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Patient and public understanding of antimicrobial resistance: a systematic review and meta-ethnography

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Objectives: To further develop an understanding of laypeople's (adult patients and public) beliefs and attitudes toward antimicrobial resistance (AMR) by developing a conceptual model derived from identifying and synthesizing primary qualitative research.

Methods: A systematic search of 12 electronic databases, including CINAHL, MEDLINE, PsycINFO, PubMed and Web of Science to identify qualitative primary studies exploring patient and public understanding of AMR published between 2012 and 2022. Included studies were quality appraised and synthesized using Noblit and Hare's meta-ethnographic approach and reported using eMERGe guidance.

Results: Thirteen papers reporting 12 qualitative studies were synthesized. Studies reported data from 466 participants aged 18–90 years. Five themes were identified from these original studies: the responsible patient; when words become meaningless; patient–prescriber relationship; past experience drives antibiotic use; and reframing public perception. These themes supported the development of a conceptual model that illustrates the tension between two different assumptions, that is, how can antibiotics be used for the collective good whilst balancing the immediate needs of individual patients.

Conclusions: Findings suggest that AMR is a distinct ethical issue and should not be viewed purely as a prescribing problem. The meta-ethnography-generated conceptual model illustrates many factors affecting the public's perception of AMR. These include laypeople's own knowledge, beliefs and attitudes around antibiotic use, the relationship with the healthcare provider and the wider context, including the overwhelming influence of the media and public health campaigns. Future research is needed to explore effective health messaging strategies to increase laypeople's baseline awareness of AMR as a public threat.

Background

Antimicrobial resistance (AMR) is one of the top 10 global public health threats.¹ The continuing emergence and spread of AMR poses a significant threat to public health and patient safety due to increasing numbers of infections becoming untreatable, and associated morbidity, mortality and healthcare expenditure.² An estimated 5 million deaths worldwide were associated with bacterial AMR in 2019.³ This figure is predicted to rise to 10 million deaths annually by 2050, with a significant corresponding impact on the global economy of approximately 100 trillion US dollars, if no action is taken.⁴ The reasons for the increase in AMR are complex, but the emergence of resistant bacteria has been attributed to decades of excessive use of antibiotics.⁵ In high-income countries (HICs), the majority of antibiotics are prescribed in primary care settings.⁶ However, evidence shows that a substantial

proportion of these prescriptions are unnecessary or inappropriate.^{7,8} This has prompted various initiatives to reduce inappropriate prescribing in primary care and coordinated efforts to understand levels of knowledge of antibiotic stewardship (AMS) amongst the general public.⁹

Antibiotic prescribing is influenced by a complex interplay between the knowledge, attitudes and behaviour of the prescriber and the patient.^{10,11} Previous studies have shown that patients overestimate the benefits of antibiotics, and their expectations can influence prescriber responsiveness to initiate a prescription.¹² Numerous public health campaigns have been launched worldwide, including global events, such as World AMR Awareness Week (WAAW) to improve awareness among the public, prescribers and policymakers with the aim of engaging these groups to act.¹³ However, concerns remain about the lack of sufficient public-facing activities and evidence-based messaging during these events, with

multi-country public awareness surveys indicating persistent public misunderstanding about the action of antibiotics against microbes and their prudent use.^{14,15}

Internationally, there has been considerable research conducted to better understand the views of patients and the public of AMR but these studies have not been systematically reviewed. Our aim was therefore to systematically search for, identify and synthesize qualitative research from HICs, exploring patient and public attitudes and perceptions about AMR to build a conceptual model and help inform future AMS interventions.

Methods

Phase 1: Selecting meta-ethnography (ME) and getting started

Preliminary searching confirmed there was a suitably sized body of qualitative studies exploring patients’ and the public’s perceptions of AMR that could be synthesized using ME. Unlike other methods for synthesizing qualitative research, which amalgamate and describe primary study findings,¹⁶ ME aims to abstract findings and develop conceptual understanding to make ‘a whole into something more than the parts alone imply’.¹⁷ ME therefore suited our study aims. This inductive seven-step method is the most commonly utilized qualitative synthesis approach in healthcare research.^{18,19} The review protocol was registered on the PROSPERO International Prospective Register of Systematic Reviews (CRD42022324001). Ethical approval was not required.

Phase 2: Deciding what is relevant

We sought primary research studies reporting on what adult patients and the public think and feel about AMR, their current understanding of the resistance issue and the language they use when discussing this topic (e.g. specific terms and phrases). A systematic literature search was conducted from January 2012 to December 2022. Conducting a search over the last 10 years was considered a pragmatic approach to ensure relevance to current antibiotic prescribing practices. Given that beliefs and social phenomena evolve, this period captures contemporary views and practices. Moreover, context is crucial for designing health interventions and assessing their applicability in various settings.^{17,20} There are significant differences between developed and developing countries in terms of healthcare infrastructure, access, resources and socioeconomic conditions.²¹ These differences, particularly in shared decision-making with patients regarding prescribing, and variations in organizational and professional risk thresholds, made it contextually more appropriate to focus on HICs.¹¹ This approach aligns with the ME guidance, ensuring the findings are applicable to the context and setting of the planned intervention and strengthening the conceptual model.^{17,22} Non-English language papers were excluded due to resource constraints for translation and concerns about decontextualizing the findings and preserving the original meaning of quotes.^{19,22}

We used the SPIDER tool (Table 1) to help with searching and locating relevant studies.²³ We systematically searched 12 electronic databases: ASSIA, BASE, CINAHL, EMBASE, ERIC, MEDLINE via EBSCO, ProQuest Dissertation & Theses, PsycINFO, PubMed, Ovid Nursing, Web of Science and Google Scholar. To maximize return, we used extensive search terminology and relevant synonyms, including medical subject headings (MeSH). To enable transparent reporting in line with the eMERGe ME reporting guidance,²² a detailed search strategy is provided in Table S1 (available as Supplementary data at JAC-AMR Online).

We supplemented our online search with other methods, including hand-searching of relevant publications, reference screening and citation searching. Grey literature sources were searched for, including government reports, audits, conference proceedings and doctoral theses. Initially, employing a tailored search strategy developed by an academic

Table 1. Search terms identified using the SPIDER tool¹⁹

Sample (patients or general public)	Patient* OR consumer* OR public* OR general public* OR population* OR people* OR communit* OR societ*
Phenomenon of Interest (understanding of antibiotic resistance)	Antibiotic* OR microbial* OR antimicrobial* OR drug* OR superbug* OR AMR OR resistanc* OR drug resistance OR anti-bacterial agent* AND understand* OR know* OR percept* OR perceiv* OR attitud* OR aware* OR belief* OR opinion* OR view* OR experience
Design/Evaluation/Research type (*qualitative)	Qualitative OR focus group* OR interview* OR ethnograph* OR observation*

*See Table S1 for hybrid qualitative filters.

Table 2. Study inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Primary research studies reporting adult patients’ and the general public’s views and understanding of antibiotics and AMR.	Studies not reporting primary qualitative data collection and analyses (e.g. quantitative research, descriptive case studies, commentaries, editorials, reviews.
Qualitative studies where there is clear identification, collection (e.g. interviews, focus groups) and inductive analysis (e.g. grounded theory, phenomenological analysis) of qualitative data.	Mixed-methods studies where qualitative data are not reported separately and cannot be extracted.
Mixed-methods studies only if the qualitative data are discrete and findings reported separately from quantitative findings.	Studies not containing direct quotations from research participants or where direct quotations cannot be obtained from a supplementary file or the study authors.
Studies carried out in HICs according to the international classification. ^a	Studies focusing on parent-related factors influencing antibiotic use in a paediatric population.
Published in English language between 2012 and 2022.	Studies conducted in low- and middle-income countries.
	Studies where the full text is unavailable, or it is not written in the English language.

^aSee Supplementary data (Phase 2) for full definitions.

librarian, potential studies for the ME were screened against our specific inclusion criteria (Table 2) using a rigorous simultaneous title and abstract screening process as recommended by the Institute of Medicine.²⁴ Subsequently, full texts were assessed by two reviewers (R.F. and F.T.) working independently and then comparing outcomes. Any discrepancies were referred to the research team for arbitration. Literature searching outcomes were reported using PRISMA²⁵ (Figure 1).

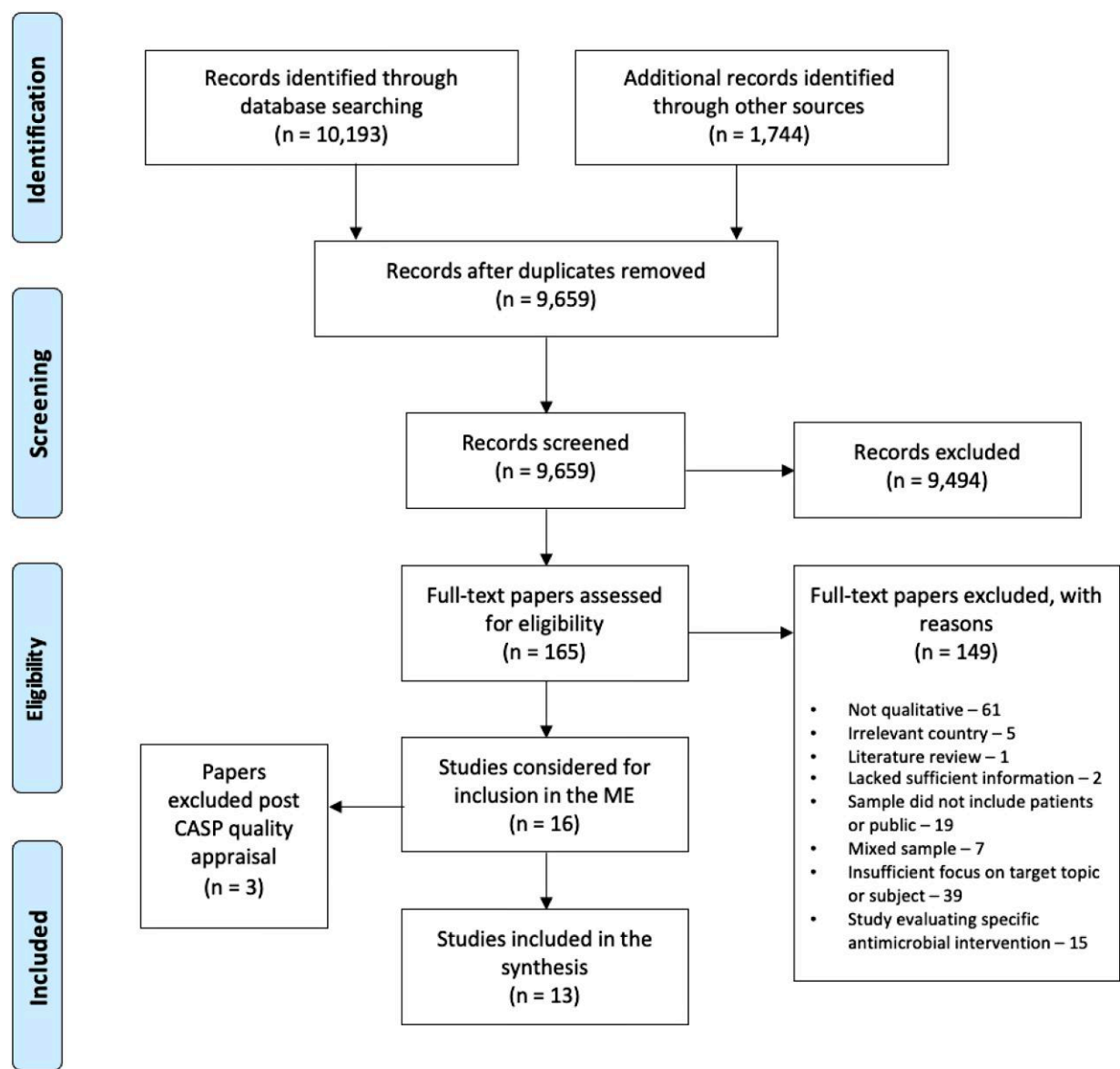


Figure 1. PRISMA diagram.²¹

Phase 3: Reading included studies

Studies meeting the inclusion criteria were read repeatedly and quality-assessed by two independent reviewers (R.F. and F.T.) using the Critical Appraisal Skills Programme assessment tool.²⁶ Grey literature was appraised using the Authority, Accuracy, Coverage, Objectivity, Date and Significance (AACODS) checklist²⁷ as recommended by NICE.²⁸ As ME is interpretive, it was important to have conceptually rich texts.¹⁸ We therefore excluded ‘irrelevant’ papers and papers that lacked conceptual depth²⁹ (see [Supplementary data, Phase 3](#) for more details). This dual approach encouraged judgements on procedural aspects of research and helped us assess each study’s contribution to the final synthesis.^{19,30}

Once we had agreed on which studies to include, we needed to familiarize ourselves with the key concepts in the data (key metaphors, phrases and meaningful ideas).¹⁸ First, to provide context for data interpretations, we entered study characteristics (e.g. participant demographics) into a template. Second, we reread all eligible studies multiple times

to identify salient concepts in the introduction, results and discussion sections of each study. We then extracted original participant quotes (first-order) and authors’ interpretations (second-order data) verbatim into NVivo v12 qualitative software and then organized using a standardized data extraction form. To ensure rigorous analysis and minimize bias, the research team conducted regular discussions to verify and challenge the accuracy of interpretations. For example, two reviewers independently analysed the data and compared their findings, which were subsequently refined through team discussions.

Phases 4 and 5: Determining how studies are related and translating studies

To determine the relationships between the studies and identify common and recurring meaningful ideas, we followed an approach recommended by Sattar *et al.*³¹ First, we created a list of the themes and concepts from

each study and juxtaposed them against each other. From this list, we then clustered the concepts from different studies into relevant categories. This phase was iterative, and categories were revised through regular meetings. This facilitated translation, which was idiomatic and carried out chronologically, starting from the earliest publication. Translation of findings was reciprocal where similar concepts (albeit expressed differently) were drawn together and refutational, where contradictory or disconfirming concepts were noted. This process enabled us to 'go beyond' findings from individual studies, from simple descriptions of the data to developing higher interpretations. Translation led to the development of overarching themes.

Phases 6 and 7: Synthesizing translations and expressing the synthesis

Through critical reflection and iterative discussion, Phase 4 and 5 findings were used to create a conceptual model. We did this by working from the identified themes to create a new line-of-argument (LOA), that is our 'third-order (reviewer) constructs and interpretation', a picture of the findings built on the individual parts of studies.¹⁸

Results

We identified 11 937 possible references (Figure 1). Of those, 16 qualitative papers met our initial inclusion criteria. Following critical reading and quality appraisal (available in Tables S2 and S3), three papers were excluded: two were judged to lack conceptual and methodological depth,^{32,33} and one research report of a mixed-methods study³⁴ was an exact replication of the Boiko *et al.*³⁵ paper, in which the same research team reported qualitative findings separately. Thirteen papers reporting findings from 12 studies were finally included in the synthesis.^{35–47}

The included studies reported the perspectives of 424 members of the public (health service users) and 42 hospital inpatients from various countries, including the UK,^{35,40,46} Sweden,^{36,37} Spain,⁴⁴ Greece,⁴⁵ multiple other European countries,⁴⁷ Australia^{38,42,43} and New Zealand.⁴¹ All except one study⁴⁶ provided gender information, and it is known that 168 (38%) participants were men. Study participants' age ranged between 18^{38,40,46} and over 90 years.³⁵ Only four studies provided details of participants' ethnicity^{35,40,41,44} and eight indicated their education level.^{36,37,40,41,43–46} In many studies, the participants were highly educated, including those with a university degree^{40,41,44,46} and postgraduate education (including a doctoral degree).^{36,37,43,45}

Sample size varied from 18⁴⁶ to 99 participants.⁴² Data were collected using individual interviews ($n=6$)^{35,38,40,42–44} and focus groups ($n=4$).^{36,37,39,45} Three studies used interviews and focus groups.^{41,46,47} One study was a report rather than a peer-reviewed journal paper.⁴⁶ Characteristics of the 13 papers, including publication year, country/setting, study focus, population, methods and findings, are detailed in Table 3.

Across all studies, 85 concepts emerged, which we organized into 11 higher conceptual categories (HCCs) that shared meaning (see Tables S4 and S5). From there, five overarching themes appeared: (1) the responsible patient; (2) when words become meaningless; (3) patient–prescriber relationship; (4) past experience drives antibiotic use; and (5) reframing public perception. Theme 1 arose from refutational analysis when it was noted that some translated findings described alternative dissonant perspectives of the same phenomenon. Themes 2–5 were

derived from reciprocal translation (findings were compatible). Table 4 shows the studies supporting each theme. We present each theme with narrative exemplars below.

Theme 1: The responsible patient

The essence of this theme is the tension between perceived individual health gains and society's need to preserve antibiotic effectiveness. Although some participants voiced concerns that prioritizing collective health benefits may bring about undesired, and perhaps fatal, consequences from antibiotic treatments being withheld from vulnerable patients, across the studies there was strong support for prioritizing societal health benefits, for example:

Yes, if we look at the big picture and think about how serious it's starting to get...it's a sacrifice you have to make, I think, to get a better situation. Society first. (Participant G4W2)³⁶

However, participant differences were noted between different studies. For example, whilst participants in two European studies expressed a shared belief in there being personal responsibility for AMR, their perceptions of the collective dimension of responsibility diverged. For instance, participants in the Swedish study described the decreasing availability of effective antibiotics as a problem of justice^{36,37} but, this notion of collective responsibility was a vague concept for most participants in the Greek study.⁴⁵ As illustrated below, a scenario in which society would share and act on the idea of a common purpose did not seem realistic for participants in this study:

So our society does not have the [features] to deal with it. Beyond antibiotics, there is public confusion. We have lost track of things. (Participant G4M1)⁴⁵

In contrast, lay participants in other studies did not perceive AMR as a self-responsibility of the individual but as a phenomenon on which they could not act.^{38–40} Although concerned about AMR, they denied their own involvement in, and responsibility for, suboptimal antibiotic use.³⁹ Some described that they felt overwhelmingly uncomfortable that the final decision whether to use antibiotics fell on them, rather than the GP.⁴³ With the exception of one study, where participants were reluctant to transfer all responsibility to medical experts,⁴² there was also a strong sense of shifting the responsibility onto others. Although highly educated, most participants did not want such responsibility.

Scientists out there will come up with something and they're really clever, so I don't worry too much because I think somebody's solving the problem. (Participant CS23, female, 28 years old)⁴³

While inpatients in Zanichelli *et al.*'s study⁴⁷ doubted their ability to understand medical information, laypeople were unsure about how they could respond to AMR on an individual level and tended to assign the accountability for the AMR issue to healthcare professionals.⁴⁰ Some participants believed that prescribing is solely an expert matter and therefore not under personal control.^{38,48} They rationalized the overuse and misuse of

Table 3. Summary of qualitative papers included in the synthesis (chronological order)

Study	Aim(s)	Sample	Data collection and analysis	Key findings
Wellcome Trust 2015 ⁴⁶ UK	To get a deep understanding of how people think and feel about antibiotics, their current understanding of the resistance issue and the language they use around this area.	18 members of the general public Age range: 18–70+ Education: 6 university educated	Pair interviews and focus groups Data analysis not reported (grey literature publication)	4 overarching themes reported: people's relationship with antibiotics; current knowledge and understanding of AMR and resistance; reactions to different 'ways in' of talking about resistance; current language and how it is understood.
Lum <i>et al.</i> 2017 ⁴³ Australia	To investigate the perspectives, attitudes and behaviours of Australian consumers on antibiotic use and antibiotic resistance, and to inform national programmes for reducing inappropriate antibiotic consumption.	32 consumers Age range: 23–53 23 female/9 male Education: 32 with undergraduate/21 postgraduate degree	Semi-structured interviews Thematic analysis	3 main themes reported: prescription type; consumer attitudes, behaviours, skills and knowledge; consumer engagement with antibiotic resistance.
Ancillotti <i>et al.</i> 2018 ³⁷ Sweden	To explore antibiotics-related beliefs and perceptions in Sweden.	23 members of the general public Age range: 20–81 13 female/ 10 male Education: 12 high school, vocational school and university diplomas; 8 had a Bachelor's degree, vocational universities, and Master's degree, 3 doctoral degree.	Focus groups Content analysis	3 overarching themes reported: perceived seriousness of, and susceptibility to, antibiotic resistance-related health issues; perceived benefits and barriers; self-efficacy in engaging in judicious behaviour and potential cues to engagement.
Zanichelli <i>et al.</i> 2019 ⁴⁶ Belgium, Croatia, France, Netherlands, Switzerland	To explore inpatients' experiences and views regarding antibiotics in five European hospitals.	42 hospital inpatients from 1 teaching hospital and 4 academic tertiary care centres Age range: 33–86 17 female/25 male	Interviews and focus groups Thematic analysis	6 themes reported: characteristics of the information received and missing information; patient preferences and expressed needs; sharing the information with family members: emotional support, alleviation of fear and physical comfort; perceptions and beliefs about healthcare workers, the 'patient's role' at the hospital and the decision-making process; bottlenecks in the organization of care at the hospital; perceptions and beliefs about AMR.
Boiko <i>et al.</i> 2020 ³⁵ England	To investigate contemporary patient expectations and experiences of antibiotic prescribing in England.	31 patients who recently consulted GP for an infection Age range: 20–90+ 24 female/7 male Ethnicity: 25 white British, 3 white (other), 2 black, 1 Asian	Semi-structured interviews Thematic Analysis	5 themes reported: beliefs; expectations; experiences of taking antibiotics; experiences of antimicrobial resistance and side effects; experiences of consultations.

Continued

Table 3. *Continued*

Study	Aim(s)	Sample	Data collection and analysis	Key findings
Davis <i>et al.</i> 2020 ³⁸ Australia	To explore explanatory models for AMR and shed light on the persistence of the resistant body assumption and related concepts.	91 members of the general public Age range: 18–71+ 58 female/41 male	Semi-structured interviews Thematic analysis	5 overarching themes reported: evolution, ecology and climate, agriculture, mobility; hygiene; orthodox explanations; overuse and misuse; resistant bodies.
Essilini <i>et al.</i> 2020 ³⁹ France	To explore the general public's perceptions of antibiotic resistance, their attitudes around antibiotic use and expectations regarding awareness campaigns.	36 members of generic public 28 female/8 male	Focus groups Thematic analysis	3 overarching themes reported: knowledge and perceptions of antibiotic resistance; the ambiguous approach to antibiotic prescription; the social role of antibiotics.
Ghuri <i>et al.</i> 2020 ⁴⁰ UK	To explore views about AMR in women who experienced urinary tract infections (UTIs) in pregnancy.	15 women who experienced UTI in pregnancy Age range: 18–43 Ethnicity: 14 white, 1 white (other) Education: 11 with university degree	Semi-structured interviews Thematic analysis	2 overarching themes reported: conceptualization of AMR; pregnancy as a deviation from the norm.
Lohm <i>et al.</i> 2020 ⁴² Australia	To explore the general public's understanding of antibiotic use and AMR.	99 members of the general public 58 female/40 male/other Age and education not reported.	Semi-structured interviews Thematic analysis	3 main themes reported: deciding to seek antibiotics/ waiting to determine the seriousness of the ailment before deciding to seek medical treatment; narrative on trust and expert knowledge of AMR and AMS; following the prescribed dosing.
Medina-Perucha <i>et al.</i> 2020 ⁴⁴ Spain	To explore service users' experiences of acute lower respiratory tract infection, the quality and access to healthcare services, and health education.	29 health service users Age range: 25–89 16 female/13 male Ethnicity: 28 white, 1 Latino Education: 1 postgraduate degree, 7 university degree; 6 high school; 9 primary school, 6 trade/certificate	Semi-structured interviews Content analysis	3 themes reported: risk perceptions and help seeking; treatment preferences and antibiotic use; relationship dynamics and communication with healthcare provider.
Ancillotti <i>et al.</i> 2021 ³⁶ Sweden	To identify factors promoting and hindering a judicious approach to antibiotics.	23 members of the general public Age range: 20–81 13 female/ 10 male Education: 12 high school, vocational school and university diplomas; 8 Bachelor's degree, vocational universities, and Master's degree, 3 doctoral degree.	Focus groups Thematic analysis	3 main themes reported: justice; responsibility; demandingness.
Hika <i>et al.</i> 2022 ⁴¹ New Zealand	To explore the experiences, perceptions and beliefs that Māori have about antibiotic use in regard to acute upper respiratory tract symptoms, and of AMR.	30 members of the general public Age range: 20–77 23 females/7 males Ethnicity: Māori Education: incomplete	Semi-structured interviews and Focus groups Thematic analysis	3 overarching factors affecting antibiotic use reported: systemic; social; individual.

Continued

Table 3. Continued

Study	Aim(s)	Sample	Data collection and analysis	Key findings
Papadimou et al. 2022 ⁴⁵ Greece	To explore attitudes, perceived norms, and values in relation to antibiotics, and improve understanding of sociocultural determinants of antibiotic resistance in Greece.	information (3 university degree; 10 high school; 4 trade/certificate) 20 members of the general public Age range: 21–55 12 female/8 male Education: 2 high school; 11 Bachelor's degree, 7 Master's degree.	Focus groups Thematic analysis	5 themes reported: norms; values; responsibility; scepticism; alternative practices.

Table 4. Studies supporting each theme

Study	Theme				
	The responsible patient	When words become meaningless	Patient–prescriber relationship	Past experience drives antibiotic use	Reframing public perception
Wellcome Trust 2015 ⁴⁶	✓	✓		✓	✓
Lum et al. 2017 ⁴³	✓	✓	✓	✓	
Ancillotti et al. 2018 ³⁷	✓	✓			✓
Zanichelli et al. 2019 ⁴⁶	✓		✓		✓
Ancillotti et al. 2018 ³⁶	✓	✓			✓
Boiko et al. 2020 ³⁵			✓	✓	✓
Davis et al. 2020 ³⁸	✓	✓	✓	✓	✓
Essilini et al. 2020 ³⁹	✓		✓		✓
Ghouri et al. 2020 ⁴⁰	✓	✓			✓
Lohm et al. 2020 ⁴²	✓	✓	✓	✓	
Medina-Perucha et al. 2020 ⁴⁴	✓		✓	✓	✓
Hika et al. 2022 ⁴¹			✓	✓	✓
Papadimou et al. 2022 ⁴⁵	✓				✓

antibiotics by the willingness of clinicians to prescribe antibiotics too readily.

... doctors are not really looking after their patients and just giving out antibiotics willy-nilly instead of giving it out when they're really required. (Male, 60s, immunity illness)³⁸

Knowledge about antibiotic consumption, resistance, and values such as altruism and trust in the healthcare system significantly influenced individual behaviour.^{36,37,42} In contrast to participants in the Essilini et al.³⁹ and Papadimou et al.⁴⁵ studies, other laypeople expressed high levels of self-efficacy to engage in judicious behaviours in relation to AMR.^{37,40,42,44}

The doctor decides, he tells me what to do, then I am responsible of what I do, if I do it well or I don't do it. (Participant 23, male, 69 years old)⁴⁴

Another area where participants' views converged was when the needs of the individual outweighed any responsibility for AMR. In terms of life-threatening illness, the majority were critical of the idea of withholding antibiotic treatment in those situations to prioritize societal interest over individual needs. They emphasized the equal value of all human life.^{37,45} There was a sense that limiting individuals' access to potentially beneficial treatment in the name of the greater good was morally questionable.

Theme 2: When words become meaningless

This theme is underpinned by an understanding that apocalyptic narratives describing AMR are unhelpful and can be unsuitable when providing information about antibiotic resistance to the general public. Reflecting the proliferation of sensationalist language, participants spoke of 'disaster fatigue'³⁷ and 'scaremongering tactics',⁴⁶ rendering AMR communication less effective. There was a

sense that ‘antibiotic resistance’ is not a term that people instantly understand. Whilst some laypeople used the climate change analogy to describe AMR as ‘a serious threat’,^{36,37} others felt it was ineffective and as one participant described:

Terms like superbugs and super-flu, they’re there to induce concern in the public. It’s a bit too much, we’re becoming desensitised to it. (Mixed-gender focus group, 18–25, at university, London)⁴⁶

Participants felt that future AMR disaster framing lacked personal relevance to them, and the vagueness of this threat caused uneasiness and uncertainty about when the disaster would become concrete.^{36–38,40,46} Some participants described that the dramatic language used in the media leads to people ‘blanking out’ the headline news stories about resistance.⁴⁶ For example, participants in the Lohm *et al.* study⁴² highlighted how ambiguity of the scientific data presented to the public eroded compliance with medical advice and caused uncertainty. Some media messages were also described as confusing and undermined people’s confidence about their role in tackling AMR, such as:

You get the odd media report saying that, you know, you shouldn’t finish the [antibiotic] course and your doctor’s telling you to finish the course, so I think there is a lot of misinformation about resistance. (Participant 3)⁴⁰

To better communicate risks associated with AMR, participants largely suggested using clear and simple language that is more personal to them and ‘hits home’.^{38,40,46} There was a sense across the papers too that laypeople take note only when the AMR threat feels direct and immediate. As one participant reported:

It’s hard to conceptualise what is going to happen ..., that just now [AMR] feels very abstract. I mean, what will happen is so far away... (Participant G2W1)³⁶

Theme 3: Patient–prescriber relationship

This theme describes the desire to be heard and to be engaged in antibiotic prescribing decisions. When participants discussed the appropriateness of prescribing, they tended to refer to informed choice and shared decision-making. It was apparent that patients wanted information about their medical condition and treatment options without necessarily wanting the responsibility for making those decisions.^{35,44} Trust played a significant role in the decision-making process. Some participants reported they would accept the medical decision not to receive an antibiotic if they trusted the GP and the reason for this was clearly explained to them.^{41,43,44} For example:

... I also understand that there’s no point in treating some things with antibiotics ... if that was clearly explained, I think I’d be less disappointed in the care that I receive from the doctor. (Participant CS05, female, 29 years old)⁴³

The importance of the relationship between clinician and patient was clear. GPs were described as more ‘accessible’ than hospital clinicians, and they were the preferred information source regarding the appropriate use of antibiotics.^{39,43} Participants perceived feeling distant from hospital doctors and that this

negatively impacted on the quality of, and time for, their communication.⁴⁷

...there is a sort of fence, a barrier... When you are here, and they are above you, then it is more complicated, I find, to communicate with them. (Participant NL04, female, 61 years old)⁴⁷

Some participants reflected on prescribers’ decision-making processes, and their own expectations for a prescription. If that expectation was not met, they felt frustrated.⁴⁴ Some laypeople talked about how prescribers seek to meet patient expectations³⁵ and described clinician willingness to prescribe antibiotics ‘willy nilly’.³⁸ Yet, most participants expressed an eagerness to avoid turning to antibiotics straightaway when unwell, perhaps a reflection of growing awareness of AMR risk:

I’m wary of antibiotics. I would only use them in extreme circumstances because I do think they’re overused in our community. (Female, 71+ years old)⁴²

Participants also described how they want to be listened to and taken seriously; to be given a thorough clinical examination and to have the GP explain the clinical findings, treatment options and decisions to them.^{35,43} However, the language used by doctors was not always understandable to many patients, and this underlined the need for patients to ask for information and clarification.^{41,47} In the Hika *et al.* study,⁴¹ participants (with lower educational status) described a hierarchy during the consultation with the doctor, where the doctor’s advice was seen as an important ‘direction’ even if they did not understand the information about antibiotics. There was also a sense of vulnerability where participants described how they do not necessarily complain about such issues during consultations because of the doctor’s time constraints and their perceived role of the patient.^{41,44,47} Many believed that ‘the doctor decides’ and some expressed feelings of disempowerment or even loss of control, a barrier that prevented them from asking questions about their prescription(s).^{44,47}

Theme 4: Past experience drives antibiotic use

The studies revealed that an individual’s self-knowledge and past experience of illness are significant influencers of their perception of when they need antibiotic treatment.^{35,38,42,44,46} Some participants described how they used additional means to get their desired outcome of antibiotic prescription.

I lied to him and said I’d had symptoms for 5–6 days and I hadn’t. I said I’m here for a prescription, I’m not moving. I was there about 10 minutes. (Mixed-gender focus group, 25–50, mixed education, London)⁴⁶

These antibiotic-seeking behaviours were strongly linked to previous experiences with similar infections and the treatment received. Past experiences of the speedy progression of the illness (with no side effects) prompted participants to seek antibiotics and avoid future episodes. Conversely, a negative experience (side effects and/or not working) decreased the likelihood of seeking or taking antibiotics.^{42,43} In one study, particularly women participants who had caring responsibilities, reported delaying antibiotic-seeking as they struggled to find time to access healthcare services.⁴⁴

Whereas other participants depicted themselves as knowledgeable and reflexive patients or ‘active agents’ of their health treatment decisions,^{42,44} raising important questions of the ‘right antibiotic being prescribed at the right time’.³⁵ In several studies, participants reported expecting to be prescribed an antibiotic when attending a GP consultation but this varied depending on the underlying cause of the infection and its impact on their daily life or their perception of being at risk—perhaps a reflection of growing awareness of AMR risk and knowledge of how antibiotics may affect their bodies.^{35,42,44}

I did expect that if it is something on the lungs, I would be given antibiotics. (Participant 18, male, chest infection)³⁵

Participants’ accounts revealed that individuals with lower levels of formal education and/or less awareness of the topic held more misconceptions about antibiotic use and resistance. For instance, some were uncertain whether resistance pertains to the individual or the bacteria.^{38,41,43,46} These misconceptions were linked to non-compliance with medical advice in some studies.⁴² Furthermore, knowledge gaps regarding the nature of infections (viral or bacterial) and their appropriate management were also evident among certain participant groups.^{38,41,46}

No idea. It’s a bit beyond me all that stuff. (Male, 50s, no chronic illness)³⁸

Participants further described how public expectations are more complex than previously reported. They reflected on some patients pressurizing prescribers, such as: ‘I’m sure many people lie just to get antibiotics’ (female, tonsillitis).³⁵ There was also a strong sense of ‘validation’ connected to antibiotics as they were seen as ‘proof of illness’.⁴⁶ For many, having a prescription meant a speedy recovery⁴⁴ as antibiotics were considered a miracle treatment.^{35,46}

It’s like a magic pill. If I take these, I’ll be sorted (Mixed-gender focus group, 18–25, not university educated, Birmingham)⁴⁶

Despite some participants understanding the ineffectiveness of antibiotics for viral infections, the non-prescription of antibiotics was seen as minimizing disease severity.³⁹ Some participants described a sense of urgency and the need for a ‘quick fix’ for their infection.⁴⁴ Reasons, such as being unable to take time off work/study, or fly (due to infection), being inconvenienced by a minor illness (e.g. an important event coming up) or persistence of worsening symptoms were reasonable grounds for expecting or requesting antibiotics.^{42–44} Participants often referred to antibiotics as something that would ‘shift’ their illness, but also as a symptomatic cure and something ‘to boost the immune system with’.³⁵

Theme 5: Reframing public perception

Participants identified the need for definitive long-term solutions despite the complexities the AMR issue presented, and they offered many suggestions for addressing misconceptions about antibiotics. In their discussions, they stressed the need for empowerment. They believed that receiving accurate information would enhance individuals’ perception of self-efficacy with regard to self-managing their health and thereby empower patients to engage in judicious antibiotic-use behaviour.^{37,39,40,45}

Consistently clear and neutral messages about antibiotics from healthcare professionals, public health campaigns and media were seen as being productive in improving awareness of AMR.^{35,37,39,41,43} The clear need for better, more accessible health information materials that are tailored to an individual’s health literacy level was also apparent.^{41,44,46} As one person noted:

Health literacy is important. I think that they [the public] need to know more, and health professionals need to know how to engage and educate you... so that they have an understanding of what antibiotics actually do. (Participant 28, female, 28 years old)⁴¹

Participants suggested adopting clearer terminology, for example, referring to ‘antibiotic-resistant infections’ or ‘antibiotic-resistant bacteria’ rather than simply ‘antibiotic resistance’. There was also a need for key messaging to highlight the interdependence of individual action and societal consequences in AMR.⁴³ Some also recognized the importance of highlighting the moral dimension of antibiotic use (preserving the efficacy of these drugs for future generations versus the patient’s own treatment expectations) within public and patient communications to foster judicious use.^{36,40} There was also a perception that patients seeking advice for common infections may benefit from better information concerning appropriate treatment options, including outlining risks to patients from prescribing and withholding of antibiotics.^{35,36,46}

People have to understand that they’re using [antibiotics] correctly when they really need to use them and that they don’t when it’s not necessary. (Participant G2M1)³⁶

Many participants felt that the public should be better informed about AMR and be involved in the work to counteract this problem.^{35,37,38} Lack of awareness of what needs to be done to tackle AMR was perceived as a powerful barrier to individual patient change. Individual doctors were seen as having a role in raising awareness, but national patient education initiatives were also seen as being key to successful change. For example:

So, doctors should ... educate patients. It should be organised at the national level, some kind of programme of basic education for the patients, for example—not to take antibiotics for flu and viral infections. (Participant HR08, male, 40 years old)⁴⁷

Most participants felt that finding more effective ways to provide information about antibiotics would not only raise awareness of AMR but also improve patients’ care experiences. For example, tailored strategies to inform hospitalized patients, and acknowledge their treatment concerns and preferences, may be useful to promote patient involvement and improve communication regarding antibiotic use.⁴⁷

Line-of-argument

In keeping with the ME method, through team discussion and critical reflection on the included studies, themes were synthesized into an LOA. This reconceptualization of findings generated a new interpretation (Phase 6), enabling development of a conceptual model (Figure 2) of the patients’ and the public’s understanding and perspectives of AMR. This model illustrates that the

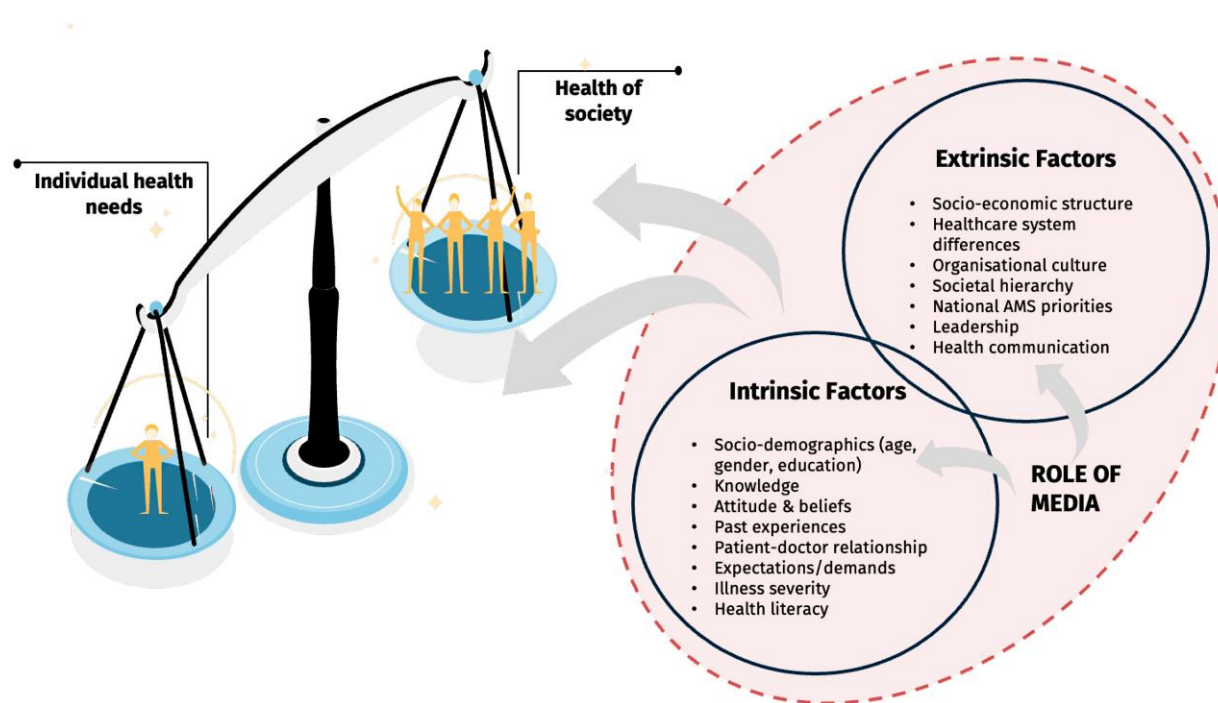


Figure 2. Balancing the health needs of individual and society—a conceptual model of patient and public understanding of AMR.

laypeople's ability to place societal needs before the individual depends on complex interplay of mutually dependent intrinsic and extrinsic factors. Among the former, knowledge, educational level, beliefs and attitudes around antibiotic use, and the relationship with the healthcare provider were the most cited factors influencing laypeople's understanding of AMR, whilst the wider context, including the national structure and healthcare systems, were the most commonly reported extrinsic factors.

Through developing this model, which highlights the complexities around this topic, patient and public understanding of AMR can be summarized as hinging on negotiating the balance between two underlying assumptions about antibiotics (Figure 2). That is, how can antibiotics be used for the collective good against the health needs of individual patients. While the relationships between these assumptions will need to be tested in future research, at the core of the problem lies the social dilemma of two opposing standpoints (individual patient versus society), with mutually exclusive interests. This dilemma involves balancing the short-term interests of individuals with the long-term interests of current and future patients. This balance is influenced by unique contextual factors that vary across different regions, cultures, and countries, and is heavily shaped by the media's role in influencing human attitudes and beliefs toward health and health behaviours. The extent of the media's direct and indirect effects on health behaviours will, however, depend on various characteristics, including individual demographics and psychological traits.

Discussion

In this novel ME, we synthesized findings from 13 qualitative studies focused on patient and public understanding of AMR. The themes identified enabled us to develop a conceptual model that adds

depth and breadth to the existing knowledge base. While our findings have some overlap with concepts in the ethical debate literature,⁴⁸ our analysis reveals important nuances related to moral sensitivity to the resistance issue that may warrant specific attention. The most striking findings were a distinct tension between individual and collective interests, and the perceived need for empowering the public through good health communications.

However, a dissonance between the two standpoints emerged from the analysis. On the one hand, the erosion of antibiotic effectiveness was perceived as a moral issue. Most participants seemed willing to place collective needs before the individual, but they were also concerned about personal risks. They were aware that the antibiotic resource is scarce, and that it would be unfair to consume it and leave limited to no antibiotic treatment options available to those who need them in the future. The use of antibiotics was perceived as morally acceptable when it is necessary for one's care, but morally questionable in all other cases. Recent studies reinforce the notion that the public are significantly more willing to prioritize society over individual needs and show willingness to abstain from using antibiotics for the common good when they are made aware of AMR risks (i.e. when provided with knowledge of relevant facts).^{49,50} On the other hand, this moral responsibility for the collective good was in conflict with beliefs about the individual's need for antibiotics to validate illness and accelerate recovery, and lack of concern about antibiotic harm and AMR. Previous research found that for many patients, being prescribed antibiotics has a great symbolic value.⁵¹

Specific notions on the effectiveness of antibiotics, expectations in terms of being given a prescription (even when not clinically needed) and compliance with regard to the medication all emerged as key factors associated with inappropriate antibiotic use. Yet, the analysis further shows that many people believe

that they do not contribute to the development of AMR, and that the responsibility for tackling the resistance issue rests solely with others (e.g. clinicians, healthcare systems). This pressing need to recognize individual accountability for the emergence of drug resistance has been recognized internationally. While not a theme in our findings, this needs to be counterbalanced with factors driving the use of 'over-the-counter' and online purchases of antibiotics. These include inadequate regulatory enforcement mechanisms and the readiness of community pharmacists to dispense antibiotics without a prescription, which significantly contribute to self-medication behaviour among the general population, including in HICs.⁵² Moreover, the widespread practice of antibiotic sharing among the public globally—where individuals lend or borrow prescription medications intended for others—is a significant concern that warrants attention from healthcare providers.⁵³ Efforts aimed at enhancing public awareness are also essential in addressing this issue.

Littmann and Viens⁵⁴ argue that if the preservation of effective antimicrobials is in the interest of both current and future generations, then individuals globally, irrespective of regional or contextual differences, should be held accountable for the ignorant or unnecessary use of antibiotics or any other practices likely to accelerate the emergence of AMR. However, recent analysis of healthcare governance, encompassing processes, structures and organizational traditions, highlights ongoing challenges in coordinating efforts and managing antibiotic misuse in human health.⁵⁵ Emerging research indicates that governance practices may significantly influence the development and spread of AMR, revealing notable disparities between and within countries.⁵⁶ In the last decade, public perceptions have shifted from a position of full or assumed trust in healthcare professionals, to a more critical stance, necessitating increased transparency and accountability in both individual and organizational performance.^{36,42,57} Ethically, this poses challenging questions about how equity and fairness are to be incorporated and balanced with considerations of effectiveness, and whether it can be ethically justifiable to restrict antibiotic use to instances where their use prevents a substantial risk of irretrievable harm.^{58,59} Yet, as these drugs are a scarce global resource, it is crucial that they are used fairly—not only a moral, but also a practical necessity.⁶⁰

Although there appears to be some improvement in public knowledge about AMR and appropriate use of antibiotics, and a decline in expectations for antibiotics, misperceptions about the problem held by participants at a conceptual level were particularly salient. For example, some participants did not know that antibiotics are ineffective against viruses and that resistance is not derived from the human body itself—even in countries where public awareness and education campaigns have been held.⁶¹ The idea that the body is itself becoming immune to the drug separates the individual from the society.⁶² The separate consideration of societal impact of resistance (manifested through public awareness of 'superbugs') gives rise to attribution of blame—whether to healthcare professionals, irresponsible patients or even the agricultural industry.⁶³ Consequently, the public take the view that it is a problem for other people to resolve, with perceptions that it is other people who should reduce their antibiotic overconsumption. Research shows that the more distant the AMR consequences, the lower the perceived personal risks to patients from it.⁶⁴ To think of AMR as some kind of future dilemma or

discountable concern may in turn lessen individual responsibility for the problem and reduce the willingness to engage in a collective endeavour to preserve antimicrobials efficacy.

Similarly to our review, studies globally found that the general public agree that antibiotic overuse contributes to AMR, but far fewer understand their personal susceptibility and contribution to AMR.^{65,66} This lack of knowledge regarding the correct use of antibiotics and the desire for a 'quick fix', often exacerbated by the lack of patient-centred information provision, could lead to over-requesting these drugs.⁶⁷ Literature shows that clinicians believe that most patients expect antibiotics,^{68,69} and that patients' expectations to receive antibiotics are sufficient to actuate clinicians to prescribe them—even when they are not clinically justified.⁷⁰ Yet, this ME highlights how patients' expectations are now more complex than earlier research reported and exhibit tensions between adherence to antibiotics and consuming antibiotics in more reflexive, informed ways. This dichotomy reflects the wider discussion in the literature about direct patient demands for antibiotics, particularly in the context of increasing AMR, and doctors' perceptions of such expectations.^{71,72} Power imbalance also came to the fore when participants perceived their clinicians to be experts. This complex dynamic highlights that patients can feel disempowered in relation to the medical experts who care for them, creating barriers for them to communicate their concerns and priorities.⁷³ Given the recent increase in trust-based antibiotic campaigns (e.g. encouraging greater trust in the advice from healthcare professionals as to whether consumers need antibiotics or not),¹³ further research into the effect of trust on information provision in reducing inappropriate antibiotic expectations from primary care patients is required.

Educational attainment appeared to influence the ability to engage with the biological aspects of AMR, consistent with prior research suggesting that individuals from lower socioeconomic backgrounds may possess varying levels of awareness, knowledge and understanding of AMR compared with their counterparts from higher socioeconomic strata.^{33,64} Public surveys have shown that education from secondary school upwards is positively associated with greater knowledge about antibiotics.^{74,75} Yet, the literature shows conflicting results as to whether more knowledge about antibiotics is associated with more appropriate use.^{76,77} It needs to be acknowledged that people's level of health knowledge and their ability to acquire and understand information differ, which could lead to misconceptions.⁶⁷ Earlier research reported a discrepancy between what patients understand and what professionals think they understand, emphasizing the need for creating an environment where patients are heard, respected and valued as partners in their own care.⁷⁸

We also found that the determinants of appropriate and inappropriate prescribing are not only situated in patient knowledge and behaviour, but also in the wider, sociocultural environment. A key finding was different (and often implicit) ideas about health, labelling of disease and coping strategies held by the public in different countries. These ideas shape both the expectations and the antibiotic-seeking behaviour of people in a country.⁷⁹ Deschepper *et al.*⁸⁰ relate the use of antibiotics in a country to a number of cultural characteristics of that country, as described in Hofstede's model of cultural dimensions.⁸¹ For instance, Hofstede explains that power distance is concerned with how people holding different status communicate with each other. This was particularly

relevant in participants' accounts concerning moral sensitivity to the problem of AMR and patient–doctor relationships. A sense of personal moral duty to preserve antibiotic effectiveness and a preference for open discussion about the use of antibiotics was favoured in countries with low power distance and high levels of trust in clinicians (e.g. UK, Sweden and Australia), as opposed to hierarchical societies, such as France, Spain and Greece.

Central to this review was the finding that individuals consider themselves uncompliant with, or confused at times by, public health messages, not because they are irresponsible but because the environment in which they live sends contradictory messages about how best to tackle AMR. In terms of AMR communications, participants' accounts did not correspond with official messages, indicating that much is yet to be done. The emergence of conflicting scientific advice, such as debate over when to cease the use of antibiotics staged in international news media, which is at odds with the ingrained public advice to 'finish the course',⁵⁷ can lead to erosion of trust of medical expertise and pose challenges for global communications about AMR. News media perceived as conveying authority may also undermine AMR interventions because they promote messages of blame and social decline.⁸² This can be further exacerbated by the tendency of health communications to cast experts and laypeople in opposition.⁸³ This situation has become more complicated since the COVID-19 pandemic. Although research has revealed a 'rallying effect' that boosted support for scientists and expertise during the pandemic,⁸⁴ the sheer scale and depth of disruption caused by the pandemic meant that it was covered not just by health specialists, but by journalists and social media platforms, whose sourcing patterns and deviance from tenets of objectivity warrant attention.⁸⁵ The significant increase in the endorsement of conspiracy theories has enabled and accentuated distrust toward health professionals and authorities, becoming a public health concern.⁸⁶

Moreover, data suggest that the way the AMR problem is framed (e.g. 'disaster' or 'apocalypse') can influence perceived susceptibility negatively and hinder judicious behaviours in relation to antibiotic use, and this use of fear may increase avoidance of AMR messages.⁸⁷ AMR resonates with the other stories of global crisis and catastrophe, such as climate change and the unprecedented destruction of ecosystems around the globe.⁸³ Yet, from the viewpoint of patients and the public, some of the language used in the media fails to capture the complexity of AMR and the analogical reasoning may sometimes be inappropriate. Evidence from other health interventions shows that communications and media can reinforce blaming of the public as unknowing, ill-educated and resistant to expert advice.⁸⁸

Numerous initiatives have been launched worldwide to appropriate antibiotic use, ranging from simple, low-cost internet campaigns to expensive mass-media efforts. A systematic review of 22 national and 6 regional campaigns revealed that multifaceted, sustained campaigns over several years yield the most significant effects.¹⁰ However, effectiveness was often hindered by the lack of a behavioural-change theory and uncertainty surrounding the key messages. Recent research indicates that public health campaigns that demonstrated improvement in their primary outcome measures typically utilized mass media for information dissemination, employed targeted messaging for specific infections, and emphasized interactions between healthcare providers and patients.⁸⁹ As highlighted by Pinder *et al.*,⁶² AMR communication is

inherently complex. The public faces conflicting messages: while urged to limit requests for antibiotics to combat AMR, they are also encouraged to seek early diagnosis and treatment for conditions such as cancer, heart disease and infectious diseases.

Effective communication strategies are urgently needed to reduce unnecessary antibiotic prescriptions. Yet, it remains uncertain which information provided by clinicians best reduces patient demand for antibiotics.⁹⁰ Limited evidence exists on the effectiveness of specific terminology to discourage requests for antibiotics where they are not clinically indicated. Public health campaigns often focus on global AMR and societal harm, with little research comparing this with personalized messaging.^{4,91} The CDC and other stakeholders recommend shifting discussions to focus on individual harm, using simple understandable statements related to the patient.⁹² Clinicians and public health campaigns should emphasize the personal risks of non-indicated antibiotic use, such as potential irreversible changes to the human microbiome and the associated social and ethical implications (e.g. shared nature of the human microbiome across communities).⁹³ Targeted interventions addressing this issue have often been overlooked, highlighting the need for greater awareness among medical professionals and clear guidelines from health policymakers.

Finally, the heterogeneity of culture, healthcare systems, consumption of antibiotics, and resistance to antibiotics across the globe most likely warrants different approaches for different countries.¹⁰ Earlier research has provided extensive evidence that different people exposed to the same message interpret it differently, depending on level of education, context and personal experience.⁹⁴ How to engage with this complexity is an unresolved challenge for health media researchers across the world,⁹⁵ and will undoubtedly require the generation of a new evidence base, with contributions from digital science and technology studies.⁸³ Targeting limited resources to raise awareness among specific groups (e.g. GPs, hospital physicians, veterinarians, farmers and the general public) and employing behaviour change techniques tailored to each group's current practices, motivations and individual context, supported by stakeholder involvement and follow-up, is one strategy to foster behaviour change.⁹⁶ Co-creating person-centred and accessible educational and communication materials with the public, tailored to different age groups and/or learners' cognitive abilities, could be another effective strategy.

Strengths and limitations

Meta-ethnography is an interpretation of previously published data and, as such, this reflects the context(s) and experiences of the reviewers. As a multidisciplinary research team, with considerable experience in qualitative synthesis, we reviewed studies that incorporated views of 466 patients and the public across a wide range of ages, utilizing a range of qualitative methodologies and sociocultural contexts, and undertaken in a number of HICs, which adds to the transferability of our evidence synthesis. This is recognized as a strength of an interpretive paradigm that aims to reinterpret meaning across different qualitative studies and generate higher translations.²² The use of ME is well established, and we have previously utilized it to explore the antibiotic-prescribing behaviour in acute hospitals.⁹⁷ However, we recognize the nuances of interpreting findings of primary studies and acknowledge that the original intended meaning from participants or original

researchers may be lost in this process. We addressed this potential weakness by ensuring all stages of the review were checked for accuracy and were grounded in the data by constantly checking the findings against the original studies. We also reported our study using the eMERGE ME reporting guidance.²²

A strength of this review is the comprehensive literature search strategy, including a large range of databases and grey literature, with robust quality appraisal of primary research. To inform the development of a novel AMR educational intervention for patients and the public, we focused on studies published in the last 10 years (2012–22). To enhance the quality of this completed ME, we updated our database searches in February 2024. One Norwegian study was identified that met our inclusion criteria.⁶⁷ Its findings resonated with our themes and, if this study had been included in our synthesis, it would not have refuted our findings but provided equivalent translation. We also attempted to interpret the findings against the papers excluded during quality appraisal. This strategy ensured that important insights have not been missed, thus eliminating potential bias and adding to the credibility of the findings. For example, Davis *et al.*'s mixed-methods study,³² which included semi-structured interviews conducted with four patients in a US primary care setting (all female, with college-level education, aged 25–45 years old), raised an issue that was not captured in our review, relating to perceived inconsistencies in prescribing practices among clinicians, highlighting the challenges of effective health communication and its unintended consequences, such as the erosion of public trust. Whilst prescribing inconsistencies were not specifically reported in our analysis, including this paper would not have changed the outcome of our synthesis or the LOA as their key recommendations, such as trust and effective health communication, were included in our themes.

To ensure that the theory generated from synthesizing primary studies is relevant to the context, this review focused exclusively on studies published in English and conducted within the past decade in HICs. Including homogeneous studies strengthened the weight of the conceptual model; however, this approach may limit its transferability to non-English-speaking populations beyond these geographical areas. Further research is needed to assess the applicability of the developed model in low- and middle-income countries. Moreover, not all included studies reported details of participants' characteristics, such as gender, ethnicity and level of education. This limitation restricted our ability to comprehensively identify differences in the public's understanding and perceptions of AMR based on these demographics. It may also have limited our capacity to fully identify disconfirming cases across the studies. Additionally, our review specifically focused on adults and the majority of participants (62%) were women. Parent-related factors influencing antibiotic use in the paediatric population were beyond the scope of this investigation. This decision was made to ensure that the findings are directly relevant to the planned AMR intervention for adult patients. Further research exploring this populations' perspectives of the resistance issue is underway.

Conclusions

This ME provides a comprehensive review and discussion of the available qualitative evidence in relation to the general public

and patients' understanding of AMR in adult patients and the public. Through synthesizing findings, we demonstrated that unclear consequences of AMR remain abstract and problematic for the public to appreciate, and the scientific understanding of the factors that contribute to the resistance overall are either deficient or incorrect. The review reflects the significance of research interest to date, suggesting that effective communication plays a key role in improving the level of community awareness about healthcare issues. However, it is erroneous to assume that improving awareness will translate into positive change of behaviour, unless the issues are addressed holistically. Although the important question of how to tailor messages about AMR for specific population groups in different national settings remains unanswered, this review showed that messaging needs to be culturally relevant and adapted to the preferences of the target population. Findings emphasize the urgent need for understandable and accessible information regarding the science of AMR, its spread and prevention.

Finally, our findings suggest that existing public campaigns may not be effective, and renewed strategies that are multimodal, targeted and are informed by behaviour science are needed. A key consideration for AMR communications is that information provision can widen—not reduce—gaps between groups according to the level of education and access to media technologies. Therefore, AMR messages need to accommodate the need of diverse members of the public, including those who have fewer educational advantages. This calls for comprehensive research representing the voices of a more diverse public (including people with lower education status, of different ethnic backgrounds and more male participants) and a tailored communication strategy, which takes into account the various drivers of AMR and the solutions associated with it.

AMR is a global issue that calls for the collective effort of governments, the pharmaceutical industry, healthcare professionals and the general public to combat. The powerful cultural factor in explaining antibiotic use and the big differences between countries may provide useful direction for policymakers to intensify international cooperation in the area of antibiotic use and resistance.

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Transparency declarations

None to declare.

Supplementary data

Tables S1–S5 are available as [Supplementary data](#) at JAC-AMR Online.

References

- 1 FAO, OIE, WHO. Monitoring Global Progress on Addressing Antimicrobial Resistance: Analysis Report of the Second Round of Results of AMR Country Self-Assessment Survey 2018. 2018. <http://apps.who.int/iris/bitstream/handle/10665/273128/9789241514422-eng.pdf?ua=1>.

- 2 Tacconelli E, Pezzani MD. Public health burden of antimicrobial resistance in Europe. *Lancet Infect Dis* 2019; **19**: 4–6. [https://doi.org/10.1016/S1473-3099\(18\)30648-0](https://doi.org/10.1016/S1473-3099(18)30648-0)
- 3 Murray CJL, Ikuta KS, Sharara F et al. Global burden of bacterial antimicrobial resistance in 2019: a systematic analysis. *Lancet* 2022; **399**: 629–55. [https://doi.org/10.1016/S0140-6736\(21\)02724-0](https://doi.org/10.1016/S0140-6736(21)02724-0)
- 4 O'Neill J. Tackling Drug-Resistant Infections Globally: Final Report and Recommendations. 2016. <https://wellcomecollection.org/works/thvwsuba>.
- 5 Palin V, Mölter A, Belmonte M et al. Antibiotic prescribing for common infections in UK general practice: variability and drivers. *J Antimicrob Chemother* 2019; **74**: 2440–50. <https://doi.org/10.1093/jac/dkz163>
- 6 ECDC. Antimicrobial consumption in the EU/EEA (ESAC-Net) – Annual Epidemiological Report for 2022. 2023. <https://www.ecdc.europa.eu/en/publications-data/surveillance-antimicrobial-consumption-europe-2022>.
- 7 Shapiro DJ, Hicks LA, Pavia AT et al. Antibiotic prescribing for adults in ambulatory care in the USA, 2007–09. *J Antimicrob Chemother* 2014; **69**: 234–40. <https://doi.org/10.1093/jac/dkt301>
- 8 Smieszek T, Pouwels KB, Dolk FCK et al. Potential for reducing inappropriate antibiotic prescribing in English primary care. *J Antimicrob Chemother* 2018; **73**: ii36–43. <https://doi.org/10.1093/jac/dkx500>
- 9 McNulty CAM, Collin SM, Cooper E et al. Public understanding and use of antibiotics in England: findings from a household survey in 2017. *BMJ Open* 2019; **9**: e030845. <https://doi.org/10.1136/bmjopen-2019-030845>
- 10 Huttner B, Goossens H, Verheij T et al. Characteristics and outcomes of public campaigns aimed at improving the use of antibiotics in outpatients in high-income countries. *Lancet Infect Dis* 2010; **10**: 17–31. [https://doi.org/10.1016/S1473-3099\(09\)70305-6](https://doi.org/10.1016/S1473-3099(09)70305-6)
- 11 Rodrigues A T, Roque F, Falcão A et al. Understanding physician antibiotic prescribing behaviour: a systematic review of qualitative studies. *J Antimicrob Agents* 2013; **41**: 203–12. <https://doi.org/10.1016/j.ijantimicag.2012.09.003>
- 12 Thompson W, Tonkin-Crine S, Pavitt SH et al. Factors associated with antibiotic prescribing for adults with acute conditions: an umbrella review across primary care and a systematic review focusing on primary dental care. *J Antimicrob Chemother* 2019; **74**: 2139–52. <https://doi.org/10.1093/jac/dkz152>
- 13 UK Health Security Agency. Guidance: World Antimicrobial Resistance Awareness Week (WAAW) and European Antibiotic Awareness Day (EAAD). 2023. <https://www.gov.uk/government/publications/european-antibiotic-awareness-day-resources-toolkit-for-healthcare-professionals-in-england/world-antimicrobial-awareness-week-waaw-and-european-antibiotic-awareness-day-eaad>.
- 14 Langford BJ, Matson KL, Eljaaly K et al. Ten ways to make the most of World Antimicrobial Awareness Week. *Antimicrob Steward Healthc Epidemiol* 2022; **2**: e187. <https://doi.org/10.1017/ash.2022.320>
- 15 WHO. Antibiotic Resistance: Multi-Country Public Awareness Survey. 2015. https://iris.who.int/bitstream/handle/10665/194460/9789241509817_eng.pdf?sequence=1.
- 16 Toye F, Pearl J, Vincent K. A qualitative evidence synthesis using meta-ethnography to understand the experience of living with pelvic organ prolapse. *Int Urogynecol J* 2020; **31**: 2631–44. <https://doi.org/10.1007/s00192-020-04494-z>
- 17 Noblit GW, Hare RD. *Meta-ethnography: Synthesising Qualitative Studies*. Sage Publications Ltd, 1988.
- 18 Toye F, Seers K, Allcock N et al. Meta-ethnography 25 years on: challenges and insights for synthesising a large number of qualitative studies. *BMC Med Res Methodol* 2014; **14**: 80. <https://doi.org/10.1186/1471-2288-14-80>
- 19 Campbell R, Pound P, Morgan M et al. Evaluating meta-ethnography: systematic analysis and synthesis of qualitative research. *Health Technol Assess* 2011; **15**: 1–164. <https://doi.org/10.3310/hta15430>
- 20 France EF, Ring N, Thomas R et al. A methodological systematic review of what's wrong with meta-ethnography reporting. *BMC Med Res Methodol* 2014; **14**: 119. <https://doi.org/10.1186/1471-2288-14-119>
- 21 WHO. Health in the Post-2015 Development Agenda: Need for a Social Determinants of Health Approach. 2016. <https://www.who.int/publications/m/item/health-in-the-post-2015-development-agenda-need-for-a-social-determinants-of-health-approach>.
- 22 France EF, Cunningham M, Ring N et al. Improving reporting of meta-ethnography: the eMERGe reporting guidance. *BMC Med Res Methodol* 2019; **19**: 9–13. <https://doi.org/10.1186/s12874-018-0600-0>
- 23 Cooke A, Smith D, Booth A. Beyond PICO. The SPIDER tool for qualitative evidence synthesis. *Qual Health Res* 2012; **22**: 1435–43. <https://doi.org/10.1177/1049732312452938>
- 24 Eden J, Levit L, Berg A et al. *Finding What Works in Health Care: Standards for Systematic Reviews*. The National Academies Press, 2011.
- 25 Page MJ, McKenzie JE, Bossuyt PM et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *Res Methods Report* 2021; **372**: n71. <https://doi.org/10.1136/bmj.n71>
- 26 Critical Appraisal Skills Programme. CASP Qualitative Checklist. 2023. https://casp-uk.net/wp-content/uploads/2018/03/CASP-Qualitative-Checklist-2018_fillable_form.pdf.
- 27 Tyndall J. The AACODS Checklist is Designed to Enable Evaluation and Critical Appraisal of Grey Literature. 2010. <https://fac.flinders.edu.au/dspace/api/core/bitstreams/e94a96eb-0334-4300-8880-c836d4d9a676/content>.
- 28 NICE. Interim Methods Guide for Developing Service Guidance. 2014. <https://www.nice.org.uk/process/pmg8/chapter/appendix-2-checklists>.
- 29 Dixon-Woods M, Sutton A, Shaw R et al. Appraising qualitative research for inclusion in systematic reviews: a quantitative and qualitative comparison of three methods. *J Health Serv Res Pol* 2007; **12**: 42–7. <https://doi.org/10.1258/135581907779497486>
- 30 Noyes J, Booth A, Cargo M et al. Chapter 21: qualitative evidence. In: Higgins JPT, Thomas J, Chandler J et al. (eds.), *Cochrane Handbook for Systematic Reviews of Interventions Version 6.4 (Updated August 2023)*. Cochrane, 2023. www.training.cochrane.org/handbook.
- 31 Sattar R, Lawton R, Panagioti M et al. Meta-ethnography in healthcare research: a guide to using a meta-ethnographic approach for literature synthesis. *BMC Health Serv Res* 2021; **21**: 50. <https://doi.org/10.1186/s12913-020-06049-w>
- 32 Davis ME, Liu TL, Taylor YJ et al. Exploring patient awareness and perceptions of the appropriate use of antibiotics: a mixed-methods study. *Antibiotics (Basel)* 2017; **6**: 23. <https://doi.org/10.3390/antibiotics6040023>
- 33 McNulty CAM, Nichols T, French DP et al. Expectations for consultations and antibiotics for respiratory tract infection in primary care: the RTI clinical iceberg. *Br J Gen Pract* 2013; **63**: e429–36. <https://doi.org/10.3399/bjgp13X669149>
- 34 Gulliford MC, Charlton J, Boiko O et al. Safety of reducing antibiotic prescribing in primary care: a mixed-methods study. *Health Serv Del Res* 2021; **9**: 1–126. <https://doi.org/10.3310/hsdr09090>
- 35 Boiko O, Gulliford MC, Burgess C. Revisiting patient expectations and experiences of antibiotics in an era of antimicrobial resistance: qualitative study. *Health Expect* 2020; **23**: 1250–8. <https://doi.org/10.1111/hex.13102>
- 36 Ancillotti M, Eriksson S, Godsken T et al. An effort worth making: a qualitative study of how swedes respond to antibiotic resistance. *Pub Health Ethics* 2021; **14**: 1–11. <https://doi.org/10.1093/phe/phaa033>
- 37 Ancillotti M, Eriksson S, Veldwijk J et al. Public awareness and individual responsibility needed for judicious use of antibiotics: a qualitative study of public beliefs and perceptions. *BMC Public Health* 2018; **18**: 1153. <https://doi.org/10.1186/s12889-018-6047-8>

- 38 Davis MDM, Lohm DB, Whittaker A *et al.* “Willy nilly” doctors, bad patients, and resistant bodies in general public explanations of antimicrobial resistance. *Social Health Illness* 2020; **42**: 1394–408. <https://doi.org/10.1111/1467-9566.13111>
- 39 Essilini A, Kivits J, Caron F *et al.* ‘I don’t know if we can really, really change that’: a qualitative exploration of public perception towards antibiotic resistance in France. *JAC Antimicrob Resist* 2020; **2**: dlac073. <https://doi.org/10.1093/jacamr/dlaa073>
- 40 Ghouri F, Hollywood A, Ryan K. “There is no choice apart from antibiotics...”: qualitative analysis of views on urinary infections in pregnancy and antimicrobial resistance. *Health Expect* 2020; **23**: 644–50. <https://doi.org/10.1111/hex.13044>
- 41 Hika K, Harwood M, Ritchie S *et al.* Maori experiences and beliefs about antibiotics and antimicrobial resistance for acute upper respiratory tract symptoms: a qualitative study. *Antibiotics (Basel)* 2022; **11**: 714. <https://doi.org/10.3390/antibiotics11060714>
- 42 Lohm D, Davis M, Whittaker A *et al.* Role crisis, risk and trust in Australian general public narratives about antibiotic use and antimicrobial resistance. *Health Risk Soc* 2020; **22**: 231–48. <https://doi.org/10.1080/13698575.2020.1783436>
- 43 Lum EPM, Page K, Nissen L *et al.* Australian consumer perspectives, attitudes and behaviours on antibiotic use and antibiotic resistance: a qualitative study with implications for public health policy and practice. *BMC Public Health* 2017; **17**: 799. <https://doi.org/10.1186/s12889-017-4813-7>
- 44 Medina-Perucha L, Garcia-Sangenis A, Moragas A *et al.* Autonomy, power dynamics and antibiotic use in primary healthcare: a qualitative study. *PLoS One* 2020; **15**: e0244432. <https://doi.org/10.1371/journal.pone.0244432>
- 45 Papadimou D, Malmqvist E, Ancillotti M. Socio-cultural determinants of antibiotic resistance: a qualitative study of Greeks’ attitudes, perceptions and values. *BMC Public Health* 2022; **22**: 1439. <https://doi.org/10.1186/s12889-022-13855-w>
- 46 Wellcome Trust. Exploring the Consumer Perspective on Antimicrobial resistance. 2015. <https://wellcome.org/sites/default/files/exploring-consumer-perspective-on-antimicrobial-resistance-jun15.pdf>
- 47 Zanichelli V, Monnier AA, Tebano G *et al.* Views and experiences with regard to antibiotic use of hospitalized patients in five European countries: a qualitative descriptive study. *Clinical Microbiol Infect* 2019; **25**: 249.e7–e12. <https://doi.org/10.1016/j.cmi.2018.04.030>
- 48 Krockow EM, Tarrant C. The international dimensions of antimicrobial resistance: contextual factors shape distinct ethical challenges in South Africa, Sri Lanka and the United Kingdom. *Bioethics* 2019; **33**: 756–65. <https://doi.org/10.1111/bioe.12604>
- 49 Carlsson F, Jacobsson G, Jagers SC *et al.* Who is willing to stay sick for the collective? – Individual characteristics, experience, and trust. *SSM Popul Health* 2019; **9**: 100499. <https://doi.org/10.1016/j.ssmph.2019.100499>
- 50 Dao B, Douglas T, Giubilini A *et al.* Impartiality and infectious disease: prioritizing individuals versus the collective in antibiotic prescription. *AJOB Empir Bioeth* 2019; **10**: 63–9. <https://doi.org/10.1080/23294515.2019.1576799>
- 51 Avorn J, Solomon D. Cultural and economic factors that (mis)shape antibiotic use: the nonpharmacological basis of therapeutics. *Ann Intern Med* 2000; **133**: 128–35. <https://doi.org/10.7326/0003-4819-133-2-200007180-00012>
- 52 Alhomoud F, Almahasnah R, Alhomoud FK. “You could lose when you misuse” – factors affecting over-the-counter sale of antibiotics in community pharmacies in Saudi Arabia: a qualitative study. *BMC Health Serv Res* 2018; **18**: 915. <https://doi.org/10.1186/s12913-018-3753-y>
- 53 Dawson S, Johnson H, Huntley AL *et al.* Understanding non-recreational prescription medication-sharing behaviours: a systematic review. *Br J Gen Pract* 2024; **74**: e183–8. <https://doi.org/10.3399/BJGP.2023.0189>
- 54 Littmann J, Viens AM. The ethical significance of antimicrobial resistance. *Public Health Ethics* 2015; **8**: 209–24. <https://doi.org/10.1093/phe/phv025>
- 55 Birgand G, Castro-Sánchez E, Hansen S *et al.* Comparison of governance approaches for the control of antimicrobial resistance: analysis of three European countries. *Antimicrob Resist Infect Control* 2018; **7**: 28. <https://doi.org/10.1186/s13756-018-0321-5>
- 56 Collignon P, Beggs JJ, Walsh TR *et al.* Anthropological and socio-economic factors contributing to global antimicrobial resistance: a univariate and multivariable analysis. *Lancet Planet Health* 2018; **2**: e398–405. [https://doi.org/10.1016/S2542-5196\(18\)30186-4](https://doi.org/10.1016/S2542-5196(18)30186-4)
- 57 Borek AJ, Edwards G, Santillo M *et al.* Re-examining advice to complete antibiotic courses: a qualitative study with clinicians and patients. *BJGP Open* 2023; **7**: BJGPO.2022.0170. <https://doi.org/10.3399/BJGPO.2022.0170>
- 58 Millar M. Constraining the use of antibiotics: applying Scanlon’s contractualism. *J Med Ethics* 2012; **38**: 465–9. <https://doi.org/10.1136/medethics-2011-100256>
- 59 Borek AJ, Anthierens S, Allison R *et al.* Social and contextual influences on antibiotic prescribing and antimicrobial stewardship: a qualitative study with clinical commissioning group and general practice professionals. *Antibiotics (Basel)* 2020; **9**: 859. <https://doi.org/10.3390/antibiotics9120859>
- 60 Adebisi YA. Balancing the risks and benefits of antibiotic use in a globalised world: the ethics of antimicrobial resistance. *Global Health* 2023; **9**: 27. <https://doi.org/10.1186/s12992-023-00930-z>
- 61 WHO. Worldwide Country Situation Analysis: Response to Antimicrobial Resistance. 2015. <https://www.paho.org/en/node/63913>
- 62 Pinder R, Berry D, Sallis A *et al.* Behaviour Change and Antibiotic Prescribing in Healthcare Settings. Literature Review and Behavioural Analysis. 2015. <https://www.gov.uk/government/publications/antibiotic-prescribing-and-behaviour-change-in-healthcare-settings>
- 63 Brooks L, Shaw A, Sharp D *et al.* Towards a better understanding of patients’ perspectives of antibiotic resistance and MRSA: a qualitative study. *Fam Pract* 2008; **25**: 341–8. <https://doi.org/10.1093/fampra/cmn037>
- 64 McCullough A, Rathbone J, Parekh S *et al.* Not in my backyard: a systematic review of clinicians’ knowledge and beliefs about antibiotic resistance. *J Antimicrob Chemother* 2016; **70**: 2465–73. <https://doi.org/10.1093/jac/dkv164>
- 65 Schneider S, Salm F, Vincze S *et al.* Perceptions and attitudes regarding antibiotic resistance in Germany: a cross-sectoral survey amongst physicians, veterinarians, farmers and the general public. *J Antimicrob Chemother* 2018; **73**: 1984–8. <https://doi.org/10.1093/jac/dky100>
- 66 Waaseth M, Adan A, Røen IL *et al.* Knowledge of antibiotics and antibiotic resistance among Norwegian pharmacy customers—a cross-sectional study. *BMC Pub Health* 2019; **19**: 66. <https://doi.org/10.1186/s12889-019-6409-x>
- 67 Bergsholm YKR, Feiring M, Charnock C *et al.* Exploring patients’ adherence to antibiotics by understanding their health knowledge and relational communication in encounters with pharmacists and physicians. *Explor Res Clin Soc Pharm* 2023; **12**: 100372. <https://doi.org/10.1016/j.rcsop.2023.100372>
- 68 Kumar S, Little P, Britten N. Why do general practitioners prescribe antibiotics for sore throat? Grounded theory interview study. *BMJ* 2003; **326**: 138–8. <https://doi.org/10.1136/bmj.326.7381.138>
- 69 Mustafa M, Wood F, Butler CC *et al.* Managing expectations of antibiotics for upper respiratory tract infections: a qualitative study. *Ann Fam Med* 2014; **12**: 29–36. <https://doi.org/10.1370/afm.1583>
- 70 Sirota M, Round T, Samaranayaka S *et al.* Expectations for antibiotics increase their prescribing: causal evidence about localised impact. *Health Psychol* 2017; **36**: 402–9. <https://doi.org/10.1037/hea0000456>

- 71 Izett-Kay M, Barker KL, McNiven A *et al.* Experiences of urinary tract infection: a systematic review and meta-ethnography. *Neurol Urodyn* 2022; **41**: 724–39. <https://doi.org/10.1002/nau.24884>
- 72 Krockow EM, Colman AM, Chattoe-Brown E *et al.* Balancing the risks to individual and society: a systematic review and synthesis of qualitative research on antibiotic prescribing behaviour in hospitals. *J Hosp Infect* 2019; **101**: 428–39. <https://doi.org/10.1016/j.jhin.2018.08.007>
- 73 Berry LL, Danaher TS, Beckham D *et al.* When patients and their families feel like hostages to health care. *Mayo Clin Proc* 2017; **92**: 1373–81. <https://doi.org/10.1016/j.mayocp.2017.05.015>
- 74 McNulty C, Read B, Quigley A *et al.* What the public in England know about antibiotic use and resistance in 2020: a face-to-face questionnaire survey. *BMJ Open* 2022; **12**: e055464. <https://doi.org/10.1136/bmjopen-2021-055464>
- 75 Vallin M, Polyzoi M, Marrone G *et al.* Knowledge and attitudes towards antibiotic use and resistance—a latent class analysis of a Swedish population-based sample. *PLoS One* 2016; **11**: e0152160. <https://doi.org/10.1371/journal.pone.0152160>
- 76 Anderson A. Online health information and public knowledge, attitudes, and behaviours regarding antibiotics in the UK: multiple regression analysis of Wellcome Monitor and Eurobarometer Data. *PLoS One* 2018; **13**: e0204878. <https://doi.org/10.1371/journal.pone.0204878>
- 77 Demoré B, Mangin L, Tebano G *et al.* Public knowledge and behaviours concerning antibiotic use and resistance in France: a cross-sectional survey. *Infection* 2017; **45**: 513–20. <https://doi.org/10.1007/s15010-017-1015-2>
- 78 Williams MV. Recognising and overcoming inadequate health literacy, a barrier to care. *Cleve Clin J Med* 2002; **69**: 415–8. <https://doi.org/10.3949/ccjm.69.5.415>
- 79 Hulscher ME, Grol RP, van der Meer JW. Antibiotic prescribing in hospitals: a social and behavioural scientific approach. *Lancet Infect Dis* 2010; **10**: 167–75. [https://doi.org/10.1016/S1473-3099\(10\)70027-X](https://doi.org/10.1016/S1473-3099(10)70027-X)
- 80 Deschepper R, Grigoryan L, Lundborg CS *et al.* Are cultural dimensions relevant for explaining cross-national differences in antibiotic use in Europe? *BMC Health Serv Res* 2008; **8**: 123. <https://doi.org/10.1186/1472-6963-8-123>
- 81 Hofstede G. *Culture's Consequences: Comparing Values, Behaviour, Institutions and Organisations Across Nations*. Sage, 2001.
- 82 Donyai P, Okafor S, Virgo R *et al.* Messages about antibiotic resistance in different newspaper genres. *Pharmacy* 2013; **1**: 181–92. <https://doi.org/10.3390/pharmacy1020181>
- 83 Davis M, Whittaker A, Lindgren M *et al.* Understanding media publics and the antimicrobial resistance crisis. *Glob Pub Health* 2018; **13**: 1158–68. <https://doi.org/10.1080/17441692.2017.1336248>
- 84 Battiston P, Kashyap R, Rotondi V. Reliance on scientists and experts during an epidemic: evidence from the COVID-19 outbreak in Italy. *SSM-Popul Health* 2020; **3**: 100721. <https://doi.org/10.1016/j.ssmph.2020.100721>
- 85 Matthews J, Zhao X, Jackson D *et al.* Sourcing UK COVID-19 news: an analysis of sourcing patterns of 15 UK news outlets reporting on COVID-19 across Facebook, Twitter, and Instagram. *Health Comm* 2023; **39**: 173–82. <https://doi.org/10.1080/10410236.2022.2162702>
- 86 Leonard MJ, Philippe FL. Conspiracy theories: a public health concern and how to address it. *Front Psychol* 2021; **12**: 682931. <https://doi.org/10.3389/fpsyg.2021.682931>
- 87 Tannenbaum M, Hepler J, Zimmerman R *et al.* Appealing to fear: a meta-analysis of fear appeal effectiveness and theories. *Psychol Bull* 2015; **141**: 1178–204. <https://doi.org/10.1037/a0039729>
- 88 Brown B, Crawford P. 'Post antibiotic apocalypse': discourses of mutation in narratives of MRSA. *Soc Health Illness* 2009; **31**: 508–24. <https://doi.org/10.1111/j.1467-9566.2008.01147.x>
- 89 Gilham EL, Pearce-Smith N, Carter V *et al.* Assessment of global antimicrobial resistance campaigns conducted to improve public awareness and antimicrobial use behaviours: a rapid systematic review. *BMC Pub Health* 2024; **24**: 396. <https://doi.org/10.1186/s12889-024-17766-w>
- 90 Miller BJ, Carson KA, Keller S. Educating patients on unnecessary antibiotics: personalizing potential harm aids patient understanding. *J Am Board Fam Med* 2020; **33**: 969–77. <https://doi.org/10.3122/jabfm.2020.06.200210>
- 91 Hwang TJ, Gibbs KA, Podolsky SH *et al.* Antimicrobial stewardship and public knowledge of antibiotics. *Lancet Infect Dis* 2015; **15**: 1000–1. [https://doi.org/10.1016/S1473-3099\(15\)00235-2](https://doi.org/10.1016/S1473-3099(15)00235-2)
- 92 CDC. Antibiotic Resistance Threats in the United States, 2019. 2019. https://www.cdc.gov/antimicrobial-resistance/media/pdfs/2019-ar-threats-report-508.pdf?CDC_AAref_Val=https://www.cdc.gov/drugresistance/pdf/threats-report/2019-ar-threats-report-508.pdf
- 93 O'Doherty KC, Virani A, Wilcox ES. The human microbiome and public health: social and ethical considerations. *Am J Public Health* 2016; **106**: 414–20. <https://doi.org/10.2105/AJPH.2015.302989>
- 94 Livingstone S. *Making Sense of Television: the Psychology of Audience Interpretation*. 2nd edn. Routledge, 1998.
- 95 Groshek J, Bronda S. The Conversation. How Social Media Can Distort and Misinform When Communicating Science. 2016. <http://theconversation.com/how-social-media-can-distort-and-misinform-when-communicating-science-59044>.
- 96 Mathew P, Sivaraman S, Chandy S. Communication strategies for improving public awareness on appropriate antibiotic use: bridging a vital gap for action on antibiotic resistance. *Int J Med Prim Care* 2019; **8**: 1867–71. https://doi.org/10.4103/jfmpc.jfmpc_263_19
- 97 Wojcik G, Ring N, McCulloch C *et al.* Understanding the complexities of antibiotic prescribing behaviour in acute hospitals: a systematic review and meta-ethnography. *Arch Pub Health* 2021; **79**: 134. <https://doi.org/10.1186/s13690-021-00624-1>

Supplementary data: Details of applied methodology as informed by the eMERGe meta-ethnography reporting guidance.

This review is based on Noblit and Hare's meta-ethnography (ME) approach¹ to synthesise qualitative research studies. Meta-ethnography consists of seven overlapping phases: getting started; deciding what studies are relevant; reading studies; determining how studies relate; translating studies into one another; synthesising translations; and expressing the synthesis¹.

PHASE 1: Getting started

There are various methods for synthesising qualitative research, ranging from those aiming to describe or aggregate qualitative findings to those that are more interpretive and generate theory.² Meta-ethnography is a seven-phase, theory-generating, interpretive methodology for qualitative evidence synthesis (QES) developed by sociologists.¹ It is well suited to synthesising qualitative information to explore a phenomenon within a real-life context, such as antibiotic use.³ We specifically chose this advanced method as it aims to generate novel interpretations that 'go beyond' individual study findings to develop a new conceptual theory or a model whilst preserving the original meanings and contexts of the primary studies.⁴ We used ME to develop novel insights and create a conceptual model pertaining to patient and public's understanding of antimicrobial resistance (AMR) to inform the development of a robust behaviour change intervention for that population.

Our team included experienced interdisciplinary health professionals and social scientists (4 white females, including 3 European and 1 Canadian, and 1 European male) with an interest in antibiotic stewardship and expertise in qualitative evidence synthesis. GW, JA and NR had vast experience in conducting QES and NR was a member of the eMERGe team that developed the ME reporting guidance. We defined the key terms as follows:

- **'Antibiotic'** was defined as any type of therapeutic agent produced by an organism or made synthetically that selectively destroys or inhibits the growth of micro-organisms.⁵ For simplicity, both terms '*antibiotics*' and '*antimicrobials*' were used interchangeably.
- **'Antimicrobial resistance'** was defined as a natural phenomenon, which occurs when bacteria, viruses, fungi and parasites no longer respond to antimicrobial therapy. As a result of drug resistance, antibiotics and other antimicrobial medicines become ineffective and infections become difficult or impossible to treat, increasing the risk of disease spread, severe illness, disability and death.⁶
- **'High income countries'**: due to an array of disparities between developed and developing countries in terms of healthcare infrastructure, resources, access and provision as well as various social, cultural, political and economic conditions⁷, only studies carried out in countries with developed economies were considered for inclusion (e.g., UK, Europe, USA and Australia). Countries were classified according to the international classifications for the year 2022 by the Economic Analysis and Policy Division (EAPD) of the Department of Economic and Social Affairs of the United Nations Secretariat (UN DESA).⁸ This approach ensured that the theory generated from synthesising primary studies reflects the function of the ME and is relevant to the context of the future intervention. Including relatively homogenous studies also helped strengthen the weight of the conceptual model.

A preliminary search confirmed that there was no QES developed *or* in progress that specifically addressed the topic of interest, and a sufficient number of primary studies existed that could be synthesised. This review formed the first stage in the development of a new behaviour-change intervention for the general public to improve their knowledge and understanding of antimicrobial resistance. Gaining in-depth and original insights from service users enabled us to develop a conceptual model which could inform practice and policy and guide further research in this field.

We registered our review protocol on the PROSPERO International Prospective Register of Systematic Reviews ([CRD42022324001](https://www.crd42022324001)).

PHASE 2: Deciding what is relevant

Details of the literature searching, screening and selection process are provided in the methods section of the paper and illustrated in the PRISMA diagram (Figure 1 within main manuscript).

Our search was informed by SPIDER (Sample, Phenomenon of interest, Design, Evaluation and Research type), designed to facilitate searching of qualitative and mixed-method studies.⁹ With assistance from an academic librarian, we systematically searched 12 electronic databases and grey literature sources, including institutional repositories to search for dissertations and theses, conference proceedings and key organisations to search for reports and audits, such as the Wellcome Trust, Scottish Medicine Consortium, Department of Health & Social Care and National Institute for Health and Care Excellence (NICE).

Given the challenges of locating qualitative research, we applied a thorough and transparent methodological search strategy that could be replicated by others using the following:

1. Electronic search strategy:

The accessed databases included: ASSIA, BASE, CINAHL, EMBASE, ERIC, MEDLINE (via EBSCO), ProQuest Dissertation & Theses, PsycINFO, PubMed, OVID Nursing, Web of Science and Google Scholar. To maximise return, extensive search terminology and relevant synonyms were used, including medical subject headings (MeSH), supplemented by free-text and broad-based terms. The search strategy consisted of a combination of various search strings, including keywords such as: “antibiotic”, “antimicrobial resistance”, “public”, “patient OR consumer”, “understanding”, “experience” “attitudes” and “beliefs” (Table 1). The available evidence was then filtered through to identify qualitative studies using hybrid qualitative research filters originally developed by DeJean et al.¹⁰ To ensure no studies were missed, the search was complemented by searching deep web sources (web pages that are not indexed and cannot be captured by performing standard searches using academic databases). The search was limited to a 10-year period (January 2012 and December 2022) to ensure that views and experiences reflected current policy and practice. We updated the search in February 2024 to check for any new publications.

Table S1. Example of search strategy applied in MEDLINE (EBSCO) including hybrid qualitative filters

1. (MH "Drug Resistance, Microbial") OR (MH "Drug Resistance, Bacterial+")
2. AB ((antibiotic* or microbial* or antimicrobial* or drug* or superbug* or AMR) N2 resistanc*) OR TI ((antibiotic* or microbial* or antimicrobial* or drug* or superbug* or AMR) N2 resistanc*)
3. (MH "Drug Resistance")
4. (MH "Anti-Bacterial Agents+")
5. AB antibiotic* OR TI antibiotic*
6. S4 OR S5
7. S3 AND S6
8. S1 OR S2 OR S7
9. AB ((patient* or consumer* or parent* or public* or general public* or population* or people* or communit* or societ*) N5 (understand* or know* or percept* or perceiv* or attitud* or aware* or belief* or opinion* or view* or experience* or thought*)) OR TI ((patient* or consumer* or parent* or public* or general public* or population* or people* or communit* or societ*) N5 (understand* or know* or percept* or perceiv* or attitud* or aware* or belief* or opinion* or view* or experience* or thought*))
10. (MH "Patients+")
11. (MH "Health Knowledge, Attitudes, Practice")
12. S10 AND S11
13. S9 OR S12
14. S8 AND S13
15. Qualitative Research/
16. Interview/
17. Nursing Methodology Research/

18. (MM "Ethnology")
19. ethnograph\$
20. qualitative
21. ethnonursing
22. phenomenol\$
23. "life stor*"
24. (life stor*).mp.
25. theme* or thematic
26. social construct\$ or (postmodern\$ or post-struc-tural\$) or (post structural\$ or poststructural\$) or post modern\$ or post-modern\$ or feminis\$ or interpret\$).mp.
27. (emic or etic or hermeneutic\$ or heuristic\$ or semiotic\$).af. or (data adj1 saturat\$).tw. or participant observ\$.tw.
28. "action research"
29. (humanistic or existential or experiential or paradigm\$).mp.
30. (field study or studies or research).tw.
31. human science
32. biographical method
33. theoretical sampl\$
34. ((purpos\$ adj4 sampl\$) or (focus adj group\$)).af.
35. ((purpos\$ adj4 sampl\$) or (focus adj group\$))
36. ((purpos\$ sampl\$) or (focus group\$))
37. (account or accounts or unstructured or open-ended or open ended or text\$ or narrative\$).mp.
38. (life world or life-world or conversation analys?s or personal experience\$ or theoretical saturation).mp
39. (lived or life adj experience\$).mp
40. "cluster sampl*"
41. "observational method\$"
42. "content analysis"
43. constant (comparative or comparison)
44. ((discourse\$ or discurs\$) analys?s)
45. "narrative analys?s"
46. TX ("semi-structured" or semistructured or unstructured or informal or "in-depth" or indepth or "face-to-face" or structured or guide) N3 (interview* or discussion* or questionnaire*) OR TX (focus group* or qualitative or ethnograph* or fieldwork or "field work" or "key informant" or phenomenograph*)
47. (MH "Interviews as Topic")
48. (MH "Focus Groups")
49. (MH "Narration")
50. S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR S34 OR S35 OR S36 OR S37 OR S38 OR S39 OR S40 OR S41 OR S42 OR S43 OR S44 OR S45 OR S46 OR S47 OR S48 OR S49
51. S14 AND S50
52. Limiters: Date of Publication: 20120101-20221231; English Language

2. Non-electronic search strategy was guided by the eMERGe reporting guidance,⁴ the authors' previous experience and expertise in conducting ME (NR, GW), and advice from the academic librarian. The strategy included:

- **Reference checking** from key primary studies, studies included in systematic reviews and the studies included in this review.
- **Citation pearl searching** of the included studies using the `Cited by` option on Web of Science and Google Scholar, and the `Related articles` option on PubMed and Web of Science.
- **Hand searching of key journals:** issues of Antibiotics, BMJ Open, JAC Antimicrobial Resistance, British Journal of General Practice, Antimicrobial Resistance and Infection Control and PLOs One to ascertain the completeness of the search strategy.
- **Contact with experts:** leading authors in the field were contacted by email for comments and suggestions on key publications, also a list of items that could potentially be included in the review.

We exported the harvested records to EndNote bibliographic software and screened against eligibility criteria (see main manuscript) in two stages. After the removal of duplicates, all electronic records were initially screened for inclusion by title and abstract by two independent reviewers (RF and FT). Where title and abstract were equivocal, the full text paper was then read to make a definite decision on the relevance of the study for inclusion in the final synthesis. Both reviewers conducted full-text evaluation ($n=165$). Where consensus regarding inclusion could not be reached ($n=9$), a third reviewer (GW) was consulted. When information was unclear or missing from potentially relevant papers, GW emailed the authors and asked for additional information. Out of 14 authors contacted, only 3 responded (Kistler, Ancillotti and Wellcome Trust representative). Any disagreement regarding eligibility of papers was discussed with the full team. Subsequently, of the 11 authors who did not respond to our requests for more information, 8 of their papers were included. On completion of Phase 2, we identified 16 papers.

PHASE 3: Reading included studies

The 16 papers were then read in full multiple times and quality appraised using the Critical Appraisal Skills Programme (CASP) tool¹¹ by two team members (RF and FT; 100% dual check). CASP has been widely used to determine inclusion of studies into ME.¹² Grey literature was appraised using the Authority, Accuracy, Coverage, Objectivity, Date and Significance (AACODS) checklist¹³, as recommended by NICE¹⁴ and included among that organisation's checklists for evidence evaluation. To ensure that evidence which lacks methodological integrity (inadequate, incomplete or ambiguous methodological reporting with a score of less than 7) was judged accordingly and that we had conceptually rich texts – a key aspect of ME¹², the strengths and weaknesses of the evidence that could potentially influence the ME results were discussed with the research team. Papers which were judged to be 'irrelevant' from the perspective of our study aims and papers with a score of more than 7 but judged to be purely descriptive and potentially lacking conceptual depth were also addressed for an overall opinion to the whole research team¹⁵. This dual approach encouraged judgements on procedural aspects of research and helped us assess each study's contribution to the final synthesis.^{16,17}

Following detailed discussion within the research team and reconciliation of the quality assessment with the third reviewer (GW), consensus was reached to exclude three papers. One mixed-method study¹⁸ was a duplicate of Boiko et al's paper¹⁹, which reported the qualitative findings separately. Two other studies were excluded as they did not reach methodological threshold (CASP score less than 7).^{20,21} Quality appraisal helps reviewers become familiar with the content of primary studies, understand their context and assess each study's potential contribution to the final synthesis. Quality appraisal allowed us to identify 'key papers' for synthesis, that is those with '*thick descriptions*' (conceptually *rich* rather than *descriptive* accounts and which included contextual detail)¹⁶ and rigorous analysis and papers that reported only superficial insights. On this basis, we excluded Davis et al.²⁰ who reported data from four participants as a follow up to a large survey and McNulty et al.²¹ as it was judged to lack an in-depth interpretation of the data, but categorised e.g., Ancillotti et al.²² as a key paper because of its reported depth of insight and its ability to contribute substantively to analysis. Details of quality appraisal are provided in Tables 2-3 below. Thirteen papers reporting 12 primary studies were therefore included in the next meta-ethnography phases.

Table S2. CASP quality appraisal

Study	Decision to retain for Phases 4-6 X/✓	1. Clear research aims		2. Qualitative methodology appropriate		3. Research design		4. Recruitment strategy		5. Data Collection		6. Reflexivity		7. Ethical Issues		8. Data Analysis		9. Findings		10. Research Value	
		R1*	R2*	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2
Ancillotti et al. (2018)	✓ – SP	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	P	U	P	Y	Y	Y	Y	Y
Ancillotti et al. (2021)	✓ – KP	Y	Y	Y	Y	Y	Y	Y	Y	P	Y	N	N	P	Y	P	P	Y	Y	Y	Y
Boiko et al. (2020)	✓ – KP	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	P	Y	P	Y	Y	Y	Y	Y
Davis et al. (2017)	X	Y	Y	P	Y	P	Y	P	Y	Y	Y	N	N	N	Y	P	N	Y	Y	Y	P
Davis et al. (2020)	✓ – SP	Y	Y	Y	Y	P	Y	P	Y	P	Y	N	P	N	Y	Y	Y	Y	Y	Y	Y
Essilini et al. (2020)	✓ – SP	Y	Y	Y	Y	Y	Y	Y	U	Y	U	N	N	Y	Y	N	N	Y	Y	Y	P
Gulliford et al. (2021)	X	Excluded – a duplicate of the qualitative data reported in Boiko et al. (2020) above																			
Ghouri et al. (2020)	✓ – KP	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	U	Y	Y	Y	Y	Y	Y	Y	Y
Hika et al. (2022)	✓ – SP	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	P	Y	Y	Y	Y	Y	Y	Y
Lohm et al. (2020)	✓ – SP	Y	Y	Y	Y	Y	Y	P	Y	Y	Y	N	N	P	Y	Y	Y	Y	Y	Y	Y
Lum et al. (2017)	✓ – KP	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	P	Y	Y	Y	Y	Y	Y	Y

McNulty et al. (2013)	X	Y	P	Y	U	Y	Y	Y	Y	Y	P	Y	N	P	Y	P	U	P	N	Y	P
Medina-Perucha et al. (2020)	✓ – SP	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	U	P	Y	Y	Y	Y	Y	Y	Y
Papadimou et al. (2022)	✓ – KP	Y	Y	Y	Y	Y	Y	Y	P	Y	Y	Y	P	N	N	Y	Y	Y	Y	Y	Y
Zanichelli et al. (2021)	✓ – KP	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	P	Y	Y	Y	Y	Y	Y	Y

Table S3. AACODS checklist for critical appraisal of grey literature

Study	Decision to retain for Phases 4-6 X/✓	1. Authority		2. Accuracy		3. Coverage		4. Objectivity		5. Date		6. Significance	
		R2	R1	R2	R1	R2	R1	R1	R1	R2	R1	R2	R1
Wellcome Trust 2015	✓ – KP	Y	Y	Y	P	P	N	Y	Y	Y	Y	Y	Y

Individual decisions 1-10: **Y** – Yes, **N** – No, **P** – Partially, **U** – Unable to determine.

Final decision for inclusion/exclusion in the synthesis:

1. **KP** - a key paper that is conceptually rich and could potentially make an important contribution to the synthesis; to be included in the review.
1. **SF** - a satisfactory paper; to be included in the review.
2. **U** - unsure whether the paper should be included.
3. **IRR** - a paper that is irrelevant to the synthesis (i.e., not a qualitative study, or not addressing the review question); to be excluded from the review.

Once the studies for inclusion in the synthesis had been agreed on, two authors (GW, JA) began by repeatedly reading the included studies to familiarise themselves with the key concepts in the data (key metaphors, phrases and meaningful ideas), the raw data of ME.¹⁶ First, to provide context for interpretations, we extracted study characteristics onto a template, which we previously used in another ME.³ Characteristics of 13 included papers are presented in the main manuscript. The extraction of raw data was then performed verbatim in chronological order. A PDF copy of each paper was imported to NVivo V.12 Software and organised separately according to the levels of data (participant quotes (first-order) and original author findings and interpretations of data (second-order)). As papers were re-read, direct quotes (first-order constructs) and authors' interpretations (second-order constructs) were coded under separate Nodes. Setting up an additional Node for Original Studies allowed identification of where concepts came from during later phases. We also set up a Node for excluded studies, which we went back to upon completion of the synthesis to check whether important insights had not been missed. Data were then organised using a standardised data extraction form (see Table 4 for an example).

Table S4. Example of a data extraction table

<p>Study title: An effort worth making: a qualitative study of how Swedes respond to antibiotic resistance.</p> <p>Objective: To identify factors promoting and hindering a judicious approach to antibiotics.</p> <p>Study themes: 3 themes identified, which appear to capture people's views on the moral challenges posed by antibiotic resistance:</p> <ol style="list-style-type: none"> 1. Justice 2. Responsibility 3. Demandingness 		
Themes (also known as key concepts)	First-order constructs	Second-order constructs
Themes	Participant quotes	Primary author interpretations
Justice	<p>(Q3) Who decides whom should be given antibiotics or not? (G1M1)</p> <p>(Q4) Yes, if we look at the big picture and think about how serious it's starting to get, well it is of course that you must. . .it's a sacrifice you have to make, I think, to get a better situation. (G4M2)</p>	<p>A common concern was where the line should be drawn between justified and unjustified use and who should set the criteria.</p> <p>The participants discussed whether society and societal needs should take precedence over individual interests. The common tendency was to grant priority to societal needs. However, the participants also voiced the concern that prioritising the collective may bring about the undesired and perhaps fatal consequence of antibiotic treatments being withheld from some patients.</p>

PHASE 4: Determining how the studies are related

We carried out this phase in several steps using the approach recommended by Sattar et al.²³ First, we compared the 13 papers by their characteristics, including the author, year of publication, country/setting, study focus, population, data collection and analytic approach (Table 3 in main manuscript).

We then related the studies by their findings. Two independent reviewers (GW, JA) extracted and coded data line-by-line using. Metaphors, themes and ideas were then compared to check for recurring concepts across studies (meaningful ideas that developed by comparing particular instances) along with contextualised details of each study.¹² These were then juxtaposed against each other to examine the relationships between the key concepts. As we progressed, an emphasis was put on grouping common concepts into relevant higher conceptual categories (Table 5). New ideas were allowed to emerge iteratively without *a priori* assumptions. The data within each category formed the basis of translation in the next stages. Continual reference to the original studies and conserving their unique language was key in this process.

Through the constant comparison method, we developed 85 concepts across the 13 papers. Reflective discussions within the team enabled us to revise, organise and further collapse these concepts into 11 higher conceptual categories (HCC) that shared meaning. For example, 'understanding own body' and 'self-care strategies' later became a more encompassing HCC of 'knowledge and skills'. This process was time- and labour-intensive but helped to make sense of the data and aid clarity.

Table S5. Reducing key concept from each study into relevant categories

1. Patient knowledge and skills	<ul style="list-style-type: none"> • Current knowledge and understanding of AMR and resistance (Wellcome Trust, 2015) • Consumer skills and knowledge (Lum et al., 2017) • Perceived seriousness of and susceptibility to antibiotic resistance-related health issues; Self-efficacy in engaging in judicious behaviour (Ancillotti et al., 2018) • Perceptions and beliefs about AMR (Zanichelli et al., 2019) • Resistant bodies (Davis et al., 2020) • Knowledge and perceptions of antibiotic resistance (Essilini et al., 2020) • Conceptualisation of AMR (Ghouri et al., 2020) • Deciding to seek antibiotics/waiting to determine the seriousness of the ailment before deciding to seek medical treatment (Lohm et al., 2020) • Risk perceptions and help seeking (Medina-Perucha et al., 2020) 	<div>Newly formed categories</div>
2. Patient expectations for antibiotics	<ul style="list-style-type: none"> • People's relationship with antibiotics (Wellcome Trust, 2015) • Consumer attitudes and behaviours (Lum et al., 2017) • Patient preferences and expressed needs (Zanichelli et al., 2019) • Demandingness (Ancillotti et al., 2021) • Expectations (Boiko et al., 2020) • Treatment preferences and antibiotic use (Medina-Perucha et al., 2020) • Individual factors affecting antibiotic use (Hika et al., 2022) 	

PHASE 5: Translating studies into one another

Comparing concepts across 13 papers and regularly discussing the arising ideas seamlessly led into translation of studies into one another. During this phase, we compared each concept from each paper with all the other papers to check for the similarities and differences between the concepts. This was similar to the method of constant comparison.²⁴ We arranged all papers chronologically and compared and contrasted the key concepts from paper one with paper two, synthesised them and compared the outcome with paper three, and so on. The interpretations and explanations provided by the study authors were treated as data, and subsequently compared and translated across the papers to achieve a synthesis. To aid synthesis, two reviewers completed a translation table separately (Table 6), which was subsequently discussed within the research team. Then, our initial broad grouping of ideas was gradually refined by merging and collapsing conceptual categories into five themes. This process enabled us to 'go beyond' findings from individual studies, from simple descriptions of the data to developing third-order interpretations.^{1,2}

Table S6. Example of a translation table

Descriptor (groups of similar concepts clustered together/broad thematic headings)	First-order constructs (the primary data reported in each studies/ participant quotes)	Second-order constructs (primary authors' interpretations of the data – metaphorical themes, concepts, meaningful ideas)
When words become meaningless	'Terms like superbugs and superflu, they're there to induce concern in the public. It's a bit too much, we're becoming desensitised to it.' (M/F, 18-25, at university, London)	AMR means nothing to people – they can't even guess what it stands for; AMR is difficult to grasp; The analogy to climate change is ineffectual (Wellcome Trust, 2015, UK)
	'You get the odd media report saying that, you know, you shouldn't finish the course and your doctor's telling you to finish the course, so I think there is a lot of misinformation about resistance.' (P3)	Conceptualization of AMR; Conflicting messages about which behaviours to adopt (Ghouri et al., 2020, UK)
	'I think that it could be that it's hard to conceptualise what is going to happen. Like you said that just now it feels very abstract. I mean, what will happen is so far away...' (G2W1)	Climate change analogy to describe the intangibility of AMR (Ancillotti 2021, Sweden)
	'What is normal for you, sometimes is expected to be known by the other as well.' (NL03, M, 62 years old)	The language used by doctors was not understandable for the common patient; Operational blindness (Zanichelli et al., 2019, Belgium, Croatia, France, Netherlands, Switzerland)
	'They do write in medical language and not everyone is medical and then you ask the pharmacy and they're only reading off what the bottle says or on the paper.' (P16, F, age unknown)	Lack of information concerning antibiotics for patients; Health literacy is important (Hika et al., 2022, New Zealand)

Most studies were similar in focus and allowed *reciprocal translation* (themes 2-5). However, as the studies were compared and translated into one another, some concepts emerged as disparate and stood in opposition to each other. The process of analysis revealed that some of the individually translated findings described alternative or opposing perspectives of the same phenomenon. For example, we observed that there were contradictory concepts related to the ideas about health, labelling of disease and coping strategies held by the public in different countries. This dissonance added a new dimension and a new *refutational* theme 1 – 'the responsible patient' was formed (see Findings in main manuscript).

PHASE 6: Synthesising translations

During synthesis of translations, the themes were brought together and matched against authors' interpretations and participants quotes of the respective primary studies. This phase is described as 'making the whole into something more than the parts alone imply'.¹ Third-order analysis was carried out by reflecting on findings from Phase 5 against the study characterises and our interpretations using a translation table, and involved a degree of conceptual innovation. This enabled us to reconceptualise the findings and generate a higher order interpretation of the data. Our themes were brought together and matched against original author interpretations and participant quotes of the respective primary studies. As reflection is critical in ME, this was achieved through frequent team discussions.⁴

On reflection within the team and revisiting the original studies, we observed that the overarching themes overlapped and demonstrated a tension between two underlying assumptions: that antibiotics are a collective good and the individual need for antibiotic treatment. For example, we noticed that these two standpoints are influenced by many factors, including people's own knowledge, beliefs and attitudes around antibiotic use, the relationship with the healthcare provider and the wider context, including overwhelming influence of the media and public health campaigns.

Finally, we created a conceptual model or visual representation of the *line-of-argument* (LOA) that was drawn from, '*but more than the sum of*', the final themes¹ (see Figure 2).

PHASE 7: Expressing the synthesis

Findings of this review are presented as narrative, a new conceptual model, supporting tables and supplementary material.

The anticipated audience for this synthesis are public healthcare practitioners and managers, professional bodies, policymakers and those responsible for designing antimicrobial stewardship interventions who may value the practical implications of the findings and also researchers who may be interested in the methodology.

Limitations: see Discussion section of the paper. Although the expertise in synthesising qualitative research was vast among the team members, ME is an interpretative approach and the development of the conceptual model was inevitably driven by the research team's backgrounds and based on their subjective interpretations. We acknowledge that a different team may have drawn different conclusions.

Due to practical issues (i.e. a large number of eligible studies to work through, also the time and resource-based constraints of the project), the emphasis was placed on the development of new interpretations and a LOA in a rigorous manner rather than producing an exhaustive summary of all studies. Therefore, a threshold to the studies methodological standards was applied. A different approach of judging the 'weight of evidence' of each paper and ensuring that only studies that provided the conceptual richness and 'thick accounts' of patients and public's lived experiences were included in the final synthesis may have been justified. However, considering that there is currently no gold standard on appraising qualitative studies, the concern was that including studies with poorly reported methods may produce findings lacking credibility.¹⁶ We therefore decided that the reported methods had to meet a certain degree of methodological 'soundness' before inclusion in the synthesis. The critical appraisal using the CASP tool was judged appropriate for that purpose.^{2,4}

The exclusion of studies describing views and experiences of parents or where the emphasis was put on parent-related factors influencing antibiotic use in the paediatric population may be contested and a more inclusive approach exploring more diverse perceptions across different population groups may have been warranted. However, this strategy was chosen to ensure that evidence obtained in this way was suitable to the area of focus. We also made the decision to exclude low-income countries to ensure that the conceptual theory generated from synthesising primary studies reflects the function of ME and is relevant to the context and setting of the planned antibiotic intervention in the UK.

Strengths: The novelty of this meta-ethnography is the generation of a higher translation that helps to conceptualise patient and public's understanding of antibiotic resistance. The number of included studies (n=13) encompassed the desired criteria, and provided a body of knowledge that allowed us to examine the phenomenon of interest and conduct a ME.¹⁶

Although the conceptual model cannot be claimed to be definitive and represent all laypeople, it offers a unique lens, through which the views and experiences of patients and the general public can be considered. The synthesis was carried out in a rigorous and systematic way including a large range of databases and grey literature with a continuous input from an academic librarian and the experienced research team, undoubtedly reinforcing the credibility of the findings. Three authors (GW, JA, NR) had a vast experience in conducting and synthesising qualitative research, whilst NR and GW had a special expertise in using ME. NR was also involved in developing the ME reporting guidance as part of the eMERGe project to increase the transparency and completeness of the reports.⁴

There is little published guidance on updating a meta-ethnography and there is no set time interval after which a meta-ethnography becomes out-of-date. Redoing a new overarching ME or ‘knocking down and rebuilding the house’ could potentially change the findings of the original meta-ethnography.²⁵ To enhance the quality of the ME, we repeated database searches in February 2024 and found one study²⁶ that met our inclusion criteria. However, we believe that including the study in the final analysis would have not refuted our findings but resulted in equivalent meaning.

To increase credibility of the review and ensure that the breadth and scope of the data are captured in the synthesis, findings were reviewed and discussed within the research team through regular briefing sessions, providing opportunities to reflect on developed ideas and then refine and analyse interpretations using multiple theoretical perspectives. Although de-contextualisation of qualitative findings can be debated among methodologists, the quality of this review and rigour applied through all the stages means that it is possible to transfer this ‘*collective consciousness*’ of the public’s perceptions of antimicrobial resistance beyond the contextual boundaries and apply the new conceptual model within the broader context of healthcare research that requires identification of both social and clinical dimension.²⁷

A key methodological strength of our synthesis is that after creating the LOA, we reflected on our interpretation of the findings against the papers excluded following quality appraisal. This strategy ensured that important insights have not been missed, eliminating potential bias and adding to the credibility of the findings. For example, Davis et al. mixed-methods American study²⁰ raised an issue that was not captured in our review relating to perceived inconsistencies in prescribing practices among clinicians, highlighting the challenges of effective health communication and its unintended consequences, such as the erosion of public trust. Whilst prescribing inconsistencies was not specifically reported in our analysis, including this paper would not have changed the outcome of our synthesis or LOA as their key recommendations, such as trust and effective health communication, were included in our themes and the LOA.

Lastly, the uniqueness of this work lies in the translation process that employed a combination of reciprocal and refutation analysis, which facilitated conceptual innovation that went above and beyond those found in individual studies. The commitment to include refutational data in the synthesis - cases that are exceptions or outliers – helped to enhance the understanding through the development of a LOA. The refutational translation acted as a reminder not to seek similarity alone and to question why some concepts ‘fit’ better than others.²⁸

References:

1. Noblit GW, Hare RD. Meta-ethnography: *Synthesising qualitative studies*. California: Sage Publications Ltd; 1988.
2. France EF, Ring N, Thomas R *et al*. A methodological systematic review of what’s wrong with meta-ethnography reporting. *BMC Med Res Methodol* 2014; 14: 119.
3. Wojcik G, Ring N, McCulloch C *et al*. Understanding the complexities of antibiotic prescribing behaviour in acute hospitals: a systematic review and meta-ethnography. *Arch Pub Health* 2021; 79: 1–19.
4. France EF, Cunningham M, Ring N *et al*. Improving reporting of meta-ethnography: The eMERGe reporting guidance. *BMC Med Res Methodol* 2019; 19: 25.
5. Brunton LL, Chabner BA, Knollmann BC. *The Pharmacological Basic Of Therapeutics*. The McGraw-Hill Companies Inc; 2011.
6. World Health Organization. Antimicrobial Resistance. World Health Organization, 2023. <https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance>
7. World Health Organization. Health in the post-2015 development agenda: need for a social determinants health approach. World Health Organization, 2016. <https://www.who.int/publications/m/item/health-in-the-post-2015-development-agenda-need-for-a-social-determinants-of-health-approach>
8. United Nations. World Economic Situation and Prospects Statistical Annex. United Nations,

2022. https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/WESP2022_ANNEX.pdf
9. Cooke A, Smith D, Booth A. Beyond PICO: The SPIDER Tool for Qualitative Evidence Synthesis. *Qual Health Res* 2012; 22: 1435–43.
 10. DeJean D, Giacomini M, Simeonov D *et al.* Finding Qualitative Research Evidence for Health Technology Assessment. *Qual Health Res* 2016; 26: 1307–17.
 11. Critical Appraisal Skills Programme. CASP Qualitative Checklist. CASP, 2023. <https://casp-uk.net/casp-tools-checklists/>
 12. Toye F, Seers K, Allcock N *et al.* Meta-ethnography 25 years on: challenges and insights for synthesising a large number of qualitative studies. *BMC Med Res Methodol* 2014; 14: 80.
 13. Tyndall J. The AACODS Checklist is Designed to Enable Evaluation and Critical Appraisal of Grey Literature: Flinders University, 2010. http://dspace.flinders.edu.au/jspui/bitstream/2328/3326/4/AACODS_Checklist.pdf.
 14. National Institute for Health and Care Excellence. Interim Methods Guide for Developing Service Guidance. NICE, 2014. <https://www.nice.org.uk/process/pmg8/resources/interim-methods-guide-for-developing-service-guidance-2014-pdf-2007974164165>
 15. Dixon-Woods M, Booth A, Sutton AJ. Synthesizing qualitative research: A review of published reports. *Qual Res* 2017; 7: 375–421.
 16. Campbell R, Pound P, Morgan M *et al.* Evaluating meta-ethnography: systematic analysis and synthesis of qualitative research. *Health Technol Assess* 2011; 15: 1–164.
 17. Higgins JPT, Thomas J, Chandler J *et al.* Cochrane Handbook for Systematic Reviews of Interventions version 6.4. Cochrane, 2023. www.training.cochrane.org/handbook
 18. Gulliford MC, Charlton J, Boiko O *et al.* Safety of reducing antibiotic prescribing in primary care: a mixed-methods study. *Health Serv Del Res* 2021; 9: 1–126.
 19. Boiko O, Gulliford MC, Burgess C. Revisiting patient expectations and experiences of antibiotics in an era of antimicrobial resistance: Qualitative study. *Health Expec* 2020; 23: 1250.
 20. Davis ME, Liu TL, Taylor YJ *et al.* Exploring Patient Awareness and Perceptions of the Appropriate Use of Antibiotics: A Mixed-Methods Study. *Antibiotics* 2017; 6.
 21. McNulty CAM, Nichols T, French DP *et al.* Expectations for consultations and antibiotics for respiratory tract infection in primary care: the RTI clinical iceberg. *Br J Gen Pract* 2013; 63: e429–e436.
 22. Ancillotti M, Eriksson S, Godskesen T *et al.* An Effort Worth Making: A Qualitative Study of How Swedes Respond to Antibiotic Resistance. *Pub Health Ethics* 2021; 14: 1–11.
 23. Sattar R, Lawton R, Panagioti M *et al.* Meta-ethnography in healthcare research: a guide to using a meta-ethnographic approach for literature synthesis. *BMC Health Serv Res* 2021; 21.
 24. Cahill M, Robinson K, Pettigrew J *et al.* Qualitative synthesis: a guide to conducting a meta-ethnography. *Br J Occup Ther* 2018; 81: 129–37.
 25. France EF, Wells M, Lang H *et al.* Why, when and how to update a meta-ethnography qualitative synthesis. *Syst Rev* 2016; 5: 1–12.
 26. Bergsholm YKR, Feiring M, Charnock C *et al.* Exploring patients' adherence to antibiotics by understanding their health knowledge and relational communication in encounters with pharmacists and physicians. *Explor Res Clin Soc Pharm* 2023; 12: 1–10.
 27. Friberg F, Dahlberg K, Petersson MN *et al.* Context and methodological decontextualization in nursing research with examples from phenomenography. *Scand J Caring Sci* 2000; 14: 37–43.
 28. Pilkington H. Employing meta-ethnography in the analysis of qualitative data sets on youth activism: a new tool for transnational research projects? *Qual Res* 2018; 18: 108–30.