Over 39 million deaths by 2050” (NZ Herald, 2024) if no urgent action was taken. Also, warnings that “common surgeries could become deadly once again” and “routine infections could prove fatal” (Johnston, 2013; The New Zealand Herald, 2024), framing MR as an existential threat to modern medicine and the healthcare system. This crisis framing positioned AMR as not a distant scientific concern but as an

immediate and escalating threat, holding both internationally and New Zealand institutions accountable. By linking AMR to future mortality and the collapse of routine healthcare, media coverage elevated AMR on the public and policy agenda, framing AMR as a crisis requiring urgent behavioural change.

Summary of Main Findings

The analysis revealed a shifted in how AMR was portrayed in the media across the 15 years. Prior to 2011, AMR had no media coverage, and in the early years appearances were sporadic and typically framed within broader public health narrative. From 2015, coverage increased, peaking in 2017 ($n = 30$), before declining around 2020, likely reflecting the COVID-19 pandemic. AMR presence increased again in 2023, emerging as a more distinct public issue. During this period, articles increasingly featured expert commentary, national statistics, with more targeted messages and calls to action.

Shifts were also evident as the tone of coverage evolved. In the earlier years, coverage adopted a neutral and scientific tone, positioning as a biomedical issue or global trend with limited relevance for immediate behavioural change. From 2017 onwards, however, coverage increasingly adopted urgent and cautionary tones. Coverage during this period, employed emotive language and crisis framing, with headlines using keywords such as “deaths” and “superbug” linking AMR to mortality rates and treatment failures, positioning AMR as an immediate threat.

Patterns of responsibility shifted accordingly over the 15-year period. Earlier coverage portrayed AMR as arising from global or abstract causes, such as microbial evolution or overseas trends. Over time, AMR became more prominent in the media, with greater responsibility attributed to supporting innovation research for new drugs, healthcare systems, and government policies. In recent years(2019-2024), responsibility increasingly directed towards the public, with emphasis on behavioural change, and localised accountability through organisations such as Te Whatu Ora.

Future impacts were consistently framed around collapsing health systems and mortality, although initially in the earlier years was through an international focus with the odd local narrative. Over time, a shift was seen as AMR grew a stronger presence in the media, with an increase of emphasis on New Zealand-specific context, highlighting that AMR is not just an overseas threat. Coverage also made references to older adults, and the inequitable health practices affecting Māori and Pacifica people within New Zealand. By localising the framing, the media enhanced the perceived relevance of AMR, strengthening its salience for a diverse audience and potentially increasing motivation for current behaviour change.

Correspondingly, calls to action became more explicit over the timeframe. In the earlier years, AMR was framed around awareness or research with limited actionable guidance. Later years, saw an increase in frequency of articles, with action-oriented messages including prescribing targets, warnings against antibiotic misuse, and broader appeals for institutions accountability. This trend reflects a growth in narrative scaffolding with the potential to influence both individual behaviours and policy-level change.

Overall, the findings indicate a transition from AMR initially being a low salience issue, internationally framed issue to an increasingly local urgent crisis. This trajectory suggests growing media engagement, positioning AMR as a priority for New Zealand and globally.

Limitations

While Study 1 provided valuable insights into how AMR has been portrayed in the New Zealand media over the 15 years (2010-2024), it is important to acknowledge several limitations. Firstly, the analysis was based on article summaries rather than the full published article. Although the summaries captured key themes, publication details, and direct quotes, it should be acknowledged that some key contextual information, tone nuances, or framing cues potentially may not have been fully represented. Consequently, the findings are limited

by the level of detail, and any bias or subjective emphasis within them may have potentially influenced the analysis, results, and conclusions.

Secondly, this study focused on written news articles available online, excluding other media platforms such as television, live radio broadcasts, podcasts, and social media. While some radio content was included when converted to online articles, the broader media landscape was not fully captured. Therefore, limiting the comprehensiveness of the findings in representing AMR across the full New Zealand media.

Thirdly, the interpretive nature of qualitative coding introduces the potential for researcher bias, influencing categorises, particularly in nuanced areas such as tone and framing. Although procedures took place to enhance reliability such as NVivo's automatic coding and comparison with ChatGPT outputs, these tools were used to enhance transparency and reflexive engagement with the data rather than to remove researcher interpretation.

Implications

Despite the limitations noted, the findings from Study 1 provided important insights for public health communication, policy development, and media engagement, highlighting the complexity and nuances within AMR as health issue. The results illustrate how media narratives presented to the New Zealand public shifted over time in both frequency and themes. The transition from minimal coverage, with little placement of local responsibility or impacts, to more active framing with developments of placement on responsibility for institutional accountability and national action, suggests that the media increasingly positioned AMR as an issue requiring behavioural change within New Zealand. These findings highlight the critical need for sustained, localised, and solution-oriented engagement by the media in addressing AMR.

The insights gained from Study 1 provide the foundation for the design of Study 2, which experimentally examines how different AMR framings shape New Zealanders'

perceptions, future-oriented thinking, and current behavioural intentions. Guided by the Collective Futures Framework, Study 2 tests how different framing of AMR influences the way New Zealanders imagine their future society, based on exposure to crisis, hopeful, or neutral scenarios. By directly comparing these framing conditions, Study 2 aims to identify which narrative approaches are most effective in sustaining participants motivation and engaging in behaviours that address the AMR challenge.

Study 2: How Collective Future Scenarios Influence Perceptions and Behaviour Toward AMR

When the media asks us to imagine a future shaped by a particular narrative framing, the implications can subconsciously extend beyond just the information itself. The subtle framing of these narratives can shape how individuals think, feel and behave towards a topic by guiding them on what to notice and they understand societal issues (Entman, 1993; Nabi & Myrick, 2019). Building on from findings in Study 1, which examined the media portrayal of Antimicrobial Resistance (AMR) over the past 15 years (2010-2024) in New Zealand, the present study examines how the future-oriented narratives informed by media representations can shape public engagement. Grounded in the Collective Futures Framework (Bain et al., 2013), Study 2 was pre-registered and examined how media-based visions of society's future influence individuals' collective and private-sphere intentions, as well as their overall attitudes toward AMR.

AMR is a major multifaceted global health challenge of the twenty-first century, with consequences affecting not only individuals, but communities and healthcare systems (Coque et al., 2023; Murray et al., 2022). However, despite its severity, public engagement and concern for AMR are inconsistent and often reactive (Auta et al., 2025). Study 1 reflected this pattern, with initial media coverage reflecting low salience, with a primary focus on overseas events, and although portraying a crisis tone, and it often lacked a clear call to action for the New Zealand public. Over the 15-year period reviewed, reporting of AMR

increased and began incorporating more solution-focused elements and greater urgency around the issue, suggesting an evolving communication narrative. Understanding these shifts in communication styles and the strength of influence is important because how the individual's imagination shapes their future can significantly shape present-day behaviour around large-scale societal issues (Milkoreit, 2017). Communication about AMR does more than provide information; for example, the way the issue is framed can influence how individuals envision what their future society may look like if AMR was to improve or worsen. These imagined futures have the potential to expand or constrain individuals' motivation to act.

Research on future-focused narratives has been investigated extensively in various domains such as climate change, sustainability, and public health (Bai et al., 2016; Nabi et al., 2018; O'Neill & Nicholson-Cole, 2009). However, little is known about how future-framing narratives shape public motivation around AMR. Existing AMR literature has predominantly focused on public awareness, antibiotic-use behaviour, or risk perceptions (Davis et al., 2018; Price et al., 2018; Roope et al., 2020). Despite growing global attention to AMR, there is little research examining whether future-focused AMR narratives influence attitudes or behavioural intentions among New Zealanders. While Study 1 demonstrated media coverage in New Zealand is increasingly incorporating both crisis and solution-focused framing, it is unclear of the extent to which these narratives shape public attitudes or behavioural intentions towards AMR.

Study 2 aims to fill this gap, using the Collective Futures Framework (CFF; Bain et al., 2013), which posits that the way individuals imagine their future society functions as cognitive templates that influence their present-day values, attitudes, and behavioural intentions. Applied to the present research, CFF helps understand the extent to which different AMR-related future scenarios shape individuals' attitudes and behavioural intentions.

The Current Study

Although AMR communication frequently highlights the future consequences to individuals and societies, there is little research about whether different future-focused narratives influence how New Zealand public engage and shape their attitudes with the issue. While research has examined future-focused narratives in domains such as climate change and environmental communication (e.g., Bain et al., 2013; Coulter et al., 2019; Veland et al., 2018), and AMR in other countries (e.g., Krockow et al., 2017; Huttner et al., 2010; McCall et al., 2023), there is little research on narrative futures influencing attitudes and behaviour in New Zealand. This important gap is what the present study seeks to address.

Grounded in Collective Futures Framework (Bain et al., 2013) this present study experimentally tests whether imagining different AMR future (neutral, hopeful, or crisis) affects participant's attitudes towards AMR, and intentions towards engaging in collective, and private-sphere actions. This study examines how future framing of AMR can shape how people think, feel, and intend to respond to the issue. To investigate this question, participants were randomly assigned to one of three scenarios portraying New Zealand in the year 2060. All conditions presented the same core AMR information but differed in the tone, framing, and portrayal of societal outcomes depicted. Full scenarios are described in detailed in Appendix A.

Hypotheses

Research indicates that the way individuals imagine society's futures can play a significant role in influencing their values and behavioural intentions (Bain et al., 2013). Research has also demonstrated that crisis-oriented futures can heighten individuals concern towards issues, increasing its perceived urgency and importance, therefore increasing their will to want to take collective action (Nabi et al., 2018). There has also been research indicating how hopeful framings can emphasise collective efficacy and solvability,

promoting long-term motivation for individuals' willingness to support and engage in behaviour that benefits society (Cohen-Chen & Van Zomeren, 2018).

Drawing from this understanding, we predict that responses across the three experimental conditions will differ. In particular, we expect that participants exposed to the crisis framing will produce higher levels of intentions to engage in citizenship/collective AMR actions, and private-sphere AMR actions, followed by those exposed to the hopeful framing, and then the neutral condition. We expected to see this same pattern emerge for participants' attitudes towards addressing AMR, with the crisis framing generating the highest levels, followed by hopeful and then neutral. Additionally, we hypothesised that the findings would reflect a higher perception of urgency and seriousness within the crisis framing than those of the hopeful and neutral framings. We anticipated that the hopeful framing would produce stronger beliefs in solvability and collective efficacy than both the crisis and neutral framing conditions.

Method

To assess the effects of different framings of AMR future scenarios and the implications this had on shaping participant's attitudes and behavioural intentions, Study 2 implemented a pre-registered between-subjects experimental survey design. The study participants were randomly assigned to one of the three experimental conditions, crisis, hopeful, or neutral. Each condition depicting a different framing of New Zealand society in 2060 while still contained the equivalent scientific information about AMR.

Study 2 was administered online via Qualtrics and it was pre-approved by the Human Research Ethics Committee (Health) under delegated authority of University of Waikato (HREC(Health) 2025#54, accepted August 1st, 2025), with the protocol and analysis plan being pre-registered on OSF (<https://doi.org/10.17605/OSF.IO/GPR2K>).

Participants and Procedure

Dynata were commissioned to recruit a total sample size of 1,764 respondents. A representative base sample ($n = 1,602$) was matched to 2018 Census distributions (gender, age, and region), with a 10% Māori booster sample ($n = 160$ participants) to enhance the precision of analyses for Māori respondents. Quotas were applied and monitored throughout data collection. National estimates were weighted back to census proportions. Sample size was determined by available funds, and post-hoc power check (G*Power 3.1.9.7) indicates that the base sample of $n = 1,602$ provides power > 0.99 to detect a small-to-medium effect size ($f = 0.20$) in a one-way ANOVA with three groups at $\alpha = .05$.

The panellists were pre-screened and identified by Dynata with the cloud-based software platform, Qualtrics, used to distribute, and collate the surveys. After the participants understood the information sheet and confirmed consent (Appendix B), they were randomly assigned to one of the three scenarios (crisis, hopeful, neutral/control conditions). To ensure consistency across the conditions of future scenarios, all three were set in New Zealand society in 2060. This timeframe aligns with future-framing guided by the Collective Futures Framework, which suggests using a 30–50-year horizon. This period length is based on participants perceiving a period long enough for meaningful societal change to occur, but still close enough to imagine with adequate confidence (Bain et al., 2013). A unified, theoretical grounded timeframe also allowed the conditions to remain comparable with previous future-framing studies.

Once the participants' finished reading the future scenarios, they completed a series of manipulation check items, designed to check they interpreted their scenario correctly. This entailed participants firstly being asked to complete an open-ended manipulation check describing their image of New Zealand society in 2060 in one or two sentences. These responses were manually checked to ensure responses were coherent, relevant to AMR and aligned with assigned conditions. Ambiguous responses were reviewed with a research collaborator to ensure reliability conditions existed, where they were absent participants

were excluded in accordance with pre-registered criteria. Participants then completed a series of quantitative manipulation check items assessing their interpretation of the scenario. These items asked participants to rate how they perceived New Zealand society in 2060; the state of AMR in New Zealand in 2060, how well the healthcare system was coping with AMR in 2060, how effective have public health polices and education been managed, and overall impact of AMR. These items were measured on a 7-point Likert-type scale, and reverse coded included to reduce any response bias. An attention check was also included, asking participants, *“To show you’re paying attention, please select ‘Egg, sausage and bacon’ from the list below”*.

Following these responses, participants completed the pre-registered outcome measures (citizenship/collective AMR actions, private-sphere AMR actions, and attitudes toward addressing AMR), identity measures, and demographic questions. If participant failed on the manipulation or attention checks (pre-specified) this resulted in their exclusion prior to analysis of data. Dynata oversaw the incentives, their panel policy, and ensured no identifying information was shared.

After applying exclusions, as described in the Data Preparation and Exclusions section (Appendix C), the final analytic sample consisted of 1,648 participants living in Aotearoa, New Zealand. The participants ranged across six age categories (18-24, 25-34, 35-44, 45-54, 55-65 to 65+), in accordance with pre-set Dynata quotas. The estimated mean age was calculated using category midpoints for descriptive purposes only ($M = 43.7$, $SD = 16.1$). The sample consisted of 56% females and less than 1% of the participants selecting an “other gender identity”. Participants were able to select multiple ethnicities, with NZ European being the most common (74.1%) and Auckland having the largest regional group of 34.7%. In terms of socio-economic status, 69.1% of the participants reported their household incomes at or below the New Zealand national average of \$134,599 in 2024, with

68.5% of participants reporting to be employed in either full-time, part-time or self-employed work.

To confirm the randomisation procedure and ensure that no systematic demographic difference inadvertently occurred across experimental conditions, chi-square tests were conducted to examine whether the experimental conditions differed on the main socio-demographic variables. There were no significant differences across experimental conditions in participants' age distribution, $\chi^2(10, N = 1648) = 7.40, p = .687$, gender, $\chi^2(4, N = 1648) = 3.71, p = .447$, regional distribution, $\chi^2(32, N = 1648) = 24.50, p = .826$, or socio-economic status, assessed via household income, $\chi^2(12, N = 1648) = 10.50, p = .569$. For ethnicity, there were no significant differences across conditions for NZ European, $\chi^2(2, N = 1647) \leq 3.11, ps \geq .211$, with only a small difference observed for Māori, $\chi^2(2, N = 1647) = 6.89, p = .032$, and Asian, $\chi^2(2, N = 1647) = 9.69, p = .008$. These minor differences observed for Māori and Asian participants resulted in them being slightly overrepresented in the neutral condition. Participants identifying as Pacific Islander, Middle Eastern/African/Latin American, or other ethnicity were not included in inferential analyses due to small cell counts.

Together the analyses indicate that the experimental groups were comparable on all assessed demographic characteristics variables examined. Following exclusions, participants were distributed across the experimental conditions as follows: crisis condition ($n = 523$), hopeful condition ($n = 508$), and neutral condition ($n = 617$).

Data Preparation and Exclusions

The data was screened according to a pre-registered criterion. Participants were excluded if they were identified as duplicate entries or did not pass the Q_RecaptchaScore validation. The pre-registered exclusion completion threshold time criterion was initially set at a minimum of 10 minutes. However, after the data collection phase was completed, the median completion time was 18.5 minutes. Therefore, too many legitimate responses would be excluded if the original threshold exclusion time was applied. To adjust the exclusion rule

recognising the measured median a revised cut-off threshold time of one-third of the median completion time (5.55 minutes) was applied. This resulting in participants results who completed the survey in under 5.55 minutes being removed prior to analyses. Additionally, participants results were also removed if they failed the attention-check item or gave nonsensical or irrelevant responses to the open-ended manipulation question (e.g., answers unrelated to antimicrobial resistance or New Zealand society, or random text input).

When revising the full data set there was a small number of cases ($n = 11$) that were flagged as “incomplete” via Qualtrics. It was ascertained that these participants did not complete the registration phase via final redirect, even though they had completed the full survey. After inspection of these participants responses, it was evident that they had completed all questions with responses to the final question; only missing data was from legitimate branching logic via experimental condition. They had also all passed all manipulation, and attention checks therefore were considered complete and included in the dataset analysed.

Completing these checks and procedures ensured that only attentive and genuine responses were retained for the full analysis. The final analytic sample comprised $n = 1,648$ participants.

Measures

Experimental Conditions.

Study 2 used random assignment, where participants were allocated to one of the three experimental conditions (crisis, hopeful, or neutral). Each condition described a future scenario of New Zealand society in 2060, with AMR framed as either a severe societal crisis, hopeful outcome following effective action, or a neutral continuation of current trends. Full scenario texts are provided in Appendix A.

Dependent Variables. Three dependant variables were used to access the extent to which the experimental manipulation shaped participants' behavioural intentions and attitudes towards AMR following their exposure to the AMR future-scenario conditions.

Citizenship/Collective AMR Actions. Participants were asked to rate twelve items indicating how likely they were to engage in collective actions in reducing AMR in the next 12 months (e.g., *“Join public demonstrations or awareness events about AMR”*, *“Vote for a candidate who supports strong action on AMR”*). A 5-point Likert scale (1 = *not at all likely*, 5 = *very likely*) was used to measure their collective action intentions and scores were averaged ($\alpha = .924$; see Appendix D). A higher score indicated the participant had a stronger collective action intention.

Private-Sphere AMR Actions. To assess participants' personal behavioural intentions, eight items were rated relating to responsible antibiotic use and healthcare practises (e.g., *“Only use antibiotics when prescribed by a qualified healthcare professional”*, *“Choose antibiotic-free meat and animal products from sustainable sources”*). A 5-point Likert scale was used again and scores were averaged, where higher scores reflected a stronger private-sphere intention towards AMR ($\alpha = .808$; see Appendix E).

General Attitudes Toward AMR. Eleven items were used to measure participants' overall attitudes and their emotional responses towards AMR (e.g., *“I would give part of my income to address AMR,”* *“Action to address AMR should be given priority, even if it causes slower economic growth”*). A 7-point scale ranging from $-3 = \text{strongly disagree}$ to $+3 = \text{strongly agree}$ to access participants' ratings. Within these items there were three negatively worded items that were reverse coded before averaging over the items ($\alpha = .773$; see Appendix F). More supportive attitudes towards AMR action were reflected by higher scores.

Moderator Variables.

Two individual difference measures were included to explore moderation of framing effects.

National Identity. This was measured as a single item ("*I identify with New Zealand*"), where participants responded on a 4-point Likert scale measuring the degree of agreement (from *Strongly disagree* to *Strongly agree*). This item is used to capture the strength of their national identity. We theorized that a stronger national identity would moderate the manipulation effect, such that those who identify with New Zealand more strongly would show amplified responses to the AMR future scenarios.

AMR Identity. This was measured using four items assessing self-identification, perceived concern, and participants' comfort discussing AMR or being associated with AMR-related matters. Participants responded on a 5-point Likert scale (1 = *Strongly disagree*, 5 = *Strongly agree*). Two items were positively worded, and two were negatively worded, which were reverse coded before creating a composite score ($\alpha = .580$; see Appendix F). The internal consistency for this exploratory measure was lower than conventional thresholds. This is not an uncommon result in exploratory measures when a small number of items exists. Therefore, when reviewing results involving this AMR identity should be interpreted with some caution. That said, the results showed a higher score represented a stronger AMR identity, indicating greater concern, and willingness to be identified as someone engaging in AMR-related efforts. Similarly, we expected stronger AMR identity to intensify the manipulation effects, with those who identify more strongly with AMR showing stronger responses to the AMR future scenarios.

Statistical Analysis

Study 2 uses a one-way ANOVA, with future scenarios conditions (crisis, hopeful, neutral) as the between-subjects factor. A separate one-way ANOVA was conducted for each of the dependent variables: citizenship/collective AMR actions, private-sphere AMR actions, and general attitudes toward AMR. For variables showing significant omnibus effect, a Tukey's HSD post-hoc test was conducted to assess to determine between-group

differences. All analyses were conducted on weighted data to account for discrepancies in sampling quotas and assessed using two-tailed tests ($\alpha = .05$) to ensure representativeness.

Exploratory Analyses

In addition to the primary analyses, an exploratory moderation analyses were completed to explore whether national identity and AMR identity moderated had an effect of the future scenario condition on the dependent variables. Given the exploratory nature these moderators' results should be interpreted with caution.

Preliminary Analyses

Assumption Checks.

To ensure the validity of the ANOVA results, preliminary assumption testing was conducted. The Shapiro–Wilk test indicated a minor deviation from normality ($p < .01$); however, given the large sample size ($ns = 1,328 - 1,648$), ANOVA is considered robust to such violations. The slight variation in sample size occurred as two measures included N/A as a response option. When computing these in JAMOV, the participants that answered N/A were automatically treated as missing data and a listwise elimination was applied. Therefore, exclusion from the specific analyses involving these composite variables. Other analyses used the full available sample ($n = 1648$). Levene's test for equality of variances were non-significant across all variables ($ps > .19$), indicating the assumption of homogeneity was met. Therefore, as the assumption of equal variance was met, a standard one-way ANOVA was used for the analyses.

Manipulation Checks.

A one-way Welch's ANOVA was conducted to assess whether participants perceived the three scenario conditions (i.e., crisis, hopeful, and neutral) differing in severity as intended. The analysis revealed a significant effect of condition on manipulation check scores, $F(2, 1069) = 182.00, p < .001$. As expected, participants in the crisis condition ($M =$

18.30, $SD = 3.67$) perceived AMR in 2060 as considerably more severe and concerning compared to those in the neutral ($M = 15.70$, $SD = 3.45$) and hopeful conditions ($M = 13.90$, $SD = 3.71$). Post-hoc comparisons using Tukey's HSD indicated that all pairwise differences were significant ($p < .001$), confirming that participants distinguished clearly between the three scenario framings. These results demonstrate that the experimental manipulation created differences in perceived severity of the AMR future scenarios, as expected.

To further check the experimental manipulation was valid, we reviewed participants' answers to the open-ended question (i.e., "Please briefly describe your image of this society in a sentence or two"). Table 2 shows selected verbatim responses and corresponding AI-generated summaries based on the answers for each of the conditions, following similar approach by Milfont, Cuttance-Dunne and Ellis (in press). Participants in the neutral condition saw life to be much the same as now and tended to portray a balanced but cautious view. They imagined New Zealand as a society that was aware of AMR and although acknowledging AMR as a persistent challenge they saw that this being maintained through regulatory control, monitoring, and education. Their tone of responses was pragmatic more than emotional, which suggests they were vigilant rather than heightened or complacent. For the crisis condition, participants provided stronger language and envisioned a dystopian and chaotic future, with answers including widespread infections, overwhelmed healthcare systems, and seeing New Zealand society collapsing. Participants in the crisis condition feared for this future and had a negative outlook and tone towards how AMR and New Zealand society would look like, seeing this issue becoming unmanageable. In contrast, participants in the hopeful condition, describe New Zealand in 2060 with an optimistic outlook seeing society having a cooperative future, with stronger awareness of AMR leading to successfully managing the issue through innovation and responsible antibiotic use. Participants in the hopeful condition reflected collective confidence in this future society and trust in institutions with having technological advancements, people being more educated of AMR, and improvement in the integration of scientific and cultural health practices.

These responses show a clear difference between all three conditions, confirming that the participants interpreted the future-scenario manipulation as expected. An attention check was included before moving onto the dependant variable questions (i.e., “To show you're paying attention, please select “Egg, sausage and bacon” from the list below). Participants were required to answer this correctly otherwise they were excluded.

Table 2.*Analysis Summary of Responses to the Manipulation Check Question*

Experimental condition	Selected verbatim answers	AI summaries produced by ChatGPT	AI summaries produced by Co-Pilot
Control/Neutral condition (<i>n</i> = 617)	“In 2060 New Zealand, society is highly conscious of antimicrobial resistance, with strict healthcare and farming practices in place to limit overuse, supported by strong public awareness and government-led monitoring that keeps the threat contained but ever-present.” “Status quo. Over prescribing antibiotics still exists.”	The <i>neutral</i> sentences describe a balanced but cautious outlook. Society in 2060 is aware of AMR and has implemented strong systems — government policies, monitoring, and education campaigns — that keep the problem controlled but still relevant. While there’s no crisis, the tone is pragmatic rather than optimistic: AMR remains an ongoing issue that must be	New Zealand in 2060 appears similar to today. AMR remains a concern, but monitoring and public awareness are steady. Some believe progress is slow or stagnant, while others feel the threat is manageable. The tone is cautious, with mixed views on whether society has adapted enough to meet future challenges.

	“New Zealand in 2060 thrives with a vigilant, health-conscious society where antimicrobial resistance is managed through consistent education, monitoring, and responsible practices in healthcare and agriculture.”	managed through vigilance and cooperation.	
Crisis Condition (<i>n</i> = 525)	“The healthcare system's even more overloaded than it is now, medical anxiety becomes more common in everyday life (like before the discovery of penicillin, where even a minor infection could become deadly), online agitators like we see today for	The <i>crisis</i> sentences describe a chaotic, dystopian future where society has collapsed under the weight of antimicrobial resistance (AMR). People are left to fend for themselves in a “survival of the fittest” world that neglects the weak and vulnerable. There’s	New Zealand in 2060 faces widespread fear and collapse due to AMR. Hospitals are overwhelmed, antibiotics fail, and infections spread uncontrollably. Society is anxious, mistrustful of healthcare systems, and some envision dystopian or apocalyptic

	vaccines and GMOs attach themselves to this "silent pandemic" and use it to spread misinformation, mistrust, and anti-scientific rhetoric that sows even more societal division." "Dystopian sci fi film where a virus has wiped a large portion of humanity out." "Society full of sickness and death."	widespread misinformation, distrust in science, and social breakdown, leading to a grim, fear-driven existence. It reflects a pessimistic view of humanity's failure to act responsibly, portraying a bleak moral and medical decay.	outcomes. Mental health deteriorates, misinformation spreads, and life expectancy drops as once-treatable diseases become deadly.
Hopeful condition (<i>n</i> = 509)	"In 2060, New Zealand is a health-literate and technologically advanced society where people	The <i>hopeful</i> sentences depict a positive and united future. By 2060, New Zealand is health-	New Zealand in 2060 is health-conscious and united against AMR. Public awareness,

	use antimicrobials responsibly, healthcare integrates both science and cultural practices, and innovative treatments like phage therapy and rapid diagnostics ensure infections are detected and treated effectively, keeping antimicrobial resistance under control.” “People are getting less sick and more accepting of vaccines.” “Good that new treatments are available and work.”	conscious, innovative, and inclusive. Advanced medical technologies like phage therapy and rapid diagnostics are integrated into daily life, supported by education and public awareness. People make informed decisions about antibiotic use, and cultural collaboration ensures equitable healthcare. This scenario reflects optimism, trust in science, and social progress toward sustainable wellbeing.	education, and innovation—like phage therapy and rapid diagnostics—keep resistance under control. Citizens use antibiotics responsibly, trust healthcare systems, and embrace both scientific and holistic practices. Society is stable, collaborative, and optimistic about managing future health threats.
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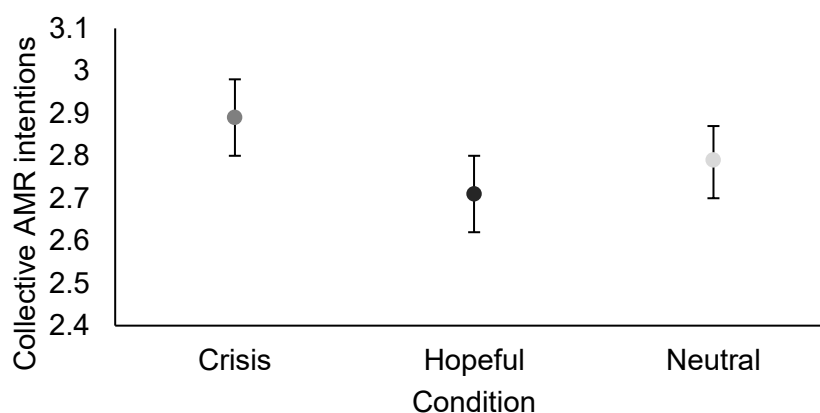
Main Results

Collective AMR Actions.

Our analysis first focused on whether collective AMR intentions differed as a function of which experimental condition participants were exposed to. As seen in Figure 8, participants exposed to the crisis condition reported the highest collective AMR intentions. A one-way ANOVA confirmed there was a statistically significant effect, $F(2, 1325) = 3.64$, $p = .027$, $\eta^2 = .005$ (see Table 3). A post-hoc Tukey comparisons revealed that participants in the crisis condition ($M = 2.89$, $SD = 0.99$) reported significantly higher intentions to engage in collective AMR actions than those in the hopeful condition ($M = 2.71$, $SD = 0.97$; $p = .020$), while there was no significant difference between the crisis and neutral conditions ($M = 2.79$, $SD = 0.98$; $p = .225$). Additionally, there were no significant differences found between the crisis and neutral conditions ($p = .225$) or between the hopeful and neutral conditions ($p = .463$). These findings suggest that framing AMR as a crisis increased participants' willingness to support at a broader community-level approach and have higher engagement in policy-oriented AMR action as compared to a hopeful framing.

Figure 8.

Mean Collective AMR Action Intentions by Experimental Condition



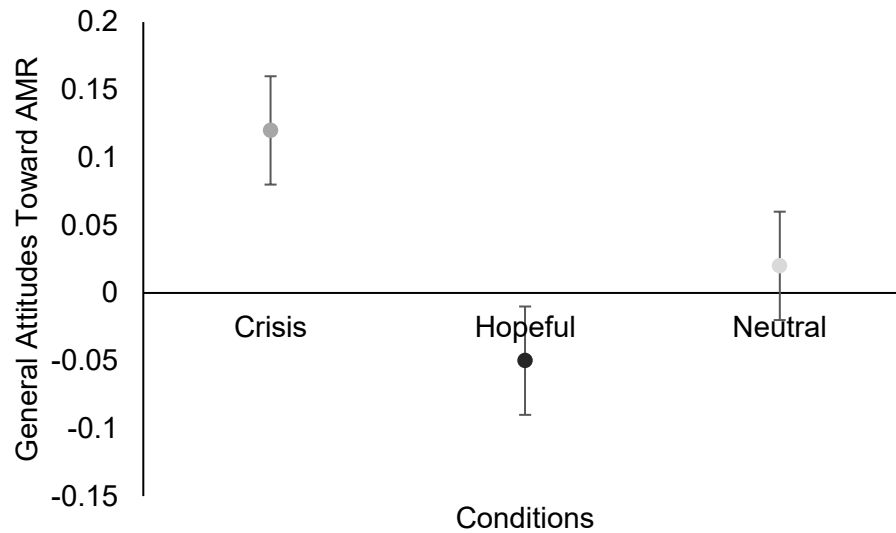
Note. Error bars represent 95% confidence intervals.

Private-Sphere AMR Actions.

A one-way ANOVA was completed to investigate if participants' private-sphere AMR intentions differed across the three conditions. The results found the effect of the condition was not statistically significant, $F(2, 1328) = 2.35$, $p = .096$, $\eta^2 = .004$ (see Table 3). Descriptively, participants in the crisis condition ($M = 3.71$, $SD = 0.92$), and neutral condition ($M = 3.71$, $SD = 0.84$) reported very similar levels of private-sphere AMR intentions, while the hopeful condition ($M = 3.60$, $SD = 0.86$) were slightly lower. The post-hoc Tukey comparisons revealed that these differences were not statistically significant ($ps > .12$). These results indicate that the framing of AMR did not influence how individuals' behaviour intentions towards AMR (e.g., using antibiotics responsibly, seeking accurate information).

General Attitudes Toward AMR.

We investigated whether the different framing of New Zealand future societies in 2026 influenced participants' general attitudes towards the future. A one-way ANOVA showed a significant effect of condition, $F(2, 1645) = 5.58$, $p = .004$, $\eta^2 = .007$ (see Table 2). The post-hoc Tukey tests revealed that participants in the crisis condition ($M = 0.12$, $SD = 0.82$) reported significantly more positive general attitudes than those in the hopeful condition ($M = -0.05$, $SD = 0.86$; $p = .002$). There were no significant differences between the crisis and neutral ($p = .193$), and the hopeful and neutral ($p = .185$) conditions. These findings suggest that framing AMR as a crisis event produces a stronger concern and urgency of the AMR issue than that of a hopeful narrative (see Figure 8).

Figure 8.*Mean General Attitudes Toward AMR by Experimental Condition***Note.** Error bars represent 95% confidence intervals.**Table 3.***Descriptive and ANOVA Statistics for AMR Outcome Variables*

Outcome						
Variable	Condition	<i>n</i>	<i>M</i>	<i>SD</i>	<i>F</i> (2, <i>df</i> ₂)	<i>p</i>
Collective Action	Crisis	415	2.89	0.99	3.64 (2, 1325)	0.027
	Hopeful	399	2.7	0.97		
	Neutral	514	2.79	0.98		
Private-Sphere	Crisis	417	3.71	0.92	2.35 (2, 1328)	0.096
	Hopeful	410	3.6	0.86		
	Neutral	504	3.71	0.84		
General Attitude	Crisis	523	0.12	0.82	5.58 (2, 1645)	0.004
	Hopeful	508	-0.05	0.86		
	Neutral	617	0.03	0.8		

Exploratory Analyses.

Finally, we investigated whether the effects of the framing conditions on AMR-related outcomes were moderated by either national identity or AMR identity. We tested each moderator separately using moderated regressions analyses using each outcome variable (collective intentions, private-sphere intentions, and general attitudes) as the dependent variable, having the condition as the predictor and the identity measure as the moderator.

National Identity.

The results of this analysis showed the interaction between condition and national identity was not statistically significant for general attitudes ($B = -0.004$, $SE = 0.034$, 95% CI $[-0.07, 0.06]$, $p = .916$), private-sphere intentions ($B = 0.011$, $SE = 0.041$, 95% CI $[-0.07, 0.09]$, $p = .782$), or collective intentions ($B = 0.019$, $SE = 0.046$, 95% CI $[-0.07, 0.11]$, $p = .679$). These results indicate that national identity did not moderate how participants responded to any of the scenario conditions.

Although, the interactions were not significant, exploratory simple slopes analyses indicated participants who reported high in national identity (+1 SD) reported with higher collective intentions ($B = 0.107$, $p = .027$, 95% CI $[0.01, 0.20]$) and general attitudes ($B = 0.084$, $p = .019$, 95% CI $[0.01, 0.16]$). In contrast, to those low in national identity (−1 SD) did not report significant association with any outcome ($ps > .40$). These effects were consistent across conditions, however, should be interpreted cautiously as indicate a main-effect association rather than a moderation. This trend suggests, that even though national identity did not significantly moderate the effects of the conditions, participants who reported stronger identification with New Zealanders tended to express greater collective intentions and more positive attitudes overall towards AMR action.

AMR Identity.

The analysis showed the interaction between condition and AMR identity was not statistically significant for collective intentions ($B = 0.079$, $SE = 0.046$, 95% CI $[-0.01, 0.17]$, $p = .090$), private-sphere intentions ($B = -0.031$, $SE = 0.038$, 95% CI $[-0.10, 0.05]$, $p = .411$), or general attitudes ($B = 0.054$, $SE = 0.034$, 95% CI $[-0.01, 0.12]$, $p = .111$). These findings indicate that AMR identity did not moderate how participants responded to any of the scenario conditions.

Similar to national identity, while the results found interactions were not significant, a simple slope analysis, revealed consistent patterns that participants higher in AMR identity (+1 SD) demonstrated stronger positive responses for collective intentions ($B = 0.136$, $p = .005$, 95% CI $[0.04, 0.23]$) and general attitudes ($B = 0.105$, $p = .003$, 95% CI $[0.04, 0.18]$) than those low in AMR identity (−1 SD) did not show significant associations with any outcomes ($ps > .40$). Although these findings suggest that while AMR identity had no significance on the scenario condition, the trend that emerged showed the direction of effects suggests that stronger AMR identification was associated with greater support and engagement toward AMR action.

Study 2 Discussion

Humans are naturally concerned and focused about their future. The way the future is framed and presented to people can profoundly impact in how their perceptions are formed, emotional responses are formed, and present-day behavioural intentions are shaped. Research across a variety of domains such as health, climate change and environmental risk, has indicated the communication about future outcomes influences how collective challenges are interpreted and how individuals evaluate their personal role can make an impact in addressing an issue. Extending on this understanding, this present study experimentally examined how different framings of AMR futures (crisis, hopeful or neutral) shaped participant's attitudes and behaviour intentions. This study contributes to the growing

literature on future-oriented communication and collective public engagement, by providing evidence that future-oriented narratives can influence our willingness to engage in collective action in the present.

Within the environmental and health communication research, there is a growing focus on future-oriented framing, as it allows for abstract global issues to be linked more closely to peoples lived experiences, enhancing personal relevance and credibility (Dasandi et al., 2022; Huang et al., 2024). By having a focus of encouraging reflection on long-term consequences of their current behaviour, this process can activate a sense of moral responsibility within and enhance a motivation to change current day behaviour to protect collective wellbeing (Bain et al., 2013). However, research suggests that the emotional valence of future framing, whether emphasising fear or hope plays a significant role in influencing people's reactions (Yang, Dillard & Shen 2012). Evidence from research on climate change communication has revealed that narratives that are crisis-oriented tend to intensify perceptions of risk and urgency but may also reduce engagement if individuals feel unable to contribute meaningfully (Said & Wölfl, 2025). Conversely, research indicates that hopeful framing can strengthen hope and perceived efficacy, however, can unintentionally reduce concern as individuals may perceive the problem as under control (Nabi & Myrick, 2020). These mixed patterns underscore the importance of carefully balancing emotional tones to sustain motivation without undermining engagement.

Despite the significance of these dynamics, there is limited empirical research examining how future-oriented AMR narratives shape public engagement in a New Zealand context. To address this gap, Study 2 experimentally manipulated crisis, hopeful, and neutral AMR futures, to assess how these framings shaped participants attitudes and behavioural intentions towards AMR in a New Zealand context.

Main Findings.

Consistent with predictions, framing of AMR future significantly influenced how participants responded. Participants exposed to the crisis scenario reported stronger collective action intentions and had more supportive attitudes towards addressing the AMR issue than those participants in the hopeful or neutral conditions with the hopeful condition consistently producing the lowest levels of engagement. This pattern observed suggests that optimistic messaging may inadvertently signal that AMR is under control, thereby reducing perceived urgency and motivation to engage. The neutral condition produced intermediate levels, that did not differ significantly from either of the other two framings. These findings imply that the framing effects were driven by the tone and content of the scenario, as the neutral condition exerted no directional influence. In contrast, no significant differences were observed across conditions for private-sphere behavioural intentions. This suggests that personal antibiotic use norms are stable and message-based manipulations are less effective.

The absence of framing effects on private-sphere intentions and attitudes is theoretically informative and aligns with established research on public goods and collective action. The research suggests when promoting societal engagement that collective action framing is more effective than individual framing in promoting, as it enhances collective efficacy and strengthens acceptance of policy measures by emphasising shared responsibility and social impact, even though the behaviours involved are private in nature (Dewaelheyns et al., 2025; Jugert et al., 2016). Systematic reviews of climate justice and environmental activism support this theoretical framework by suggesting that when narratives are primarily driven by collective identity, social norms, and perceived shared impact encourages stronger engagement as individuals perceive their contribution as more meaningful, whereas private actions are perceived to be evaluated in terms of personal costs and benefits (Fielding & Hornsey, 2016; Pong & Tam, 2023). Research on psychological distance suggests that when threats are framed as abstract, such as AMR

scenarios in this study, are more difficult for individuals to translate into changes in private behaviour, where collective appeals to reduce this distance by emphasising shared norms and societal responsibility and embedding individual actions within a shared social context (Trope & Liberman, 2010; Maiella et al., 2020).

The stronger engagement observed under the crisis framing may prompt stronger engagement as individuals' perceptions of threat are heightened, which activates a sense of collective responsibility. In contrast, the hopeful framing condition, although intended to create optimism, produced unintentionally a more relaxed results, suggesting individuals saw the AMR issue as being managed, effectively decreasing the sense of urgency. This pattern is consistent with research in climate change communication, which found that optimistic messages can sometimes lead to lowering perceived risk and weaken motivation for action intentions (Hornsey & Fielding, 2016).

Although the crisis framing condition produced higher support for policy and community-level action, the observed effects were of relatively modest magnitude, therefore suggesting that threat-based messaging alone may be limited in its ability to shape a substantial shift in behaviour. Research in meta-analyses investigating fear appeal has found that threat-based communication on their own tends to produce limited motivation that rarely translate into lasting behavioural engagement. However, when this heightened concern is combined with clear, achievable solutions individuals tend to produce a more meaningful and lasting engagement (Witte & Allen, 2000; Tannenbaum et al., 2015).

Taken together, these findings demonstrate that AMR narratives can shape public engagement in ways that both align with and also diverge from the communication intent. This underscores the nuance and complexity when communicating issues like AMR, and the need for careful, informed consideration in framing messages, given the sensitivity of behavioural responses to any subtle shift in narrative.

The findings found overall, crisis framing effectively increased perceived severity concern and strengthened support for collective action, while the hopeful narrative reduced perceived seriousness and engagement. While the neutral framing, which conveyed factual information about AMR without emotional exaggeration and having New Zealand staying consistent with its current state, performed similarly to the crisis condition in several engagements. This suggests that credible, evidence-based communication may be sufficient to maintain steady public engagement without relying on emotionally charged narratives.

The exploratory analyses indicated that national and AMR identity and AMR-related identity did not significantly moderate the framing effects. However, both the identity measures showed a modest positive association with AMR engagement, with stronger identification linked to slightly higher support for addressing AMR. This pattern aligns with broader social-identity research, that indicates individuals with a stronger identification with a group may increase motivation to engage with actions that protect collective wellbeing (Fielding & Hornsey, 2016). Although identity did not interact with the experimental conditions in this present study, these findings suggest that collective self-concept may potentially play a role in shaping general attitudes towards AMR and warrants further investigation.

Limitations.

While Study 2 contributes valuable insights into AMR communication, several limitations in the work should be acknowledged. Firstly, the effects observed on the experimental manipulation while being statistically significant, they were of relatively small magnitude. This finding suggest that a single, brief written scenario may only moderately influence attitudes or behavioural intentions. Within everyday context, communications typically involve individuals repeatedly being exposes to varied messages and across different formats.

Secondly, participants were only exposed to one frame future scenario. Although this was the design of the study and a single exposure was necessary for establishing causal effects, it constrains how accurately the findings capture and translate into real-world dynamics. Dahabreh & Bibbins-Domingo (2024) suggest that isolated exposures can have limited external validity and rarely mirrors the complex and cumulative information individuals encounter on a daily.

A third limitation was participants only imagined one temporal distance into the future. The choice of a 35-year future timeframe was grounded in alignment with the Collective Futures Framework, suggesting 30 years balances a psychological distance with perceived plausibility (Bain et al., 2013). The use of a single time point limited insight into whether different temporal distances would shape how participants thought about the future in context to AMR. Research indicates that the temporal distance can affect how individuals form attitudes and how they perceive issues (Fujita et al., 2008).

Additionally, the study relied on assessing participant's self-reported intentions rather than observed behaviours. Although intentions frequently serve as predictors of individual's behaviour, there is substantial evidence that indicates a notable gap can exist between what individuals' stated intentions are and their actual actions are (Sheeran & Webb, 2016).

Finally, a relatively minor error related to a formatting oversight in the question related to personal action/behavioural intentions measure. The number "4" was unintentionally omitted from the 5-point scale, resulting in the scale option being 1,2,3,5, and "Not applicable." This resulted in the mid-point of the scale being slightly lower than all other questions. However, the scale presented was identical for all three scenarios. Therefore, the consistency across the three conditions was preserved with the ability to compare responses accurately across the three scenario remaining valid. The results revealed that for private-sphere behavioural intentions there was no difference across the conditions, implying that the missing value had minimal effect on the response pattern. A robustness check was

conducted in which the scale was recoded to include the missing values which produced the same overall pattern, supporting there was no compromise occurred and the results were stable.

In conclusion, the findings from Study 2 offer experimental evidence on how different framings of AMR futures can influence public engagement. Participants exposed to the crisis condition reported higher collective action intentions and more supportive attitudes towards AMR. While participants in the hopeful condition reported to perceive less concern and lower engagement with weakened AMR engagement, potentially due to reduced perceived severity. The neutral condition produced stronger engagement than the hopeful condition for collective action intentions and more supportive attitudes towards AMR. These differing patterns reveal insightful and valuable information about the sensitivity of the New Zealand public and their responses to emotional tone of future AMR narratives. Together, these findings highlight the importance of carefully balancing emotional tone and content in AMR communication, an issue discussed further in the general discussion.

General Discussion.

This thesis investigated how AMR has been historically communicated to the New Zealand public via published media, and subsequently, how different future framing narratives shape public attitudes and behavioral intentions towards addressing the AMR challenge. This research was conducted through two complementary studies, combining longitudinal media analysis with an experimental between subject design testing future framing. This provided an integrated analysis in understanding patterns used in AMR media communication, and the psychological effects and impacts on the New Zealand public engagement of the patterns used.

Together, the finding revealed valuable insights into the effectiveness of AMR communication. Study 1 revealed AMR has often been communicated through episodic crisis narratives in the New Zealand media, while Study 2 indicated that crisis future framing

narratives produced stronger outcomes in shaping collective narratives and general attitudes. Together these studies underscore temporal framing plays a critical role in shaping engagement in slow-moving public health threats.

Overall Main Findings.

Combined, the findings from both studies, offer an integrated insight into how AMR communication has evolved over time and how future framing narratives play a role in shaping public engagement, attitude and behavioural intentions in Aotearoa New Zealand.

Study 1 revealed that AMR media coverage in New Zealand has historically been inconsistent and largely reactive, with earlier coverage portraying AMR as a distant global, or highly technical issue, rather than framing it as a local relevance issue. Although crisis framing was consistent across the 15-year timeframe (2010 to 2024), it was frequently detached from local responsibility and offered limited clear actionable guidance for the New Zealand public. However, an increase in AMR salience with time was identified including increased local accountability and relevance, placing greater emphasis on urgency, and solution-focused narratives. Despite elements of this shift evident, coverage remained episodic rather than sustained, suggesting that AMR has yet to be embedded as a long-term societal issue. From an agenda-setting perspective, this inconsistency pattern potentially limited the public's attention and sustained engagement with AMR being portrayed as a slow-moving crisis. This view is consistent with Just Transition principles, with inconsistency undermining the development of shared responsibility, and a solution-oriented understanding for long-term societal preparedness.

Study 2 experimentally extended from Study 1, by investigating how different future framed AMR narratives shaped individuals' responses to their behavioural intent and attitude, beyond just the scientific information content of the message. Participants in the crisis framed condition reported stronger collective intentions and supportive general attitudes toward addressing AMR than those exposed to a hopeful framing. Participants in

the hopeful condition consistently produced the lowest levels of AMR engagement across all dependant variables. This could potentially be due to these participants not being exposed to the more severe effects of AMR, resulting in these participants having an incomplete knowledge of AMR, and misunderstood how serious the escalating threat of AMR is. Therefore, the hopeful framing may have unintentionally led to less intense responses and a diffusion of the need to take responsibility for making changes to their current behaviour. The absence of differences in private-sphere behavioural intentions did not differ across framing conditions. This suggests that individual antibiotic-use norms may be relatively stable and therefore less susceptible to narrative manipulation.

Together the evidence combined from Study 1 and Study 2 indicates that the patterns of AMR communication may require integrating fear with clear efficacy cues to influence AMR engagement. This can be achieved by acknowledging the seriousness of AMR while articulating clear calls to action and collective responsibility. By conveying AMR as a current and escalating threat is likely to foster a more sustained public engagement than relying on narratives that emphasise catastrophe or reassurance in isolation. Communication that combines facts and agency like “AMR is a serious threat, but here is what you can do to help prevent it...” are likely to influence more sustainable public engagement.

Viewing Study 1 and Study 2 through the Just Transition framework lens, demonstrates how significant these findings are. Central to the Just Transition framework priorities for addressing responses to systemic challenges are collective responsibilities, long-term planning, equity, and shared societal action. Findings from Study 1 highlighted that communication in the New Zealand media has not consistently been framed in ways that support a Just Transition, with media narratives fragmented and often lacking continuity, local accountability, and clearly articulated calls for action. Study 2 supports this future by demonstrating that when futures are framed as managed and under control this may inadvertently reduce public motivation and lessen perceived urgency. Collectively, the findings suggest that AMR communication aligned with Just Transition principles should

balance future risk with fairness and collective agency and the societal choices required to navigate AMR in an equitable and sustainable manner.

Implications.

Theoretical Implications.

By integrating future framed AMR narratives into analyses of media influence, the research advances theoretical understanding beyond immediate salience and framing effects and offers a deeper insight into how narratives shape collective evaluation societal challenges. By integrating agenda-setting theory in Study 1 with the Collective Futures Framework in Study 2, this research demonstrates the role of how imagined futures scenarios as a mechanism through which media narratives can influence public engagement with the complex, slow-moving public AMR health threat.

Through agenda-setting analysis, Study 1 identified patterns of inconsistent and episodic media coverage, this may have limited issue salience for AMR framing by delayed consequences and diffused local responsibility. Although crisis framing was consistent throughout the dataset, temporal variability in its positioning suggests that AMR gains intermittently agenda prominence in public foreground. Therefore, this potentially reduces the view of AMR as a long-term societal threat to the public. Consistent with agenda-setting approaches, Study 1 was not designed to measure the effects of AMR portrayal on the New Zealand public but to gain insight and identify the media environment frames used for public interpretation and potential influence.

Study 2 extends these findings by experimentally examining how future framing narratives grounded by Study 1 shapes public engagement under different narratives. Collectively these findings suggest that engagement may be shaped around the context in which information is presented to them and how the individual images and feels about that future to encourage current behavioural change.

Practical and Communication Implications.

From a practical communication perspective, the findings highlight how AMR is framed to the public plays a critical role in shaping public engagement, particularly in the context of the findings from Study 1, where coverage was revealed as inconsistent and/or episodic. Whilst the findings in Study 2 indicated that the crisis framing condition was associated with higher collective intentions and general attitudes towards AMR, the effects were modest in magnitude. The hopeful condition, in contrast, reduced perceived urgency and collective intentions. This finding is worth noting given that Study 1 identified an increase in optimistic, innovation-focused narratives in the later years of AMR coverage. Although this research did not investigate these effects in detail, it highlights the relevance in examining such narrative functions. The neutral condition produced stronger effects than the hopeful condition across all variables, suggesting factual narratives sustain stronger public concern without enhancing emotional appeals. Importantly, there was no significance in private sphere suggesting that dependence on framing of narratives alone is insufficient for sustaining long-term engagement.

Therefore, these finding suggest effective AMR communication is likely to require an integration approach that combines factual consistent information with crisis-oriented framing narrative to heighten severity and urgency. Beyond narrative framing, sustained engagement with AMR will also depend on increased frequency and diversity of media platforms for messages delivery. Given the episodic nature of publications, found in Study 1, reliance on intermittent bursts, may constrain the media's capacity to maintain agenda salience for AMR and public attention for this slow-moving health threat.

Communication strategies that coordinated multi-media platforms like including digital platforms, broadcast media, and public health campaigns may help reinforce urgency and sustained public engagement. This along with supported repeated exposure, reinforce

shared responsibility narratives may aid in reducing the risk that AMR being perceived as a distant or intermittent issue and increase behavioural intent and attitudes towards AMR.

Policy Implications.

The findings from both studies highlight the importance implications for AMR policy and public health governance in Aotearoa New Zealand. Inconsistent attributes of responsibility identified in Study1 may have limited the publics clarity around institutional accountability, and potentially weakening trust and severity. Although public trust was not measured in Study 1, research has shown that that ambiguity around responsibility may reduce expectations of effective coordinated policy action (Koivula et al., 2024).

Findings from Study 2 build on this narrative suggesting that framing responsibility and future consequences as collective forms produce greater responses of engagement than on individual behavioural change. From a policy perspective, these findings indicate when considering communication strategies to have importance on consistent institutional leadership and coordinated action, cross-sector collaboration, and collective responsibility.

The absence of alignment between media narratives and policies potentially weakens trust and collective engagement with AMR. Therefore, this highlights the importance of clear national strategies, regulatory actions, and health system responses within policy actions. This alignment together may work together to positively shape public awareness and understanding around about institutional responsibility for long-term societal threats like AMR.

Limitations.

While this thesis provided valuable insight into AMR communication within New Zealand media and how different future framed narrative shape public attitude and engagement towards AMR, there are some limitations should be acknowledged when interpreting the findings across both studies.

Firstly, Study 1 analysis was only conducted on article summaries rather than the full media context. While the summaries were well articulated and procedures were taken to validate summaries against original articles for recurring themes, there is potential for constraint to the depth of contextual, linguistic, and emotional nuance captured. Therefore, due to the summary simplification, some framing subtleties, such as metaphor, narrative structures, and complex messages may not have been fully represented and understood. Consequently, the representation of tone and framing may have been less nuanced and contextual rich relative to how audiences encounter AMR narratives in everyday media consumptions.

This follows onto the second limitation, where both studies were limited in their representation of the broader contemporary media ecosystem. Both studies were limited to written format rather than exploring the full scope of complex layers the public encounter in everyday life. Study 1 focused on AMR in New Zealand media publications, excluding other influential formats such as television, podcasts, social media, audio radio (although some written radio commentary was included). Study 2 was similar, in using short written future scenarios as the experimental stimulus. Therefore, these findings are limited as they are based exclusively on written exposure of AMR, therefore may not fully capture how public engagement with AMR is shaped by repeated, multimodal exposure across diverse contemporary media platforms. Therefore, future studies could investigate whether cumulative or multi-format messages, investigating if different platforms produce stronger or more sustained AMR engagement effects than single format written message.

Thirdly, Study 2 captures responses to a single exposure and a single temporal horizon (2060). While this timeframe was chosen in alignment with Collective Future Framework and achieves an appropriate balance between psychological distance with plausibility, it does not fully capture how responses may vary across different time frames, or repeated exposure to similar messages. To gain a better understanding of the impact this may deliver future research could be explored by examining different temporal distances

(e.g., 2035 vs. 2080), and repeated exposure, shape public engagement and perceived urgency, and behavioural intentions towards AMR. While research cannot fully capture the complexity of real-world conditions, future research could investigate how individuals respond when being exposed to crisis, hopeful, and neutral framings or repetitive messages and how this affects their engagement and intent. Also, investigating different timeframes could reveal additional patterns in participants' responses to their behavioural intentions towards AMR and provide new insights as to how most messaging can be communicated most effectively.

Fourthly, In Study 2 responses of behavioural outcomes were measured using self-reported intentions, rather than behavioural observations. Intentions are meaningful predictors of behaviour; however, evidence demonstrates that there can be a behaviour gap between individuals' intentions and actions (Sheeran & Webb, 2016). By incorporating behavioural tasks this would provide more robust insights into real-world AMR behaviour. These behavioural measures could include donation choices or information sharing decisions, providing more valid insight into individuals' AMR engagement and enabling assessment of the extent to which stated intentions translate into behavioural change over the same 12 months period specified in the survey's intention measures.

Finally, while the experimental effects observed in Study 2 demonstrated statistically significant results, the modest size effects suggests that framing while being one contributing factor may have limited capacity and insufficient to drive substantial behavioural change. Research on the Extended Parallel Process Model, reports that fear or hope based messages accompanied with clear, actionable efficacy messages strengthens the effect of impact for emotional appeals on behavioural engagement (Witte & Allen, 2000; Tannenbaum et al., 2015). As such, future research could investigate how different narrative framing alongside efficacy cues and solution clarity, improves institutional trust to sustain long-term AMR engagement.

Future Directions.

This present study provided valuable insight to AMR communication, however building on from these findings and the limitations noted, can provide a better foundation for future research and a greater opportunity to gain further clarification on how AMR communication shapes public engagement. A key area for future investigations involves examining the influence of efficacy cues affects public engagement. The current study revealed crisis future framing heightened AMR concern however, this framing on its own may be insufficient to foster long-term motivation. Therefore, future experiments could gain a deeper understanding by studying whether adding efficacy with clear actions and solutions to crisis messages works together to influence stronger AMR responses. Additionally, if understanding if certain combinations work better than other or are more effective in reducing complacency.

A second future direction could be to study how different group identities, such as national identity, professional identity, or health-related identity, affect individuals' motivation in AMR engagement. Although the findings showed identity did not moderate the framing effect in this study, the small associations observed may still influence general support for addressing AMR. Prior research in the collective-action literature has demonstrated that shared identities can strengthen motivation and willingness to engage in collective action, in particular their own group that they relate to (Van Zomeren et al., 2008). Building on this, future studies could adopt a more systematic approach by investigating a broader range of identity domains and assessing whether certain identity pathways amplify responsiveness to AMR narratives.

A third potential direction centres around culturally grounded approaches to AMR communication. Given the Aotearoa New Zealand context and the incorporation of a Māori booster sample, future studies could investigate whether having AMR framed communication that draws from Māori concepts to increase the local relevance. This could involve concepts

such as whakapapa and kaitiakitanga and situating AMR messages within familiar frameworks heightening the issue to feel more “for us”, thereby strengthening motivations for Māori to engage with the issue. Taking a local approach may potentially help identify communication strategies that align and resonate deeper with diverse cultural understandings of collective responsibility and long-term engagement for wellbeing.

Finally, as part of this study only one format of a written future scenario was investigated, further research could examine AMR communicated in a more naturalistic environment. This could involve embedding AMR narratives within different media formats, reflecting everyday exposure, such as social media content, mock podcasts or public health campaigns, to provide a stronger examination of how different platforms of AMR framing shape public engagement in different contexts. These findings would offer valuable insight into designing full strategic AMR communication and guide structure to maximise public motivation to a more varied audience.

Conclusion.

Collectively, the patterns that emerged from the findings underscore the importance of how an AMR message is framed when communicating with the public. Based on our findings it is important for messages to acknowledge the seriousness of AMR; while outlining achievable actions for individuals to be held accountable, this approach offers the most constructive and balanced strategy for motivating sustainable AMR engagement and behaviour. The results produced from the neutral condition show comparable performance to the crisis condition on several outcomes suggest that when participants are exposed to evidence-based information it resonates with credibility. Therefore, even with a neutral, a sufficient impact on individuals may still be delivered that maintains a consistent public concern.

In a broader context, this study provides valuable insight and builds a foundation for research on future-oriented communication. This study illustrates how the nuanced narrative

framing effects and how individuals imagine their future society can meaningfully shape their current attitudes and behavioural intentions towards something multifaceted like AMR which can be used when considering other complex health issues. As AMR continues to escalate within New Zealand and at a global scale, understanding the impacts of how communications lands on individuals is critical for designing the most impactful strategies to communicate effectively with the public. This study highlights the importance of recognising that narratives can have unintended consequence, and the importance of carefully considering the tone and framing used within the message, given the impact they have on influencing how individuals perceive and respond to complex large-scale issues.

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Appendix A.**Condition Scenarios.****Neutral (Control) Condition:**

Imagine it is the year 2060. Although AMR can occur naturally, its development has been influenced by long-standing patterns of antimicrobial use in both human and animal health. Practices such as overprescribing antibiotics and widespread antimicrobial use in farming remain areas of concern. In New Zealand, agencies like the Ministry of Health and PHARMAC have continued steady efforts to monitor AMR and promote responsible antimicrobial use in healthcare and agriculture. Public education campaigns have maintained awareness around appropriate antimicrobial use, and national strategies introduced in earlier decades remain in place. While AMR remains a growing threat to health, food security, and development, New Zealand's monitoring, responses, and public concern have stayed relatively stable through to 2060.

Hopeful Condition:

Imagine it is the year 2060. Through coordinated global and local efforts, by 2060 AMR is now fundamentally under control. New Zealand has seen a significant increase in the careful and responsible use of a wide range of antimicrobial medicines, helping to slow the development of resistance. Major advances in science and technology have led to innovative solutions, including novel treatments and improved infection prevention methods. Effective public health campaigns have played a crucial role in raising awareness about AMR, educating the public on the importance of appropriate antimicrobial use and stewardship. New treatments such as phage therapy, vaccines, and rapid diagnostic tools are now routinely and correctly used by healthcare providers. These innovations have greatly improved the ability to detect infections early and select the most effective therapies. Additionally, healthcare systems have adapted to support holistic approaches, integrating both medical and cultural healing practices. Public understanding of AMR has grown

substantially, with individuals making more informed and responsible decisions about when and how to use medical treatments, contributing to ongoing efforts to reduce AMR's impact.

Crisis Condition:

Imagine it is the year 2060. By 2060, AMR has escalated into a full-scale global and local health crisis. In New Zealand and worldwide, many infections no longer respond to antimicrobial medications. Hospitals are overwhelmed with drug-resistant infections. What were once routine surgeries and cancer treatments have become life-threatening due to the high risk of untreatable infection. Medical professionals describe this as a “silent pandemic” causing millions of deaths annually, with numbers still rising. This crisis results from years of overuse, misuse, and inaction allowing AMR to accelerate beyond control. New Zealand, like many countries, failed to implement stronger policies or public education in time. Effective treatments have become scarce, and the healthcare system struggles to cope and treat patients properly. The everyday security once provided by modern medicine has eroded, and New Zealand society, along with the rest of the world, faces severe consequences.

Appendix B.

PIS Form.

Antimicrobial Resistance (AMR) and New Zealand Society Study

Welcome to our study! It is important to read this document carefully so that you can make an informed decision about whether you would like to participate.

You are invited to participate in a national survey exploring how media coverage of antimicrobial resistance (AMR) shapes public perceptions of its future and influences behavioural intentions today. This project forms part of a master's research study supervised by Prof Taciano Milfont from the School of Psychological and Social Sciences at the University of Waikato.

Purpose of the research:

Antimicrobial resistance (AMR) occurs when bacteria and other microorganisms evolve to resist the effects of antibiotics and similar medicines. This growing public health issue has been covered in different ways by the media, some portrayals emphasise crisis and urgency, while others highlight innovation or uncertainty.

This research investigates how such narratives may shape the way New Zealanders think about AMR in the future and what actions they are willing to take now in response to the issue.

Procedure:

You will be asked to complete a short online survey, which should take approximately 20–30 minutes.

The survey includes:

- Questions about your general views on AMR
- A short future-based scenario to reflect on
- Questions about how you imagine New Zealand society in the year 2060
- Your current attitudes and behavioural intentions relating to AMR
- Some demographic questions

There are no right or wrong answers. We are interested in your personal views.

Your rights as a participant:

Participation in this study is entirely voluntary. You are free to withdraw from the study at any time before submitting your responses, without giving a reason and without any negative consequences. However, once you have submitted the survey, your responses will be fully anonymised and cannot be withdrawn, as they will no longer be linked to your identity in any way.

Risks and discomforts:

There are no anticipated risks associated with participating in this study.

Benefits:

While you may not receive direct personal benefit, your participation will contribute to better understanding of how to improve public communication and behavioural strategies in response to AMR.

Confidentiality, anonymity and data storage:

All data collected in this study is anonymous and will remain confidential. Your responses will not contain identifying information, and results will be analysed and reported in aggregate form only. All data will be securely stored and retained for a minimum of five years in accordance with university policy and may be used in future research or publications.

Researchers' contact details: If you have any queries, please contact the Principal Investigators by email

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This research project has been approved by the Human Research Ethics Committee (Health) at the University of Waikato as HREC(Health)2025#54 on 1 August 2025. Any questions or concerns about the ethical conduct of this research may be sent to the

Secretary of the Committee, email humanethics@waikato.ac.nz, postal address: Human Research Ethics Committee (Health), University of Waikato, Te Whare Wananga o Waikato, Private Bag 3105, Hamilton 3240).

Appendix C.

Data exclusion.

Participants will be excluded from analysis if they complete the survey in under 10 minutes, as such a short completion time suggests insufficient engagement with the material. The survey also includes both attention and manipulation check to ensure data quality.

Participants who fail checks will be removed from the dataset. All exclusion criteria will be applied prior to conducting the main analyses.

Appendix D.

Collective Intention Question.

Many individuals and organisations concerned with public health believe that addressing Antimicrobial Resistance (AMR) is a key priority. **With this in mind, how likely are you to engage in the following activities in the next 12 months?**

(If it is not possible for you to perform an activity, please choose “not applicable”)

	Not at all likely					Very likely	Not applicable
Give money to a public health or AMR awareness organisation/research	1	2	3	4	5		na
Read a newsletter, article, or publication about AMR	1	2	3	4	5		na

Sign a petition supporting action to reduce AMR	1	2	3	4	5	na
Contact a government representative to support stronger AMR policies	1	2	3	4	5	na
Vote for a candidate who supports strong action on AMR	1	2	3	4	5	na
Write to newspaper in support of action to help reduce AMR	1	2	3	4	5	na
Avoid buying from companies that overuse antibiotics in farming	1	2	3	4	5	na
Join or support a group raising awareness about AMR	1	2	3	4	5	na
Volunteer to help with a campaign or event about AMR	1	2	3	4	5	na
Join public demonstrations or awareness events about AMR	1	2	3	4	5	na
Post AMR-related messages or links on social media (e.g., Facebook, Instagram, TikTok)	1	2	3	4	5	na
Speak in favour of addressing AMR in conversations with your friends or family	1	2	3	4	5	na

Appendix E.**Private-Sphere Question.**

Some people support action on Antimicrobial Resistance (AMR) through activities in their personal lives. **With this in mind, how likely are you to engage in the following activities in the next 12 months?** (If it is not possible for you to perform an activity, please choose “not applicable”)

<i>I intend to...</i>	Not at all likely Very likely					Not applicable
Only use antibiotics when they are prescribed by a qualified healthcare professional	1	2	3	4	5	na
Take antibiotics exactly as prescribed by your healthcare professional (e.g., correct dosage and duration)	1	2	3	4	5	na
Read reliable sources to stay informed about appropriate antibiotic use	1	2	3	4	5	na
Learn about how antibiotics are used in farming and choose food produced with responsible practices	1	2	3	4	5	na

Seek information about AMR and how to reduce personal risk and spread	1	2	3	4	5	na
Avoid asking your healthcare professional for antibiotics for virus-related illnesses (like a cold or the flu) because antibiotics don't work on viruses	1	2	3	4	5	na
Choose antibiotic-free meat and animal products from sustainable sources	1	2	3	4	5	na
Take steps to prevent infection (e.g., handwashing, vaccinations)	1	2	3	4	5	na
Choose to buy from businesses or brands that promote responsible antibiotic use	1	2	3	4	5	na

Appendix F.

General Attitudes towards AMR Question.

Please rate the extent of your disagreement or agreement with the following statements about Antimicrobial Resistance (AMR).

	Strongly disagree	Strongly agree
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I would give part of my income to address AMR	-3	-2	-1	0	1	2	3
I would agree to an increase in taxes if the extra money was used to address AMR	-3	-2	-1	0	1	2	3
The benefits of addressing AMR do not justify the expense involved	-3	-2	-1	0	1	2	3
Action to address AMR should be given priority, even if it causes slower economic growth	-3	-2	-1	0	1	2	3
Even if I do something for AMR, my action will make no difference	-3	-2	-1	0	1	2	3
My actions to reduce the effects of AMR will encourage others to act	-3	-2	-1	0	1	2	3
Even if each of us took action aimed at addressing AMR, the combined effect would be negligible	-3	-2	-1	0	1	2	3
It is extremely important for me to help reduce the threat of AMR	-3	-2	-1	0	1	2	3
I feel a lot of joy or happiness when I do something that helps reduce the threat of AMR	-3	-2	-1	0	1	2	3
I feel a lot of sorrow or unhappiness when I fail to do something that could reduce the threat of AMR	-3	-2	-1	0	1	2	3
One of the goals I try to achieve in life is to help protect health and wellbeing by reducing the impact of AMR for future generations	-3	-2	-1	0	1	2	3

Appendix G.**New Zealand Identity and AMR Identity Question.**

Please rate the extent of your agreement or disagreement with the following statements about yourself in relation to Antimicrobial Resistance (AMR).

	Strongly disagree	Moderat ely disagree	Neither agree nor disagree	Moderat ely agree	Strongly agree
I identify with New Zealand	1	2	3	4	5
I identify as someone who supports efforts to reduce AMR	1	2	3	4	5
I am someone who is very concerned with the issue of AMR	1	2	3	4	5
I would be embarrassed to be seen as someone who is concerned about AMR	1	2	3	4	5
I would not want my friends or family to think of me as someone who is concerned about AMR	1	2	3	4	5

Appendix H.**Full Survey.****SURVEY****ANTIMICORBIAL RESISTANCE (AMR) AND NEW ZEALAND SOCIETY****INSTRUCTIONS**

This survey focuses on Antimicrobial Resistance (AMR), a phenomenon in which bacteria and other microorganisms develop the ability to resist the effects of medications designed to eliminate them, such as antibiotics. As a result, infections become more difficult to treat, may persist for longer periods, and can spread more easily, increasing the risk of so-called ‘superbugs’

In this survey, we are interested in your views about the future consequences for New Zealand if people take action to address AMR.

You will be asked about your personal views on AMR, and the consequences of people’s actions to address AMR in New Zealand. We also ask about your views and activities to address AMR, and about other aspects of yourself and society. Your responses are anonymous and will be used for research purposes only.

Please note that there are no correct or incorrect answers – we are just interested in your opinions.

In the following pages, we want you to think about the long-term effects of Antimicrobial Resistance (AMR) to New Zealand.

Specifically, we want you to compare New Zealand society today with
New Zealand society in 2060 as described in the scenario below.

Scenario: (Control Condition)

Imagine it is the year 2060.

Although AMR can occur naturally, its development has been influenced by long-standing patterns of antimicrobial use in both human and animal health. Practices such as overprescribing antibiotics and widespread antimicrobial use in farming remain areas of concern.

In New Zealand, agencies like the Ministry of Health and PHARMAC have continued steady efforts to monitor AMR and promote responsible antimicrobial use in healthcare and agriculture. Public education campaigns have maintained awareness around appropriate antimicrobial use, and national strategies introduced in earlier decades remain in place. While AMR remains a growing threat to health, food security, and development, New Zealand's monitoring, responses, and public concern have stayed relatively stable through to 2060.

Scenario: (Crisis Condition)

Imagine it is the year 2060.

By 2060, AMR has escalated into a full-scale global and local health crisis. In New Zealand and worldwide, many infections no longer respond to antimicrobial medications. Hospitals

are overwhelmed with drug-resistant infections. What were once routine surgeries and cancer treatments have become life-threatening due to the high risk of untreatable infection. Medical professionals describe this as a “silent pandemic” causing millions of deaths annually, with numbers still rising.

This crisis results from years of overuse, misuse, and inaction allowing AMR to accelerate beyond control. New Zealand, like many countries, failed to implement stronger policies or public education in time. Effective treatments have become scarce, and the healthcare system struggles to cope and treat patients properly. The everyday security once provided by modern medicine has eroded, and New Zealand society, along with the rest of the world, faces severe consequences.

Scenario: (Hopeful Condition)

Imagine it is the year 2060.

Through coordinated global and local efforts, by 2060 AMR is now fundamentally under control. New Zealand has seen a significant increase in the careful and responsible use of a wide range of antimicrobial medicines, helping to slow the development of resistance. Major advances in science and technology have led to innovative solutions, including novel treatments and improved infection prevention methods. Effective public health campaigns have played a crucial role in raising awareness about AMR, educating the public on the importance of appropriate antimicrobial use and stewardship.

New treatments such as phage therapy, vaccines, and rapid diagnostic tools are now routinely and correctly used by healthcare providers. These innovations have greatly improved the ability to detect infections early and select the most effective therapies. Additionally, healthcare systems have adapted to support holistic approaches, integrating both medical and cultural healing practices. Public understanding of AMR has grown substantially, with individuals making more informed and responsible

decisions about when and how to use medical treatments, contributing to ongoing efforts to reduce AMR's impact.

Please briefly describe your image of this society in a sentence or two:

(Manipulation Check Questions)

Based on the scenario you just read, how would you describe the current state of AMR in New Zealand in 2060?

Completely under control and manageable			Moderately concerning but somewhat controlled			A severe and uncontrolled health crisis
1	2	3	4	5	6	7

Based on the scenario you just read, how well is the healthcare system coping with AMR-related infections in 2060?

Overwhelmed and struggling			Moderately able to cope with some challenges			Very well equipped and effective
----------------------------------	--	--	--	--	--	---

1	2	3	4	5	6	7
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Based on the scenario you just read, how effective have public health policies and education been in managing AMR in 2060?

Highly effective, with strong public understanding			Moderately effective but inconsistent			Ineffective or insufficient action
1	2	3	4	5	6	7

Based on the scenario you just read, what is the overall impact of AMR on New Zealand society in 2060?

Highly effective, with strong public understanding			Moderately effective but inconsistent			Ineffective or insufficient action
1	2	3	4	5	6	7

Attention check question

Question text:

To show you're paying attention, please select "Egg, sausage and bacon" from the list below.

Dropdown options:

- Egg, sausage and bacon (*correct*)

- Egg and Spam
- Egg, bacon and Spam
- Egg, bacon, sausage and Spam
- Spam, Spam, Spam, egg and Spam

Please rate how typical the following characteristics would be of **New Zealanders in the 2060 Antimicrobial Resistance (AMR) scenario you just read**, compared to New Zealanders today.

Characteristic	New Zealanders' characteristics in the 2060 AMR scenario											
	Much less typical than today						Much more typical than today					
Caring	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	
Lazy	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	
Unfriendly	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	
Honest	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	
Competent	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	
Unskilled	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	
Capable	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	

Please rate how important the following values would be to **New Zealanders in the 2060 Antimicrobial Resistance (AMR) scenario you just read**, compared to New Zealanders today.

	New Zealanders' values in the 2060 AMR scenario											
	Much less important than today						Much more important than today					
Value												
Equality												
(equal opportunity for all)	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	

Self-discipline

(self-restraint, resistance to temptation)	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
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Pleasure

(gratification of desires)	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
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Wealth

(material possessions, money)	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
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Honesty

(genuine, sincere)	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
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Enjoying life

(enjoying food, sex, leisure, etc.)	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
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Social justice

(correcting injustice, care for the weak)	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
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Freedom

(freedom of action and thought)	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
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Family security

(safety for loved ones)	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
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Ambitious

(hardworking, aspiring)	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
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Respect for tradition

(preservation of time-honoured customs)	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
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An exciting life (stimulating experiences)	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
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Please rate whether the following aspects of New Zealand society would become worse or improve **in the 2060 Antimicrobial Resistance (AMR) scenario you just read**, compared to New Zealand society today.

Aspect of society	New Zealand society in the 2060 AMR scenario										
	Much worse than today					Same as today					Much improved than today
	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
Violent crime	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
Education levels	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
Poverty	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
Volunteering	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
Disease	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
Economic development	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
Pollution	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
Scientific progress	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
Extent of community groups	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
Theft	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5

In the following pages, we would like to know your personal attitudes and actions with regard to Antimicrobial Resistance (AMR).

Many individuals and organisations concerned with public health believe that addressing Antimicrobial Resistance (AMR) is a key priority. **With this in mind, how likely are you to engage in the following activities in the next 12 months?**

	Not at all likely				Very likely	Not applicable
Give money to a public health or AMR awareness organisation/research	1	2	3	4	5	na
Read a newsletter, article, or publication about AMR	1	2	3	4	5	na
Sign a petition supporting action to reduce AMR	1	2	3	4	5	na
Contact a government representative to support stronger AMR policies	1	2	3	4	5	na

Vote for a candidate who supports strong action on AMR	1	2	3	4	5	na
Write to newspaper in support of action to help reduce AMR	1	2	3	4	5	na
Avoid buying from companies that overuse antibiotics in farming	1	2	3	4	5	na
Join or support a group raising awareness about AMR	1	2	3	4	5	na
Volunteer to help with a campaign or event about AMR	1	2	3	4	5	na
Join public demonstrations or awareness events about AMR	1	2	3	4	5	na
Post AMR-related messages or links on social media (e.g., Facebook, Instagram, TikTok)	1	2	3	4	5	na
Speak in favour of addressing AMR in conversations with your friends or family	1	2	3	4	5	na

Some people support action on Antimicrobial Resistance (AMR) through activities in their personal lives. **With this in mind, how likely are you to engage in the following activities in the next 12 months?**

(If it is not possible for you to perform an activity, please choose “not applicable”)

<i>I intend to...</i>	Not at all likely					Very likely	Not applicabl e
Only use antibiotics when they are prescribed by a qualified healthcare professional	1	2	3	4	5		na
Take antibiotics exactly as prescribed by your healthcare professional (e.g., correct dosage and duration)	1	2	3	4	5		na
Read reliable sources to stay informed about appropriate antibiotic use	1	2	3	4	5		na
Learn about how antibiotics are used in farming and choose food produced with responsible practices	1	2	3	4	5		na
Seek information about AMR and how to reduce personal risk and spread	1	2	3	4	5		na
Avoid asking your healthcare professional for antibiotics for virus-related illnesses (like a cold or the flu) because antibiotics don't work on viruses	1	2	3	4	5		na

Choose antibiotic-free meat and animal products from sustainable sources	1	2	3	4	5	na
Take steps to prevent infection (e.g., handwashing, vaccinations)	1	2	3	4	5	na
Choose to buy from businesses or brands that promote responsible antibiotic use	1	2	3	4	5	na

Please rate the extent of your disagreement or agreement with the following statements about Antimicrobial Resistance (AMR).

	Strongly disagree							Strongly agree
I would give part of my income to address AMR	-3	-2	-1	0	1	2	3	
I would agree to an increase in taxes if the extra money was used to address AMR	-3	-2	-1	0	1	2	3	
The benefits of addressing AMR do not justify the expense involved	-3	-2	-1	0	1	2	3	
Action to address AMR should be given priority, even if it causes slower economic growth	-3	-2	-1	0	1	2	3	
Even if I do something for AMR, my action will make no difference	-3	-2	-1	0	1	2	3	

My actions to reduce the effects of AMR will encourage others to act	-3	-2	-1	0	1	2	3
--	----	----	----	---	---	---	---

Even if each of us took action aimed at addressing AMR, the combined effect would be negligible	-3	-2	-1	0	1	2	3
---	----	----	----	---	---	---	---

It is extremely important for me to help reduce the threat of AMR	-3	-2	-1	0	1	2	3
---	----	----	----	---	---	---	---

I feel a lot of joy or happiness when I do something that helps reduce the threat of AMR	-3	-2	-1	0	1	2	3
--	----	----	----	---	---	---	---

I feel a lot of sorrow or unhappiness when I fail to do something that could reduce the threat of AMR	-3	-2	-1	0	1	2	3
---	----	----	----	---	---	---	---

One of the goals I try to achieve in life is to help protect health and wellbeing by reducing the impact of AMR for future generations	-3	-2	-1	0	1	2	3
--	----	----	----	---	---	---	---

Please rate the extent of your agreement or disagreement with the following statements about yourself in relation to Antimicrobial Resistance (AMR).

	Strongly disagree	Moderately disagree	Neither agree nor disagree	Moderately agree	Strongly agree
I identify with New Zealand	1	2	3	4	5
I identify as someone who supports efforts to reduce AMR	1	2	3	4	5

I am someone who is very concerned with the issue of AMR	1	2	3	4	5
I would be embarrassed to be seen as someone who is concerned about AMR	1	2	3	4	5
I would not want my friends or family to think of me as someone who is concerned about AMR	1	2	3	4	5

Thanks so much for your answers so far! You're almost there—just a few more questions to go, including some about climate change and a few background questions to help us better understand who completed our survey.

1. How important is the issue of climate change to you personally?

Extremely important

Very important

Somewhat important

Not too important

Not at all important

2. How worried are you about climate change?

Very worried

Somewhat worried

Not very worried

Not at all worried

3. How much do you think climate change will harm you personally?

A great deal

A moderate amount

Only a little

Not at all

Don't know

4. How much do you think climate change will harm future generations of people?

A great deal

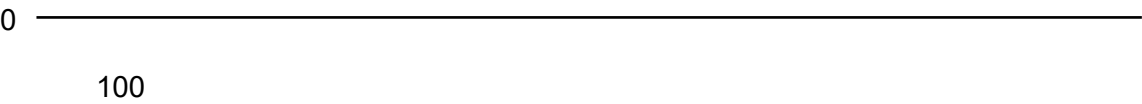
A moderate amount

Only a little

Not at all

Don't know

5. To the best of your knowledge, what percentage of climate scientists think that human-caused climate change is happening?



6. I have personally experienced the effects of climate change

Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
1	2	3	4

8. Thinking about climate change, to what extent do you feel each of the following emotions?
(Please select one option for each emotion.)

Emotion	1 = Not at all	2 = Not very likely	3 = Moderately	4 = Very
Afraid	☐	☐	☐	☐
Helpless	☐	☐	☐	☐
Angry	☐	☐	☐	☐
Guilty	☐	☐	☐	☐
Disgusted	☐	☐	☐	☐
Outraged	☐	☐	☐	☐
Ashamed	☐	☐	☐	☐

The following statements reflect different views people may hold about climate change.

Please indicate your level of agreement with each one.

	Definit ely not	Probab ly not	Slightly not	Neutral	Slightly yes	Probab ly yes	Definit ely yes
Individuals and consumers are ultimately responsible for taking actions to address climate change	1	2	3	4	5	6	7
Individuals should take appropriate decisions as consumers to address climate change	1	2	3	4	5	6	7
Individuals should take appropriate decisions as voters to address climate change	1	2	3	4	5	6	7
To prevent climate change, we must focus primarily on mobilizing individuals, not on government policy or business	1	2	3	4	5	6	7
Reducing emissions is going to weaken our country in the global market	1	2	3	4	5	6	7

If our country adopts policies to
reduce emissions, other countries
will actively take advantage of us

1 2 3 4 5 6 7

As other countries do not reduce
greenhouse gas emissions,
reducing emissions in our country
will only weaken the national
economy

1 2 3 4 5 6 7

The introduction of policies to
reduce emissions will weaken the
position of our country in relation
to our neighbours and rivals

1 2 3 4 5 6 7

We should focus our efforts on
current and future technologies,
which will unlock great
possibilities for addressing climate
change

1 2 3 4 5 6 7

We should focus on developing
new technologies that will solve
climate change in the future

1 2 3 4 5 6 7

The development of modern
technologies will allow mankind to
cope with climate threats

1 2 3 4 5 6 7

We should invest even more in
the development of new

1 2 3 4 5 6 7

technologies, because only they
will allow us to overcome the
climate crisis

Our country is a world leader in
addressing climate change

1

2

3

4

5

6

7

We are among the most
prosperous countries in reducing
emissions

1

2

3

4

5

6

7

Other countries should follow our
example when it comes to
combating climate change

1

2

3

4

5

6

7

We should be proud of how our
country is dealing with climate
change

1

2

3

4

5

6

7

Fossil fuels are part of the solution
towards a low-carbon future

1

2

3

4

5

6

7

We should not move away from
fossil fuels (e.g., coal, natural gas,
petrol) but focus on using them
more efficiently

1

2

3

4

5

6

7

Fossil fuels must continue to play
an integral role in the global
economy for the foreseeable
future

1

2

3

4

5

6

7

Fossil fuels are not so bad if you use them wisely and rationally	1	2	3	4	5	6	7
---	---	---	---	---	---	---	---

Vulnerable members of our society will be burdened by climate policies	1	2	3	4	5	6	7
--	---	---	---	---	---	---	---

Climate change mitigating actions will be too significant burden for poor people	1	2	3	4	5	6	7
--	---	---	---	---	---	---	---

Preventing climate change will be too costly for our society	1	2	3	4	5	6	7
--	---	---	---	---	---	---	---

The poorest will become victims of the policies introduced as part of the combat against climate change	1	2	3	4	5	6	7
---	---	---	---	---	---	---	---

Any mitigation climate actions we take are already too little, too late	1	2	3	4	5	6	7
---	---	---	---	---	---	---	---

It is already too late to try to mitigate climate change	1	2	3	4	5	6	7
--	---	---	---	---	---	---	---

Taking action to reduce the effects of climate change is pointless because it's already too late	1	2	3	4	5	6	7
--	---	---	---	---	---	---	---

There is nothing we can do to combat the inevitable climate change	1	2	3	4	5	6	7
--	---	---	---	---	---	---	---

DEMOGRAPHICS

1. How old are you? _____ years

2. What is your gender? Male Female

3. Are you a New Zealand citizen? NO YES

4. How many years of your life have you lived in New Zealand? _____ years

5. What is your ethnic/cultural background?

6. Do you use or support traditional healing practices (e.g., Rongoā Māori)?

Yes / No /

7. If you have views on AMR or antibiotics from a cultural or traditional healing perspective (e.g., Māori or Pacific health), please share them here _____

8. Are you a university student? NO YES (specify main area of study)

9. Are you currently employed or not? (If you have more than one job, please focus on your main job)

Yes, paid employment:

- ☐ Full time employee (30 hours a week or more)
- ☐ Part time employee (less than 30 hours a week)
- ☐ Self-employed

No, no paid employment:

- ☐ Unemployed (looking for work)
- ☐ Retired/pensioned

☐ Not in the job market (e.g., raising children, not looking for work)

10. How religious are you, if at all?

	Very religious							
Not at all religious	0	1	2	3	4	5	6	7

11. In political matters, people sometimes talk about "the left" and "the right." How would you place your views on this scale, generally speaking?

Left	1	2	3	4	5	6	7	8	9	10	Right
------	---	---	---	---	---	---	---	---	---	----	-------

**12. In political matters, people sometimes talk about "liberals" and "conservatives."
How would you place your views on this scale, generally speaking?**

		Moderate/				
Very		Slightly	middle of	Slightly		Very
liberal	Liberal	liberal	the road	conservative	Conservative	conservative
1	2	3	4	5	6	7

13. If you were able to vote in a national election tomorrow, which political party would you vote for?

Please write the party name here:

14. If you had to describe this party's position on Antimicrobial Resistance (AMR), which of the following would it be? (Please choose ONE of the options below that corresponds most closely to your view):

- ☐ This party is committed to addressing AMR and supporting strong public health measures
- ☐ This party supports public health, but does not have specific AMR policies
- ☐ AMR is not a concern of this party
- ☐ This party opposes action on AMR or antimicrobial regulation
- ☐ I do not know this party's position on AMR

15. The current average annual household income in New Zealand is \$134,599.

Considering all of the sources of income of members of your household, is your income:

Very much		A little		A little		Very much
above the	Above the	above the	About	below the	Below the	below the
average	average	average	average	average	average	average
1	2	3	4	5	6	7

16. Do you live in a more urban/city area, or a more rural/country area?

Very rural/country	1	2	3	4	5	Very urban/city
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Appendix I.**Antimicrobial Resistance and Future Thinking – Debriefing Sheet**

Thank you for participating in this study! This research is part of a Master of Psychology thesis at the University of Waikato. The study explores how people respond to different media-inspired future scenarios about Antimicrobial Resistance (AMR), and how these narratives may shape our thoughts about society, health behaviours, and the future of New Zealand. Antimicrobial Resistance refers to bacteria and other microbes becoming resistant to antibiotics, which is a growing global public health issue. This study investigates how communication about AMR can affect our values, perceptions, and intentions to act in the present.

Some of the content in this survey may have raised concerns or feelings of uncertainty about health, the future, or societal issues. These reactions are completely valid. If you experienced any discomfort or distress while completing this survey, please consider accessing the following free, confidential mental health services:

- **New Zealand Services:**
- **Need to Talk?** – Call or text 1737
- **Lifeline** – 0800 543 354
- **Healthline** – 0800 611 116

If you would like to receive a summary of the study results once the research is complete, or if you have any questions, please feel free to contact the researcher:

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This research project has been approved by the Human Research Ethics Committee (Health) at the University of Waikato as HREC(Health)202564H on 1 August 2025. Any questions or concerns about the ethical conduct of this research may be sent to the Secretary of the Committee, email humanethics@waikato.ac.nz, postal address: Human Research Ethics Committee (Health), University of Waikato, Te Whare Wānanga o Waikato, Private Bag 3105, Hamilton 3240.