



# Treatment ‘cultures’, sexually transmitted infections and the rise of antimicrobial resistance

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## Abstract

In this article, we examine the current management of sexually transmitted infections (STIs), in the context of rising antimicrobial resistance (AMR), through the lens of ‘treatment cultures’. Prevailing treatment cultures—including the prominence of syndromic care for STIs—foster certain possibilities and foreclose others, with important consequences for countering AMR. Drawing on qualitative interviews with STI professionals, experts and industry representatives, we unpack these stakeholders’ accounts of STI treatment cultures, drawing out the importance of *socio-historical* (i.e. taboo and stigma), *political-economic* (i.e. perceptions of significance, profit-making and prioritisation) and *subjective* (i.e. patient contexts and reflexivity) dimensions therein. In developing this critical account of how treatment cultures are formed, reproduced and indeed resisted, we reveal how such discourses and practices render the reining in of AMR and shifting antibiotic use difficult, and yet, how productive

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engagement remains key to any proposed solutions. As such, the article contributes to our understanding of AMR as a highly diversified field, through our exploration of the bio-social dimensions of resistance as they relate to the case of STIs.

**KEYWORDS**

qualitative research, sexual health, sociology of antimicrobial resistance, sociology of care

**INTRODUCTION**

Bacterial sexually transmitted infections (STIs) have received comparatively little attention relative to other areas in which antimicrobial resistance (AMR) is a growing concern (Seña et al., 2020; Williamson & Chen, 2020). Yet, STIs have widespread impacts, which are worsening as antibiotics become less effective (Unemo et al., 2017). It is estimated that one million STIs are acquired every day across the world, with 129 million cases of chlamydia, 82 million cases of gonorrhoea and 7.1 million incidents of syphilis documented internationally each year (WHO, 2023b). There has been a lack of interest, political will or economic investment to proactively engage in rising resistance for STIs. While HIV, with associated high mortality and societal costs, has been a focus of significant investment, innovation and subsequent drug development, bacterial STIs have languished in the cultural shadows (WHO, 2012; WHO, 2021). This is, as our participants reflect on below, in part due to enduring sexual taboos (Lichtenstein, 2003; Nesamoney et al., 2022) and perceptions of STIs being ‘less serious’ than other illnesses. Yet, a cliff edge is nearing with rising resistance, and in particular, serious concerns raised about AMR in *Neisseria gonorrhoeae* (gonorrhoea) and *Mycoplasma genitalium* (Iwuji et al., 2022; WHO, 2023a).

Here, drawing on a series of interviews with clinical, expert and industry stakeholders, we examine STIs resistance and the aligned problem of antibiotic ‘overuse’, to explore their views on how prevailing ‘treatment cultures’ emerge and sustain themselves, and their implications for rising rates of resistance. This is placed within a broader scene whereby sexual health practitioners are being asked to be increasingly judicious with antimicrobials (Kenyon et al., 2023; Tompson & Chandler, 2021) to curb resistance.

The idea of ‘treatment cultures’, we argue below, is instructive for advancing the sociology of AMR, which has already done considerable work to explore the phenomena of resistance beyond mere biology, or individual or practitioner decision-making (e.g. Adam et al., 2020; Broom et al., 2017; Broom et al., 2021; Broom et al., 2023; Chandler, 2020), to explore its embeddedness in structural fragilities, economic priorities and cultures of immediacy, among many other bio-social forms (Will, 2018; see also Brown & Nettleton, 2017b on resistance imaginaries). Thinking with a ‘cultures’ frame provides an abstraction to help make sense of how bio-social forms assemble modes of practice.

It also remains that thus far, little of the sociological AMR scholarship has touched on STI related issues, which as a case study and site of sociality throws up unique dimensions which are instructive for the broader scene of AMR. This includes contours of stigma and taboo,

interplaying, as they do, with ideas about severity, responsibility and forms of cultural (de) prioritisation. Moreover, an exploration of the perception of treatment cultures within such a context, sheds light on the tussle between normative influences, interpersonal desires to ameliorate illness and provide care, whilst concurrently pursuing efforts to curb AMR.

## BACKGROUND

### Epistemologies of STIs

The 'successes' of antimicrobial treatments for STIs have, to some extent, given rise to a critical paradox. As new antibiotics were introduced over the decades to treat gonorrhoea, for example, these treatment 'successes' have subsequently become 'failures' in their ability to cure the disease due to rising rates of AMR. In other words, initial successes of antimicrobials have diminished in their returns over time. In the 1930s, sulfonamides were used to treat gonorrhoea infections, but by the late 1940s more than 90% of gonococcal isolates showed resistance to sulfonamides, leading to a replacement of the treatment with penicillin (Jose et al., 2020; Unemo & Shafer, 2014; Workowski et al., 2008). However, resistance to penicillin was emerging as early as 1946 (Jose et al., 2020). This saw the introduction of chlortetracycline to treat penicillin resistant strains, which led to the emergence of tetracycline resistance, and by the 1980s resistance to penicillin and tetracycline meant azithromycin and fluoroquinolones became preferred modes of treatment (Unemo & Shafer, 2014; Workowski et al., 2008). In the 1990 and 2000s, resistance to azithromycin in European countries, the United States and Argentina meant it was no longer used as a single dose treatment for gonorrhoea (Unemo & Shafer, 2014). Increasing resistance to fluoroquinolones during the 2000s saw this class of antibiotics also being abandoned in European and Asian countries (Unemo & Shafer, 2014). Cephalosporins, such as ceftriaxone and cefixime have been used since the 1990s, however, as a result of increasing concerns about resistance (CDC, 2021), combination antimicrobial treatment (ceftriaxone and azithromycin) is now the standard of care. However, this approach results in antibiotic resistance pressure for other organisms such as *Mycoplasma genitalium* and non-STI enteric pathogens, and some countries have moved away from the combination antimicrobial approach for this reason (CDC, 2021).

While this narrative may appear to be about unfortunate biological processes, this is a partial account, with swiftly rising resistance embedded in societal processes including the perception of microbes, economic and political priorities, misuse of resources and critically, prevailing notions of 'appropriate treatment' (Andraka-Christou, 2020; Baccini et al., 2022; Sell & Williams, 2020). This is evident in the multitude of strains of thought, and frameworks, for making sense of STIs (Aral, 2002; Crosby et al., 2016). Kenyon (2020) and Kenyon et al. (2022) broadly differentiate between these as individualist vis-à-vis ecological epistemologies for understanding STIs. They argue that the former tends to focus on intensive screening, eradication of microbes and individual characteristics and behaviours of people, while the latter focuses on contexts, interdependencies and multi-level analysis. Whilst there is an intermingling of viewpoints (Kenyon, 2020), enduring divisions still permeate the STI milieu. The influence of epistemological framings, such as individual versus ecological, shapes the way diseases are perceived, prioritised and ultimately treated. For example, an individualist framework will place emphasis on a disease and its elimination through antibiotics, whilst an ecological framework opens greater space for considerations about how these antibiotics affect other aspects of a person's

health, or the importance of stewardship (Kenyon et al., 2022). This points to how treatment, often deemed to be the appropriate and ‘medico-scientific’ approach, turns out to be a cultural formation, sometimes enacting longer term harm, and therefore open to reflexivity, interrogation and transformation. We argue that such deliberations are critical to dealing with the current threat of antibiotic resistant STIs.

## STI care through a ‘cultures’ lens

Building on the accounts of our participants shown below, here we focus on ‘treatment cultures’, as an important context for engaging with the presence and problem of resistance (Jenks, 2005).<sup>1</sup> The turn towards viewing practice-as-culture may seem like a rather pedestrian notion, yet as social scientists have shown across multiple sites and contexts (Armstrong, 1995; Good & Hannah, 2010; Kleinman et al., 1978; Mol, 2002, 2008), such a framing has the potential to better illuminate complex and contingent practices such as antibiotic use by highlighting hitherto hidden values, prevailing epistemologies and the highly selective ontologies at the intersection of bugs, bodies and intervention. That is, a ‘culture’ framing means paying attention to how science and medicine, in this case of and around STIs, *constructs* the objects/subjects it seeks to intervene upon, thus foregrounding and foreclosing the potential actions that can be taken in relation to them and how these normative forces may also be troubled, resisted and revised by those responsible for delivering care.

Connecting with the ecological framework raised above (Kenyon et al., 2022), a cultures frame also fully links instances of intervention or treatment (i.e. testing for STIs or deployment of antibiotics) with their disparate and multidimensional personal, interpersonal and structural influences. This includes recognising that these multidimensional and entangled influences reach well beyond the clinic and into the realms of the multi-scalar, spanning organisations and public, private and corporate entities (Ecks, 2005; Fisher et al., 2015; Gagnon & Lexchin, 2008). Thus treatment cultures and aligned practices are always emergent at the interstices of culture, economy, expertise and evolving technologies. This also allows for the notion of different, plural, treatment cultures (within health systems, across nations, across spaces/locales and so on), acknowledging the multiple ways of *doing* STI care (WHO, 2016). Critically, seeing treatment as culturally co-produced, centres the multidimensional changes that need to take place (Tompson & Chandler, 2021), including how infection, antibiotics and care are thought about and the normative practices surrounding them.

As suggested, treatment cultures have normative, discursive and practical aspects, which circulate and are emergent over time and across contexts (Armstrong, 1995). Rather than still or set, treatment cultures evolve in relation to such things as technological change, management standards, evidence-making and communities of practice (Broom et al., 2017; Mol, 2008). They are never settled, but also, have normative, structuring aspects, which in context of this study assemble to create dominant modes of practice through routine, guidelines, ideas about ‘healthy’ bodies and available resources (see ASHM National Prep Guidelines, 2021). Moreover, because treatment cultures are always emergent, they as much about practices of treatment, as they are about reflections on these practises, which may challenge the need to treat all instances of infection itself (Armstrong, 2018).

In the context of this study, our understanding of the dominant treatment culture—as both normative force and everyday practice—emerges from the reflexivity of participants, and is located in their reflexive practices, in much the same way that for example, racism or sexism

(Ang et al., 2024; Chandra et al., 2024) may be elucidated by reflections and interventions to address them. This also means, participants identify features of the prevailing treatment culture, trouble parts of it and assemble their own ways of brokering professionalism, delivering care and trying to curb the rise of AMR, as we explore below.

## METHODS

### Sampling and data collection

This article draws on and extends our ongoing body of research, which examines the economic, social and political drivers of antibiotic resistance (e.g., Broom et al., 2021; Broom et al., 2023; Peterie et al., 2023), to unpack how prevailing social practices assemble to shape antibiotic resistance in the context of STIs. We present findings from qualitative interviews that were conducted from 2021 to 2023 with a diverse range of stakeholders with expertise in STIs and AMR. Stakeholders were recruited by purposively sampling through researcher networks, to ensure participants possessed the appropriate expertise required for the project. Data collection entailed in-depth, semi-structured interviews with stakeholders working to curb AMR in clinical, private sector and pan-national contexts. Participants ( $n = 23$ ; male = 10, female = 13) were comprised of sexual health clinicians and general practitioners, key industry stakeholders involved in pharmaceutical and/or diagnostic research and development, and representatives of peak pan-national organisations. All clinical participants ( $n = 13$ ) came from Australia. Participants representing industry and pan-national organisations held professional roles in Australia ( $n = 5$ ), Europe ( $n = 3$ ) and the US ( $n = 2$ ). As such, this study has a lean towards Australian experiences ( $n = 18$ ). Video conferencing was used to conduct interviews by authors Alex Broom, Michelle Peterie and Lise Lafferty. They ranged between 30 and 60 min. Interviews were audio-recorded and transcribed verbatim. This involved the removal of all identifying information to preserve participant confidentiality. Interview questions and discussions revolved around three key themes: participants' perceptions and direct experiences of AMR in the context of STIs, their ongoing efforts to develop and implement AMR solutions in their respective contexts, and support or challenges faced when working to do so. Key interview questions to illicit this information included: What are the main strategies currently used to ameliorate resistance in STIs, in your context? What do you see as the main (short, mid and/or longer term) costs in terms of effects of resistant STIs? To what extent does AMR shape your practice in STI care, and has this changed over time? The study received ethics approval from the University of Sydney's Human Research Ethics Committee (reference: 2022/128). Informed consent was obtained from all interviewees who participated in the study in alignment with the approved ethics protocol.

### Data analysis

A framework approach was used to analyse the data in this study (Pope & Mays, 2006). This involved five key steps (1) Familiarisation: review of transcripts by members of the research team. (2) Identification: discussion within the research team to identify key themes that answered the research questions. (3) Application of themes: transcripts were coded thematically, which meant identifying key excerpts that reflected identified themes. These data were

also inductively organised into sub-themes. (4) Charting: an overall picture of the data was built using headings and sub-headings, which included sub-themes that had been identified in step 3. For this article in particular, charting sought to unpack how STI treatment in the context of AMR can be understood as a cultural production. (5) Mapping and interpretation: associations between data points were clarified and explanations developed and written.

The team decided thematic saturation had been reached once ideas and experiences new participants described in their interviews echoed ideas and experiences already documented in interviews (see Guest et al., 2020). Coding was undertaken by multiple team members, and analysis was shared and discussed with the wider research team, including clinician-researchers, to confirm the consistency and credibility of the interpretation, and to ensure consensus was reached about findings. Atypical, negative, conflicting and contradictory items were also identified during theme development and coding to enhance analytic rigour. However, the emphasis in this study has been to identify recurring and dominant themes within the dataset, and in this article, to understand how treatment can be conceptualised as a cultural production to understand STIs and AMR, including political and economic considerations, normative practices and conceptualisations of disease, and individuals' engagements with them, to develop a panoramic view of how change can take place. We will use quotes from interviews to illustrate key themes, and to support interpretation of the data.

## RESULTS

### The politics of treatment cultures

Whilst clinical interactions and exchanges may not always seem entangled in politics and economics, they inevitably are, shaping the potential of treatment cultures (Dixon et al., 2021). The limits and boundaries of possibility are very often induced or foreclosed outside of the clinic. Often weaving in cultural ideologies, and the undulations of secrecy and taboo in STIs, prevailing treatment cultures are at least partially assembled in policy decision-making, political blind-spots and/or practices of scientific deprioritising. As interviewees explained, the flows from political interest are strong and enduring, with the complex intersection of stigma, and the idea of 'undeserving' subjects creating a perfect storm for a lethargy of action to improve STI practices in relation to rising resistance. As one participant told us below:

It's not pleasant discussion to have with someone about syphilis and gonorrhoea and all of that. Politicians aren't interested, and it would be the brave politician that might take that on because, again, that would be seen as something a bit - it's not one of those things that people donate lots of money to [...] Children's research, endless money. STIs, no one's interested. No one wants to take that on ... I think there's a big assumption of, "Well, it serves them right. It's their fault that they've got this." There's a lot of blame associated with STIs over any other disease.

(Clinician, Australia)

Deservingness of attention and investment of resources was simultaneously tied to the perceived severity of STIs within the accounts of our participants. It was noted that whilst infections may cause suffering, *'there's not a lot of death'* [Industry, US]. While there has been some increase in interest in antibiotic resistant STIs—most notably in England due to media

attention about 'Super Gonorrhoea'—our participants considered their work, field and the concerns of communities impacted by STIs to be low on the political agenda. This has a potential impact on innovation, proactive policy and good governance (or lack thereof).

Ultimately, the prioritisation of STIs was talked about within the interviews as located within a prevailing cultural imaginary where stigma, personal responsibility and perceptions of severity heavily influence treatment, and treatment cultures, resulting in a relative paucity of resources being allocated to addressing antibiotic resistant STIs. This lack of prioritisation concurrently weaves through instances of care, significantly shaping treatment cultures, including the intersection of practice and innovation.

## The practice–innovation nexus

Whilst often beyond the view of interventions in the clinic, interviews revealed that scientific innovation, technological development and the limits of industrial production/distribution are integral to both assembling and developing treatment cultures, creating or foreclosing material possibilities (i.e., new drugs and new diagnostics). As such, broadening the lens within which STI care is viewed, shows how prevailing treatment cultures exist at the nexus of economical–social–political considerations.

The influence of these matters is evident, for instance, in the ongoing urgency for quicker and more accessible tests to be made available, to identify STIs (e.g., *Neisseria gonorrhoea*) and specific strains of STIs, allowing clinicians to provide faster and more exacting treatments as follows:

I think because we have a lack of point-of-care testing. So if we have a bedside test where we can do a point-of-care test and tell the patient that, "In 10–15 minutes we can give you a result, so we know whether to actually treat you for this condition or not." It's just that we don't have the lab technology. So, as a result of that, you've got a patient in front of you who's unwell, who's at risk of spreading it to other partners if not treated then and there. We are overtreating because we don't know what the causative organism is. Whereas if we had point of care testing, that way you can get an answer in real time, you'd be able to overcome that.

(Clinician, Australia)

So, having a specific mutation on a molecular test, similar to what they have for tuberculosis, this molecular testing for rifampicin and isoniazid-resistant tuberculosis, so you know quite quickly, initially, but then you should give first-line treatment or change the treatment. So, I think something like that would be great for sexual health while you're balancing the need to treat quickly versus trying to target your treatment appropriately.

(Clinician, Australia)

These material possibilities—and, indeed, current technological limitations—are imbricated with and emerge from financial viabilities, and politically driven cost-benefit considerations. They are also connected with the flailing pipeline of drug and diagnostic innovation, which is deeply interconnected with public sector priorities (see Peterie et al., 2023). Put differently, what happens in the clinic is embedded in dimensions of the economy of health and care,

incorporating the flow-on effects of the priorities of businesses (return on investment assessments), the ‘nudges’ of governments (subsidies) and so on:

My commercial counterparts are basically saying, “well I get it, there’s a medical need for it. But how much are you going to sell? And how much can we charge? How much is a customer going to pay?”

(Industry, US)

Has to be an element of risk sharing, I guess, with both governments, health services, and industry. I think it has to be a kind of a tri-party thing. Otherwise it’s hard for organisations to take the risk when they are responsible for losing, they have the most to lose. [...] If there’s no commitment, if we bring something to market and we trial it, it’s successful, but then we have to spend six years to try and get it into guidelines and reimbursement [from government] that’s a lot of time, that’s a lot of resources for us to commit with no certainty that we’re going to get any business after we get that.

(Industry, Australia)

As these quotes show, and as indicated by others we interviewed, the upstream conditions and decisions of industry, and the incentive structures of governments and policy makers, are influential in what technology makes it through to the clinic as a site of care. This demonstrates the processual nature of STI care, where porous and open-ended boundaries (Mol, 2008), between governance, priority setting and innovation investment impact what is possible in terms of streamlining and improving care, including the use of antimicrobials. Very often, treatment decisions are made in the context of *absence*—the absence of progressive policies, well thought through subsidy structures, swift low-cost innovations and so on. Upstream decisions, as articulated in the interviews, were viewed as generative of practices (including antimicrobial (mis) use), which often develop in the context of poor or absent resources and infrastructure. These all subsequently shape and produce treatment cultures, and exist alongside ongoing normative clinical practices, such as disease elimination.

## Culturing the clinic: Presumptive histories

The political, economic and innovation considerations surrounding STI treatment cultures—those mentioned above and beyond—coalesce with, and assemble, a routine, normative and taken-for-granted clinical practice. One challenging aspect of prevailing treatment cultures in the STI field (and infection care more broadly) is the practice of syndromic care—treatment based on signs and symptoms rather than definitive tests which certain participants believe is contributing to AMR. As a participant stated below:

For example, when somebody comes in with, say, proctitis, we treat them syndromically for all the organisms because they’re in a lot of pain and they want treatment at that point, but we’re treating many organisms over a period of time without having a diagnosis, without having a cause for that condition. So, I think that is also contributing [to AMR].

(Clinician, Australia)



Syndromic care has a temporal dimension, in that syndromic interventions, and associated cultures of practicing in this way, are deeply embedded not only historically, but also contemporarily, in the context of STIs. Signs and symptoms of infection may be *enough* to warrant swift pharmaceutical intervention. Additionally, the notion of a 'natural' recovery (more on this below) is largely unexplored in prevailing STI treatment cultures, with the STI perceived as a danger to be swiftly eliminated (albeit a possibility that may not always be available with the rise of AMR). In other words, syndromic care exists alongside the accumulated possibilities of technology and intervention, *making sense* within the logics of the prevailing treatment culture, but giving rise to potentially greater opportunities for resistance. As one interviewee stated below:

So, AMR is often not the priority for the clinician and the patient at the coal face, and it is invisible to them, and that the damage that they are doing is invisible. It's very like driving your car and catching your plane, you don't see that impact really or relate that impact directly to climate change or losing antibiotics [...] So I think it's education, is about making it more visible, very present in people's consciousness, understanding the longer term implications of short term practices...

(Clinician, Australia)

The temporal myopia (see Broom et al., 2021) and lack of visibility of consequences-at-scale (see Davey et al., 2017), which foreground treatment in the here and now, do little to connect to envisaged futures, since they focus on STI associated antibiotic use in the present. This means the slippage of antibiotics from 'solution' to 'non-solution' and even (in certain instances) to 'problem maker' (by increasing resistance) remains obfuscated.

Alongside syndromic care, STI care practices—which enable prevailing treatment cultures—subject bodies to routine surveillance, identifying disease and preparing bodies for microbial elimination. This in and of itself is not inherently positive or negative, but as noted by participants, needs to be thought about carefully in the context of resistant STIs. For instance, in Australia, pre-exposure prophylaxis (PrEP) to prevent HIV transmission was introduced in 2018, and guidelines suggest users of PrEP, predominantly men who have sex with men (MSM), are reviewed and tested every three months for HIV, syphilis, chlamydia and gonorrhoea (ASHM National Prep Guidelines, 2021). This has led to higher rates of testing within this group, as accessing PrEP requires a new script every 3 months, which includes the aforementioned screening. However, interviewees expressed concerns that these guidelines, and subsequent treatment cultures in the STI milieu, have led to over testing and subsequently even greater antibiotic use (Williams et al., 2023). This, interviewees stressed, is contributing to selective pressure on microbes to encourage resistance, yet is not reducing the prevalence of disease:

[A] lot of these patients that we pick up on asymptomatic screening, yes, okay, we might treat that asymptomatic rectal gonorrhoea in that patient and it might be gone for seven days or something, but then they might go right back into that same-sexual network where they haven't had all of those contacts treated and they might get it again a week later, two weeks later. There is evidence that a lot of these infections, asymptomatic infections, the body will clear by itself over a matter of weeks to months. So we're just peppering around these antibiotics, but I don't think we're making a difference.

(Clinician, Australia)

It's very hard to find any data anywhere in the world that says that test and treat actually reduces the prevalence [of microbes] in a population. You may reduce the harms of the organism, that's fair enough, but you don't reduce the prevalence. [...] So, I'm starting to change my mind on this and thinking that we should be perhaps more thinking of these organisms as commensals [able to be lived with] and not testing and not treating, because treating gonorrhoea in particular is just going to lead to more resistance because we're not going to do it perfectly. Antimicrobial resistance, antibiotic resistance has risen, prevalence is staying the same, so how are we winning in that sphere?

(Clinician, Australia)

As such, the introduction of new medications, like PrEP, becomes embedded within pre-existing logics and priorities that favour disease elimination as always good 'care', perpetuating and strengthening norms around this approach despite the downsides:

And I think part of that is that, as healthcare providers, the contract is between you and that patient that's in front of you, that you want to do the best for, not the next patient, the patient after, or the patient in two weeks, or the patient who's out in the community who will be potentially affected by how you deliver antibiotics today. So, there's this disconnect between the practise of medicine and that surrounding issue of AMR.

(Expert, Europe)

Such care practices, seeking to eliminate disease, were also evident in presumptive antibiotic use (although a decreasing measure now), where contacts of a known STI case are treated on the assumption they may have the disease. In these circumstances antibiotic use is premised on an imagined future, where an infected subject carries a disease, and such an imagining is then embroiled within a logic of disease elimination even if the disease itself does not necessarily exist. As a participant explained:

... I think we were always of the view, in my earlier days, probably the first 20 years, 25 years of my career, that if someone was a named contact they would be treated. And I think a lot of the nurses, especially the older nurses still feel that way because that's what's been drummed into us. If you're a contact, you get treated. But there's been more and more studies [...] that suggests that you don't need to do that for most people, and that it may well be a better use of resources not to treat that individual at that particular time, but to wait until we get a result [...] but certainly clinician sentiment has changed in that I think we can see that evolving to wait until we get a result back.

(Clinician, Australia)

As suggested, the use of PrEP itself is also underpinned by an imagined future, where one may contract HIV, and therefore the body is '(pre)treated' to prevent this from happening. Interviews reveal that such future thinking within treatment cultures, and the epitomisation of the disease-free body as 'health', creates an immediacy in the treatment of STIs such as gonorrhoea and chlamydia. As stated, such short-term thinking does little to consider the future of the antibiotic itself, or, more importantly, to account for a future where resistance may become

the norm for STIs. Moreover, instances of syndromic and presumptive antibiotic 'treatment' can be conceptualised part of broader 'covering' practices, where antibiotics are used for fear of adverse impacts if they are not administered (see Dixon et al., 2021), and can therefore also be seen as care.

Remarkably, and somewhat paradoxically, at present, unlike other STIs, *Mycoplasma genitalium* is *not* part of standardised screening processes. One participant suggests an expedient reason for the disparity:

It's quite interesting, we do not screen for *Mycoplasma genitalium* in asymptomatic people. And the rate of carriage, about 10% in women and 6% with men. So we're very comfortable not screening that infection, and we're very comfortable not screening that in heterosexuals, but for some reason, chlamydia and gonorrhoea never fell into that group. And I think it's because *Mycoplasma genitalium* is very difficult to treat. So, I think that's why there's been a difference.

(Clinician, Australia)

Like other cultures, treatment cultures are also uneven and contradictory. In this instance, the treatment culture is 'at peace' with bodies occupying an unknown and liminal space of potentially being 'infected' and not in complete 'health'. The same approach, however, is not extended to gonorrhoea or chlamydia, suggesting cultural practices and imaginaries have historically congealed differently around particular infections and diseases, including the later discovery and research on *Mycoplasma genitalium* (Unemo & Jensen, 2017). However, importantly, the 'reification' of such practices exists alongside critique and an emergent counter-culture, which challenges normative ways of thinking about and doing treatment.

### **Prefigure cultures: Collateral damage and the logic of (microbial) protection**

As outlined by our interviewees, the rise of AMR has begun to challenge existing treatment cultures in sexual health and STI intervention specifically, and prefigure alternative treatment cultures. Our interviews provided clear accounts of an emergent 'counter-culture' in STI care, driven by the notion that traditional STI care and antimicrobial use is short-sighted in an era of AMR. Clinicians spoke to the concerted efforts being made, in a practice setting, to reduce antibiotic use and shift treatment cultures, even if this meant pushing up against national guidelines and existing policy structures:

So we, for some time at [our clinic], and we sort of do our own thing a little bit, we don't necessarily follow the national guidelines, so we stopped presumptive antibiotic use in STD contacts some time ago. And I looked at it, the proportion infected previously, and then I relooked at [our data] last year, and it was actually only 30% were infected in that sample of 800. So it wasn't huge. That meant we didn't treat 70% of the contacts. We treated 30% and we gave them the right antibiotic for the right infection.

(Clinician, Australia)

Also going against cultural treatment assumptions of disengaged and 'immoral' actors, certain patients were also narrated as being highly reflexive about their antimicrobial

consumption, particularly as they engaged with (proliferating) health information in the public sphere. A growing number of patients, we heard, were thought to be increasingly concerned about their gut microbiome and how it might be affected by antibiotics. This was particularly the case among highly educated patients in urban centres:

And I talk to the gay and bisexual men who come in, and they actually don't like all the antibiotics they're getting, they are worried about their gut microbiome, they are worried about resistance. And it's just that we haven't actually engaged them in conversations to talk about, "How do we decrease screening? How would that go with you if we actually reduce screening? Would you feel that you were being deserted or would you feel that this would be a good step, and how do we go about it?" Because what we're doing is actually doing, I think, more harm than good.

(Clinician, Australia)

Treatment cultures are thus already 'objects' of intervention: as sites where actors can apply critical reflexivity to the 'doing' of treatment, shifting normative practices and contributing to the emergence of a counter-treatment culture. These concerns about gut microbiome, wider health and antibiotic use vis-à-vis STI treatment, also challenge contemporary western biomedical epistemologies. Such epistemologies tend to conceptualise disease and ailments as singular 'events' in need of treatment, as opposed to existing along a holistic continuum of mind-bodies and how interventions can have unintended consequences. That is to say, the concerns about gut microbiome articulated by patients to interviewees entails a rethinking of the mind-body link, as constituted by a complex system, where treatment and disease have consequences for the entire organism. Furthermore, the emergence of a counter-treatment culture can also be seen as constituted by a process of 're-designation', where antibiotics' meanings are being re-cast:

And I think if everyone could actually sit down and say, "Look, antibiotics are actually precious. They've made a huge difference to health in the last 100 years, but we're blowing them, and we should actually be being careful with them so that they can last a lot longer." Because the antibiotic pipeline is pretty restricted. There doesn't seem to be much coming on board, and there certainly won't be the level of new drugs with the level of resistance that's going on.

(Clinician, Australia)

As suggested earlier, this *reimagining* of antibiotics is about seeing them not only in the present, but also through a lens of futurity. In this way, contemporary meaning and practice around antibiotics comes to be shaped by imaginings of possible futures in which antibiotics are ineffective. The emergence of counter-cultural practices points to the way treatment cultures are always emergent from the contexts in which they are located, and speaks to the agency of social actors to shape them.

## Complexity of institutions

During interviews, participants also emphasised the importance of understanding how treatment cultures are shaped by the institutional contexts where treatment takes place. A treatment

culture, as it were, was very often highly dependent on institutional variations in what (and who) is available. That is, care is materialised through material resources, expertise, staffing, presence of allied health and so on. What you 'get' was talked about as shaped by the institutional environments at play, with participants specifically contrasting general practice with specialist sexual health clinics:

Just, for example, moxifloxacin, so once somebody has a result of macrolide-resistant *Mycoplasma genitalium*, the next drug of choice is moxifloxacin. And so many times at the [sexual health specific centre] we'll get either calls from GPs saying, "Look, I'm just sending this patient to you because I've prescribed them moxifloxacin and they can't afford it," or it's not available. Well, they won't really say it's available here. They'll send it to us because moxi is what is advised and moxi is free at the [sexual health specific centre]. [...] But if moxifloxacin was on the PBS and was as cheap as doxycycline, then that would make it very much easier for GPs to not fuff around with azithromycin for macrolide-resistant MG.

(Clinician, Australia)

It was a common and critical finding across the interviews that treatment cultures are emergent through institutional forms (an elaborate tussle between the individual and contexts). Inappropriate testing, time pressure and unaffordability at general practices were talked about by participants as contributing to problematic treatment cultures. In Australia, 'affordability' as a 'personal barrier' to accessing moxifloxacin, for instance, did not exist in some (specialist sexual health) settings because it was available for free. While these observations may seem common sense, as articulated by our participants, they demonstrate how 'pressure points' are socially produced within the environments in which they emerge.

What was equally clear, however, is that institutions should not be conceptualised as siloes, as they can in fact inform one another. The treatment culture of a sexual health clinic can shape practices in a non-sexual health clinic, and vice-versa in a process of 'cultural enrichment', as one clinician explained:

And that's where a place like the [sexual health specific centre] is very good, because basically they're approachable, we can ring a sexual health physician or some clinician that has very good experience and they can supplement our information we get from guidelines.

(Clinician, Australia)

Expertise can flow and spill across spaces as sexual health clinics become 'resource nodes' within a broader network of clinics, providing important 'sub-cultural' knowledge and imparting transformative capacities to the treatment cultures of other clinics. Our data also demonstrated that the complexity surrounding treatment cultures exists alongside the complexity of people who enter these spaces, which shapes the way treatment is done.

## Complexity of people

An interviewee's reflections on patient engagement illustrates how treatment cultures emerge and evolve at the nexus of macrostructural forces, institutions and intersect with the

complexities of people's lived experiences. As such, treatment of STIs, like other forms of care, is 'historical', in that it is entwined with everyday practices of living, thinking and being (Mol, 2008). Following, what treatment means and feels like, will differ based on the person. Participants explained patients may wish to be treated more promptly due to stigma attached to homosexuality, a desire to return to their sexual lives and the 'ick factor' of having an STI (see also Broom et al., 2023):

I've seen a number of gay men who aren't out in their community, so they're actually super high risk for HIV and syphilis and all these things, but their GP doesn't know, they're not going to tell anyone, they are going to travel three hours to Melbourne to do all of that [medical] stuff. And the other thing is, it's not just the GP, it's also, well, who's working in the lab in that regional town? If you get that antibiotic, there's only very few indications for an injection of benzylpenicillin or for an IM injection of ceftriaxone. So then, does the pharmacy know? Does the receptionist know? It extends quite far as not just the GP. It's like, "Where do I take that prescription? Where do I get that blood test?" et cetera, et cetera.

(Clinician, Australia)

Echoing existent AMR research (Davis et al., 2020), clinicians also emphasised the value of seeing patients as co-collaborators, capable of meaningful involvement in their own care practices, and talked about how to work with them more productively:

And I think that I now do not routinely hand out scripts to all patients who come in with symptoms. I will either make a decision with them that we'll wait to see what they've got, or I will give them a script and say, "It really would be best not to fill it until you get a call from us, because it might not be the right antibiotic for you. If you get really—increase in your symptoms in the next 24, 48 hours, do start it. But if you don't, then let's just wait to see what you've got." And people are great about it. They're like, "Yeah, actually I don't really want to take antibiotics anyway." [...] So, I think it's dissemination of information in a really accessible way, and partnering with consumers so that they understand that their behaviour actually impacts on this problem and can be part of the solution to the problem, or can be part of accelerating the problem.

(Clinician, Australia)

Interviewees noted that in a multicultural country like Australia, with large numbers of new immigrants, community engagement would also need to account for the different treatment cultures that people are used to:

... I would be putting my money [...] in consumer education [...] So, consumer campaigns that really were co-designed with different populations. CALD [culturally and linguistically diverse] population, again, may come from countries where there's a lot of antibiotics swishing around, so I think that would be a really important community to have champions and co-designed campaigns for, as well as for doctors and nurses who are serving those communities as well. So, if I think about in terms of equity deserving groups in terms of this space, I do think that the

CALD groups would benefit a lot just around that health literacy, but it would need to be coming from them.

(Clinician, Australia)

This is not to suggest that immigrants only have 'needs', as all communities, dominant or minority, have 'culture' and 'contexts' that must be worked with (Chandra, 2021). Rather, interviewees highlighted the importance of '*meeting communities where they're at*' [Industry, US], to co-create viable and appropriate solutions, attuned to the complexities of subjectivities, and their relationship to treatment cultures (Hinchliffe, 2022).

## DISCUSSION

This study builds on the broader sociological scholarship of AMR (Brown & Nettleton, 2017b; Frid-Nielsen et al., 2019), which seeks to understand resistance relationally and culturally (e.g. Brown & Nettleton, 2017a; Davis et al., 2020)—as structurally embedded (e.g. Chandler, 2020; Dixon, et al., 2021; Tompson & Chandler, 2021)—and to explore the evolving tussles between immediate and future orientations (e.g. Will, 2018). This includes the complexities of how institutions, practices, patient subjectivities and professional norms assemble antibiotic use and resistance (Dixon et al., 2021; Rynkiewich et al., 2023; Tompson & Chandler, 2021) and work against change. Given most participants in this study have experience working in the Global North, our analysis of these processes is contextually limited, most specifically to Australia.

In light of the existent AMR scholarship, our study illustrates how stigma and taboo lead to processes of de-prioritisation, which has implications for the development of innovations, and subsequently the types of care (or not) that clinicians are able to provide, which may assist in curbing the rise of AMR. It also shows how resistance induces new tensions within the STI field pertaining to syndromic treatment and care, including the way patient subjectivities and contexts, such as homophobia or physical pain, may necessitate syndromic treatment, highlighting the challenge of balancing presents and futures in such a context. As such, the particularities of our case study extends sociological scholarship on AMR, by further complicating the ways in which resistance plays out across economic, institutional and clinical spheres. This inserts an important new layer to our comprehension of the bio-social dimensions of resistance, which is critical to both comprehension of AMR as a highly diversified scene, and important for gaining traction in any proposed solutions. In saying this, we note an analysis of treatment cultures may be limited in its generalisability. However, the concept nonetheless provides an abstraction for analytic enquiry, which helps to critically evaluate taken-for-granted ways of practising care and how it is produced, as we have done so in this study.

Importantly, present treatment cultures surrounding STIs are predominantly influenced by an ideology that a healthy body is pathogen free, relying on black and white definitions of what constitutes a 'pathogen' in the first place (Kenyon et al., 2022). In essence, as our participant's note, the consequence of this is subjecting bodies to regular surveillance and antimicrobial intervention: detecting, targeting and eliminating pathogens, as in the case of quarterly bacterial STI testing for PrEP users. This constructs 'sexual health' as being almost exclusively about individuals in the here and now, and relatively swift recoveries, that is, valorises immediacy. In the context of AMR, this black and white sensibility — which our participants often challenged — does little to consider collective health, holistic health or sustainable futures. By way of example, disrupting treatment cultures to allow a body to be 'unhealthy' or 'diseased' in the

present (e.g., by letting asymptomatic gonorrhoea remain untreated in cis men who exclusively have sex with other cis men (Wardley et al., 2023)) may ironically create the potential for healthier bodies in the future by contributing to broader efforts to curb AMR. Such a frame of reference shifts the emphasis away from the infection as a singular organism that causes disease in the present, to a more complex and panoramic understanding that considers the future of antibiotic use (see Kenyon et al., 2022 for an in-depth discussion). This exists in tension with positive aspects of treatment cultures as described by participants, where clinicians seek to provide genuine care, whilst considering the subjectivities and contexts of their patients.

As a result, a paradoxical relationship to treatment practices emerges at the crossroads of individual needs vis-à-vis broader concerns about the rise of resistant STIs. While participants understood the need to administer antibiotics in a more considered manner to preserve their efficacy, they simultaneously recognised that patients experiencing significant pain and discomfort should be treated, even if this is based on symptoms. As Mol (2008: 74) states, 'in the logic of care attentiveness and specificity are good and neglect is bad'. The point is not to simply withhold treatment. Rather it is to take measures, where possible, such as reduced testing to not detect asymptomatic infections, or waiting for results to deliver more precise treatment, which may help curb the rise of AMR. Considering this, we argue that clinicians are balancing two forms of care, which includes care for the individual in the present, and care for the collective future that needs antibiotics to last. In this sense, clinicians must navigate the tensions of individualist and ecological frames, as they decide who to care for, and how, occupying positions at the intersection of the dominant treatment culture, concerns about AMR, and caring for their patients. While absent from this study, patient attitudes to STIs in the context of AMR will provide a deeper understanding of the relational dynamics of such care, and what they mean for resistance.

To some extent, clinician insights are already being integrated into treatment cultures, in everyday clinical practice. Cultures, after all, are changeable; not static. This means current over reliance on antibiotics in STI care can be 'designed out' (Dixon et al., 2021), to a degree, through cultural transformation. This was apparent in participant reflections concerning the counter-culture moves they are instigating. Thinking with the idea of a counter-culture shows how treatment cultures are already an object of enquiry open to reflexivity and critical evaluation, giving rise to new practices. These prefigurative actions also include reflections from patients themselves, who express concerns about their gut microbiome vis-à-vis routine antibiotic use, and therefore may be open to new care practices (Davis et al., 2020). However, as suggested throughout our analysis, the transformation of treatment cultures will also require policies that address structural issues (Kirchhelle et al., 2020), such as government-industrial relations vis-à-vis innovation, and the prioritisation of STIs in the first place. This includes centring traditionally 'undeserving' subjects, such as MSM and sex workers, within global AMR policies, where issues of stigma and prejudice can mean the neglect of these groups.

## CONCLUSION

This article demonstrates that a sociological framing of rising antibiotic resistance in STIs necessitates thinking about treatment as a cultural production to further develop a panoramic and relational understanding of the transformations that can curb resistance. Data illustrate that treatment cultures are assembled through the interaction of political priorities, economic considerations, taken-for-granted clinical practices and an orientation towards the present. However, these normative practices are also subject to intervention, where clinicians critically



evaluate treatment, which gives rise to counter-cultural practices. This bottom-up approach involves re-designating antibiotics as precious resources, which need to be used carefully with an orientation towards the future. Ultimately, findings demonstrate that a relational and networked solution is required, where governments better support industry for scientific innovation, and share in cost-benefits. This has potential flow-on effects to increase efficiency of testing and treatment, and the subsequent transformation of clinical practice, alongside a critical rethinking of the meaning of care, infection elimination and a future-orientated approach to antibiotics, involving tailored engagements with community members. As such, future research should consider exploring community understandings of AMR and STIs, their relation to people's sexual practices and reflections on potential solutions to the curb the rise of resistance (e.g. reduction of testing for MSM). This will be crucial for developing interventions that speak to people's everyday realities and experiences of sexual pleasure. Moreover, to develop appropriate relational and networked solutions, further research should also focus on other localised contexts, including different regions within the Global North. This will provide valuable insight into existent local sexual health infrastructures, and constructions of sexuality, as they relate to the nuances of addressing antibiotic resistant STIs globally.

### AUTHOR CONTRIBUTIONS

**Shiva Chandra:** Conceptualization (lead); formal analysis (equal); writing—original draft (equal); writing—review & editing (equal). **Alex Broom:** Conceptualization (lead); formal analysis (equal); funding acquisition (lead); methodology (equal); writing—original draft (equal); investigation (supporting); writing—review & editing (equal). **Damien Ridge:** Writing—review & editing (supporting). **Michelle Peterie:** Formal analysis (equal); investigation (lead); methodology (equal); project administration (lead); writing—review & editing (supporting). **Lise Lafferty:** Investigation (supporting); writing—review & editing (supporting). **Jennifer Broom:** Writing—review & editing (supporting). **Katherine Kenny:** Writing—review & editing (supporting). **Carla Treloar:** Writing—review & editing (supporting). **Tanya Applegate:** Writing—review & editing (supporting).

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### CONFLICT OF INTEREST STATEMENT

There are no conflicts of interests to declare.

### DATA AVAILABILITY STATEMENT

Due to the nature of the study and to protect participant confidentiality, the data from this study are not publicly available.

### ETHICS STATEMENT

Ethics approval was sought and granted from University of Sydney's Human Research Ethics Committee (reference: 2022/128).

### PATIENT CONSENT STATEMENT

N/A.

## PERMISSION TO REPRODUCE MATERIAL FROM OTHER SOURCES

N/A.

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## ENDNOTE

<sup>1</sup> This article draws on a broad definition of culture as a way of life and by extension approaches to STIs similarly constitute a way of doing treatment (see Jenks, 2005 for an in-depth discussion of definitions of culture).

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