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GBTQ+ Safe Sex Entanglements: Finding the Bacterial in the Age of Resistant STIs and Prevention Innovation

Shiva Chandra, Alex Broom, Damien Ridge, Katherine Kenny, Michelle Peterie, Jennifer Broom, Bridget Haire, Lise Lafferty, Carla Treloar, Stephanie Raymond, Catriona Bradshaw, Tanya Applegate, Rebecca Guy

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Author Names and Affiliations:

Shiva Chandra (Corresponding Author)

Sydney Centre for Healthy Societies, School of Social and Political Sciences, Faculty of Arts and Social Sciences, The University of Sydney, Sydney, New South Wales, Australia

Email: shiva.chandra@sydney.edu.au

Alex Broom

Sydney Centre for Healthy Societies, School of Social and Political Sciences, Faculty of Arts and Social Sciences, The University of Sydney, Sydney, New South Wales, Australia

Email: alex.broom@sydney.edu.au

Damien Ridge

School of Social Sciences, University of Westminster, London, UK

Email: d.ridge@westminster.ac.uk

Katherine Kenny

Sydney Centre for Healthy Societies, School of Social and Political Sciences, Faculty of Arts and Social Sciences, The University of Sydney, Sydney, New South Wales, Australia

Email: katherine.kenny@sydney.edu.au

Michelle Peterie

Sydney Centre for Healthy Societies, School of Social and Political Sciences, Faculty of Arts and Social Sciences, The University of Sydney, Sydney, New South Wales, Australia

Email: michelle.peterie@sydney.edu.au

Jennifer Broom

School of Medicine and Dentistry (Sunshine Coast Campus), Griffith University, Sunshine Coast, Queensland, Australia

Infectious Diseases Service, Sunshine Coast Hospital and Health Service, Sunshine Coast, Queensland, Australia

Email: jennifer.broom@health.qld.gov.au

Bridget Haire

School of Population Health, University of New South Wales, Sydney, NSW, Australia

Kirby Institute, University of New South Wales, Sydney, NSW, Australia

Australian Human Rights Institute, University of New South Wales, Sydney, NSW, Australia

Email: b.haire@unsw.edu.au

Lise Lafferty

The Kirby Institute, UNSW Sydney, Sydney, New South Wales, Australia

Centre for Social Research in Health, UNSW Sydney, Sydney, New South Wales, Australia

Email: l.lafferty@unsw.edu.au

Carla Treloar

Centre for Social Research in Health, UNSW Sydney, Sydney, New South Wales, Australia

Email: c.treloar@unsw.edu.au

Stephanie Raymond

Sydney Centre for Healthy Societies, School of Social and Political Sciences, Faculty of Arts and Social Sciences, The University of Sydney, Sydney, New South Wales, Australia

Email: stephanie.raymond@sydney.edu.au

Catriona Bradshaw

Melbourne Sexual Health Centre, Alfred Health, Melbourne, VIC, Australia

School of Translational Medicine, Faculty of Medicine, Nursing and Health Sciences, Monash University, Melbourne, VIC, Australia

Centre for Epidemiology and Biostatistics, School of Population and Global Health, The University of Melbourne, Melbourne, VIC, Australia

Email: catriona.bradshaw@monash.edu

Tanya Applegate

The Kirby Institute, UNSW Sydney, Sydney, New South Wales, Australia

Email: tapplegate@kirby.unsw.edu.au

Rebecca Guy

Kirby Institute, University of New South Wales, Sydney, New South Wales, Australia

Email: rguy@kirby.unsw.edu.au

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Corresponding author address (full address is required)

The University of Sydney,
Camperdown NSW 2050

Corresponding author email address

shiva.chandra@sydney.edu.au

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Title

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Abstract

Few studies have explored community experiences of our increasingly resistant bacterial landscape, and, in the sphere of sexually transmissible infections (STIs) and antimicrobial resistance, there is even greater absence of community-centred research. This is despite a growth in STI transmission worldwide, which, alongside accelerated resistance, will disproportionately affect GBTQ+ (gay, bisexual, trans, queer+) populations. In this article, drawing on semi-structured interviews conducted in 2024 with 49 cis and trans gay and bisexual men, trans women and gender diverse people, we explore contemporary GBTQ+ safe sex practices as they relate to the growing threat of antibiotic resistant STIs. Key themes identified where the pharmaceutical turn in safe sex practices, the tensions this produced, the complexities of condom use, and the influence of biographies on safe sex practices. We illustrate how the turn toward pharmaceutical solutions have reconfigured and continues to reconfigure safe sex, giving rise to pleasures that were hitherto 'off-limits' to many. However, escalating antibiotic resistance threatens to again alter community practices and relationships to STI prevention measures. Drawing on Barad, we develop these themes to theoretically conceptualise safe sex as not fixed, but as an *entanglement* that is relationally and iteratively (re)configured through the connections between objects, subjectivities, practices, temporalities, and the human-microbial dynamics entailed therein. Findings suggest public health and clinical communication about resistance should speak to population concerns about gut health, resistance vis-à-vis Doxy-PEP, changing definitions of safe sex, and the importance of pleasure.

Key words: antimicrobial resistance; qualitative; sexuality; Australia; STIs/STDs; sexual health; safe sex

Introduction

In 2020, there were 374 million recorded new cases of *Neisseria gonorrhoeae* (gonorrhoea), chlamydia, syphilis, and trichomoniasis internationally for people aged 15 to 49 (WHO, 2024). Such high rates of global sexually transmissible infections (STIs) are reproduced nationally in Australia, with a rise of gonorrhoea, chlamydia and syphilis cases reported in 2022 (King et al., 2023). In Australia, gay and bisexual men were more frequently diagnosed with gonorrhoea and syphilis infections between 2018 and 2022 (King et al., 2023). Risks are escalating in vulnerable groups because of increasing antimicrobial resistance (AMR) in gonorrhoea and *Mycoplasma genitalium* (mycoplasma) (CDC, 2024). Over time, gonorrhoea has become sequentially resistant to multiple classes of first line drugs (Jose et al., 2020; Unemo & Shafer, 2014; Workowksi et al., 2008). As a result, the use of third generation cephalosporins – ceftriaxone and cefixime – has been the backbone of gonorrhoea treatment since the 1990s. However, the emergence of extensively drug-resistant gonorrhoea (van Hal et al., 2024), including decreased susceptiability to ceftriaxone, is a growing threat, with increasing treatment failures expected as resistant strains become more prevalent. Yet, community understandings of antibiotic resistant STIs and their implications for safe sex practices remains limited.

As STI rates increase globally, populations with high STI prevalence, such as men who have sex with men (MSM) and transgender people (WHO, 2024) will be impacted disproportionately by accelerated resistance given high rates of STI diagnosis in these populations. However, a significant portion of the literature on these population's safe sex practices has tended to focus on HIV and its prevention. While historically, at least in the last four decades, bacterial STIs have been considered less threatening than HIV, in the context of evolving AMR and effective prophylactic and treatment agents for HIV, investigation into safe sex practices as they relate to bacterial STIs and AMR is now timely.

In this paper, we explore contemporary safe sex practices across Australia amongst cis and trans gay and bisexual men, trans women and gender diverse people. We do this by conceptualising safe sex practices in relation to the evolving microbial milieu as *entanglements* rather than singular sites of human-microbial dynamics. We use the concept of entanglements as it captures the relational and 'unfinished' nature of safe sex in relation to the human, material, and microbial, drawing attention to the iterative way safe sex is (re)produced as new STI prevention measures develop, how they interact with evolving bacterial pathogens, and what this means for people's sexual practices and the temporal dimensions of safe sex.

Historical framings of safe sex within sexuality and gender diverse populations have mostly focused on cis-gender gay and bisexual men, or men who sex with men broadly (MSM). For this reason, our historical account below has a skew towards this group, despite our more diverse study sample. When referring to the work of other authors, and historical trends, we have tried to use the terminology that best captures their work and framings. For this reason, we use MSM where appropriate, and GBTQ+ to refer to our more diverse study sample. Moreover, while we use 'community/communities' to describe GBTQ+ people as a collective, we acknowledge the complexities of belonging, and tensions therein (anonymised, 2024).

The Cultural Brokering of 'Safety'

Analysing the historical and contemporary terrain of safe sex practice in GBTQ+ populations provides a snapshot of the developing relations in which STI risks are being managed, and where resistance is emerging and will increasingly play out. The HIV/AIDS crisis saw the development of 'safe sex' in the 1980s as a formalised and professionalised concept and set of practices – both in Australia and in other parts of the world such as North America (Chambers, 1994; Kippax et al., 1993). The Australian construction of safe sex was premised on an ethic of co-operation between the communities most affected, government health departments and medical bodies, community organisations, researchers, and public health and health promotion professionals, in ways that engaged with the realities of people's everyday lives (anonymised, 2024; Cook, 2020; Robinson & Wilson, 2012).

During this time, gay organisations and services (which had developed to address HIV/AIDS) actively promoted the use of condoms, which up until then had predominantly been seen as a heterosexual intervention to address pregnancy, alongside other non-medical risk reduction practices (Cook, 2020; anonymised, 2021). Rather than evoking fear (see Lupton, 2015), sex was framed as positive and human, whilst an ethic of care was also advanced among community members (Leonard, 2012). This led the development of the 'condom code' in gay communities in Australia and North America, premised on the initial idea that a condom was needed in every instance of anal sex (Race, 2018). In Australia, community-based organisations promoted this message often in ways that were sexually explicit and humorous, focusing on the 'celebration of sexuality' and 'the possibility of safe sexual fulfilment' (Sendziuk, 2003:

114). As such, public health campaigns placed emphasis on behavioural methods of HIV/AIDS prevention, and their ability to foster pleasure.

Despite this, there were concerns that, over time, gay men had 'relapsed' into condomless anal sex (Holt, 2014). While traditional public health epistemologies were more likely to frame this as 'failure' to engage in safe sex, others pointed to the early emergence of 'negotiated safety' (Holt, 2014; Kippax et al., 1993). Here, regular sexual partners who were both HIV negative would eliminate the use of condoms with each other, while negotiating to engage in safe sex practices with others outside of the relationship (Kippax et al., 1993; Kippax et al., 1997). Alongside practices of negotiated safety, researchers identified other measures employed by MSM to reduce the risk of HIV transmission, such as 'serosorting' and 'strategic positioning'. The former involved selecting partners with the same HIV status as oneself and limiting condomless sex to these partners (Holt, 2014; Race, 2018). Conversely, strategic positioning involved partners assuming sexual positions, based on HIV status, to reduce the chances of transmission (Van de van et al., 2002). The use of online hookup applications, such a *Grindr*, has seen a continuation of serosorting practices, with people using the affordances of these platforms, such as ability to display HIV status on profiles, to find sexual partners of the same HIV status (Chadwick, 2023; Numer et al., 2019). Importantly, such practises demonstrate that rather than being passive recipients of public health messaging, community members are knowing and reflexive subjects, capable of processing complex bio-medical knowledge to shape their practices towards risk reduction, or what Race (2003) calls a process of 'reflexive mediation' (see also Crawshaw, 2012). However, in this context, bacterial STIs have traditionally taken a 'back seat', especially given their treatability in comparison to HIV.

In the contemporary period, the most significant developments around safe sex in Australia and the Global North more broadly have been Treatment as Prevention (TasP) (treating patients with HIV to prevent transmission to others) and the introduction of pre-exposure prophylaxis for HIV (PrEP) (taking antivirals to significantly reduce HIV acquisition rates for people at high risk), signalling the growing importance of pharmaceutical approaches to HIV prevention (Kolstee et al., 2022; Wells et al., 2023). TasP is premised on the fact that an individual whose HIV viral load is undetectable due to antiretroviral therapy (ART) cannot transmit the infection to sexual partners (Bavinton et al., 2018). In Australia, regulatory changes have also been introduced including the availability of PrEP antivirals on the Pharmaceutical Benefits Scheme (PBS) since April 2018, which means the government subsidises the medication for people with access to Medicare (Australia's universal health insurance scheme). Individuals have the option to take the pill daily, or on demand (which is only recommended for cisgender men) (ASHM, 2023). This involves taking 2 pills 2-24 hours before sex, 1 pill 24 hours after the double dose, and another pill 24 hours after that. In light of this, communication and messaging around PrEP has mostly relied on reducing the risk of HIV infection (Kutner et al., 2021). There has been limited engagement with the broader implications of PrEP such as possibilities for pleasure and reduced HIV anxiety, except for certain grassroots organisations (see Kutner et al., 2021 for more).

Recent debates about Doxy-PEP represent ongoing developments in pharmaceutical solutions to safe sex practices, and a turn towards greater consideration of bacterial STIs. Doxy-PEP involves taking a 200mg dose of doxycycline up to 72 hours after a sexual event (where condoms have not been used) to reduce the chances of acquiring a bacterial STI. However, there is significant variation in national and international perspectives on the approach (see Cornelisse at al., 2024 for an overview). In Australia, the Australasian Society for HIV, Viral Hepatitis and Sexual Health Medicine (ASHM) has recommended the use of Doxy-PEP for at

risk MSM, primarily for the prevention of syphilis (Cornelisse et al., 2024). A key consideration in these debates is the concern that Doxy-PEP may contribute to development of antibiotic resistant STIs, and antibiotic resistance in bystander organisms and non-target infections more broadly (anonymised, 2024; Cornelisse et al., 2024). Recent research with MSM and non-binary people also shows that knowledge about AMR leads to concerns about Doxy-PEP use, and the potential for it to induce resistance (Eshan et al., 2024; Holt et al., 2025). This complicates the ongoing use of pharmaceuticals for STI prevention, which is part of a longer historical shift away from behavioural measures.

Entangled Safety

To theorise how pharmacological innovation and resistant STIs shape practices and understandings of safe sex, we draw on the work of Barad (2010; 2007) to conceptualise safe sex as a relational entanglement of objects, practices, subjectivities, and temporalities, which actively produce one another. According to Barad (2010; 2007), objects, people, space and time are produced through intra-active processes. *Intra-action*, as opposed to *interaction*, speaks to the idea that material objects and discursive meanings do not pre-exist their interaction with one another; rather, they are constituted by their relationality in the first place. This means materialisation or 'mattering' is an ongoing, iterative process, which is never stable or complete but always 'becoming' (Barad, 2007). This has implications for the relationship between space, time, and matter, which are conjoined in a process of *spacetimemattering*, where:

> *... the past was never simply there to begin with and the future is not simply what will unfold; the 'past' and the 'future' are iteratively reworked and enfolded through the iterative practices of spacetimemattering [...] Space and time are phenomenal, that is, they are intra-actively produced in the making of phenomena ... (Barad, 2010: 260-261).*

As such, time and space are enmeshed with, and produced through, people and things, rather than existing outside of individuals and objects. Barad (2007: 177) conceptualises this entangled co-production as generative of potential (and limitations), or as they state '*intra-actions iteratively reconfigure what is possible and what is impossible – possibilities do not sit still*'. It is also through this relational process that separations are made and boundaries drawn to construct reality. Writing about human and non-human separations, Barad (2007: 172) explains that '*human bodies, like all other bodies, are not entities with inherent boundaries and properties but phenomena that acquire specific boundaries and properties through the open-ended dynamics of intra-activity*'. Within this framework, Barad (2007: 178) conceptualises agency as 'a matter of intra-acting', where 'it is an enactment, not something that someone or something has'. Importantly, this is not limited to humans, but also includes other forms of matter, which participate in the intra-active creation of limitations and possibilities. As such, agency is relational, and entails abilities to shape that making of reality. As the historical trajectory of safe sex recounted above demonstrates, it has always been intra-actively shaped by technological developments, and processes of reflexive mediation, as populations have iteratively shaped what this looks like. Drawing on this and Barad's framework, we conceptualise safe sex as continually 'becoming', examining how it is shaped by treatment innovation and the threat of antibiotic resistant STIs in ways that redraw the boundaries around what constitutes safe sex as it is re-materialised through the interaction of objects, people, time and (im)possibilities.

Method

Recruitment and Interviews

In this paper, we report on interviews with 49 people conducted in 2024 who were recruited through a variety of online and offline methods using a purposive sampling strategy. This included advertisement through Facebook and Instagram, ACON (Sydney based LGBTQ+ health organisation), sexual health services, professional mailing lists, and researcher networks. Our advertisement material asked potential participants '[a]re you concerned about antibiotic resistant STIs?' and explained that we wanted to talk to community members about this. This material included our selection criteria. It stated that potential participants (1) had to be 18 or older, (2) be living in Australia, and (3) identify a gay or bi+ man, trans or gender diverse person, or a man part of these sexual networks (see anonymised, 2024, for a reflexive analysis of the study's sampling strategy and rationale). We used 'bi+' to capture the diversity within the 'bisexual umbrella', which includes people attracted to multiple genders, like those identifying as queer, agender, and non-binary. All participants provided informed consent before taking part in a semi-structured interview. At the start of interviews participants were informed that it was not a test of knowledge, rather, it was to understand what people know about AMR and sex. They were informed interview questions would revolve around their understanding of antibiotic resistance, sexual practices, experiences with medical professionals, and reflections on how to address drug resistant STIs. Participants were told they did not have to answer questions they did not want to and could pass questions if they were uncomfortable. All interviews were conducted by [anonymised] who is a cis-gender gay man. Ethics approval was sought and granted from [anonymised] and the [anonymised]. Pseudonyms are used throughout the article. In light of our interviews, we have chosen to use 'safe sex' over 'safer sex' as this was the language mostly used by our participants.

Participant Demographics

Of the 49 interviewees, 43 were reported 'male' at birth, and six were reported 'female' at birth. Eleven people identified with a gender other than the one they were reported at birth (at times also including gender reported at birth). This included identifiers such as: genderqueer, agender, transgender man, non-binary, and trans masculine. Of these 11 participants, some also identified with more than one gender, e.g., one participant identified as non-binary, genderqueer and agender.

Thirty-eight participants identified with a single sexuality: 37 as 'gay', and five as 'bisexual'. One participant identified as 'pansexual'; one as 'gay and pansexual'; two as 'gay and bisexual'; two as 'bisexual and pansexual'; and one as 'bisexual, queer, and pansexual'. Ages ranged from 19 to 61. Thirty-four participants were born in Australia and 15 were born overseas.

Participants came from all Australian states and territories spread across urban, rural, and regional locations. Self-identified ethnic backgrounds included: Anglo (17); Anglo Celtic (3); Caucasian (3); White (2); Anglo Australian (1) Australian (1); Australian-Canadian (1); Aboriginal Australian (1); Asian (1); Malaysian Asian (1); Vietnamese (1); Chinese (1); Singaporean Chinese (1); Indonesian (1); Filipino Australian (1); Pakistani (1); Indian (1); Jewish (1); Scottish and Irish (1); Spanish (1); Turkish (1); Latino (1); White American (1); Eastern European (1); Greek (1); Italian (2); and one participant had mixed ethnicity.

Drawing on in-depth interview discussions about safe sex practices, at least two people were HIV positive, and the rest of the sample appear to be HIV negative.

When reporting participant quotes below, we have provided age, their gender identification, and gender reported at birth (RMAB – reported male at birth; RFAB – reported female at birth).

Analysis

Interviews lasted approximately 1 hour in length and took place via Zoom or in person. They were audio recorded and transcribed by a professional service for analysis. Data analysis in the study drew on interpretive traditions in qualitative research (anonymised, 2020). This entails a deeply explorative approach to data collection and analysis to understand participants' subjective and complex experiences. To do this, we undertook a thematic analysis of the data (Guest et al., 2012). After each interview, detailed notes were written by [anonymised], capturing key insights, observations of interest, and an overview of participant experiences and reflections. During this stage, key themes were identified; this process included making connections between different interviewees' experiences, and noting divergent, atypical, and conflicting experiences (Ezzy, 2002). This process included regular discussions with the broader team and centred around exploring the five key areas of interest highlighted above.

To systematically organise and analyse data, interviews were coded by [anonymised] using Nvivo14 software, taking an inductive approach that drew on the notes, observations, and team discussions allowing for in-depth exploration of the data, and to reflect on the development of codes. More formalised coding involved two stages: first, the identification of broad overarching codes/themes, and then a second stage where broader codes were 'broken down' into sub-codes to create a more nuanced understanding of the data. Undertaking systematic coding of data after the initial exploratory stage of analysis highlighted above, ensured themes that were identified during later interviews could be sought out and coded in earlier data, alongside diverging experiences as well. This allowed us to group data that may have appeared unrelated at first, draw connections, and complicate themes further. Barad's framework guided our interpretation of data by sensitising analysis to the relational aspects of objects, practices, subjects, and time, and how these mutually constitute and transform one another to understand the ongoing productions of safe sex practices, and the (im)possibilities entailed. For example, the code on 'PrEP use' was broken down into sub-categories such as 'PrEP negating the use of condoms', and 'PrEP opening domains of pleasure'. This process allowed use to think through how PrEP (object) was intra-actively giving rise to new formations of safe sex, and experiences, which we explore below.

Results

The Pharmaceutical Turn in Safe Sex

From the 1980s to the 2010s, the notion of safe sex within MSM communities was largely premised on the use of condoms to prevent HIV transmission during anal intercourse, alongside other behavioural interventions (i.e., negotiated safety). The last decade has witnessed a pharmaceutical revolution in approaches to shaping safe sex discourse and practices, and the emergence of antibiotic resistant STIs. In Australia, the introduction of PrEP, and its popularity with large numbers of MSM in particular, has seen a steady decline of HIV infections amongst this group, particularly those born in the country (Grulich et al., 2021; Medland et al., 2018). Concurrently, present evidence suggests the use of PrEP has simultaneously resulted in an

increase in condomless anal sex (anonymised, 2021; Holt et al., 2018). Participants explained how use of PrEP provided robust non-condom protection against HIV, with some considering bacterial STIs, namely gonorrhoea and chlamydia, a minor but largely treatable 'inconvenience' (see also Sarno et al., 2021), with STIs relationality mattering one another's perceived severity, through their entanglement with PrEP severity. As Oliver (35 yrs, man, RMAB) outlined:

> *It sounds awful but, if you had to say rank the, the STIs […] obviously, we all know that HIV is the one that is the one that, in a sense, is the incurable one. But it has the treatment regime that can obviously reduce your, your transmission rate and those type of things. […] like it's that list. You don't want the first one but you're happy with any of the others. And, and you're happy to take that risk. And, if like PrEP is the one that deals with the top one, well, everything else is treatable.*

Oliver also linked this with the potential rise of resistant STIs, explaining:

> *So, it's that juggling act, I think, in that PrEP has created a false sense of security which then goes, "Well, I can have more high-risk sexual activity," for example, which then increases your risk of an STI, which then potentially you have more of them and you get treated with more antibiotics. You then create, obviously, an anti-resistant [antibiotic resistant infection] …*

Other participants also saw condomless sex as increasingly normalised, at least in comparison to the pre-PrEP/U=U era. Leon (36 yrs, non-binary/genderqueer, RMAB) reflected on returning to *Grindr* after a long hiatus, only to be confronted by the remarkable extent to which people were apparently willing to have condomless sex compared to years earlier:

> *… I'd been off Grindr for almost a decade. And when I went off […] PrEP wasn't really a thing. And then when I came back, I came into a world where PrEP existed and the amount of people who were like, "Breed me" [ejaculating in someone's anus without a condom] on Grindr in big fat letters was somewhat confronting.*

While condomless sex in GBTQ+ populations is not new, as certain participants were having condomless sex before the widespread uptake of PrEP, interviewees talked about the collective turn to chemical prophylaxis reconfiguring this as a more viable possibility. For example, Hamish (29 yrs, man, RMAB) explained that before taking PrEP he was not engaging in condomless sex. However, the protection offered by PrEP allowed him to discover – in practice – the joy of semen exchange with other men, which he had only fantasised about up until then:

> *There was the fantasy there watching porn growing up and everything. I never really thought to do it because I thought I'm going to just play it safe with the condoms on. But afterwards I was like, yes, this is fucking awesome.*

In a similar manner, Harry (30 yrs, man, RMAB) said that before going on PrEP semen exchange was not part of his sex life. He was '*too scared before then because of the risk [of HIV]*'. However, because of PrEP he has discovered '*the thing that I enjoy the most is having their [sexual partner's] cum in me*'. Lachlan (30 yrs, man, RMAB) also explained that without condoms sex '*just feels better*' and is '*like hotter as well*', which he would only occasionally engage in with trusted partners before PrEP, however, now he mostly has condomless sex since being on PrEP. In other words, PrEP symbolises and has intra-actively mattered greater

opportunities for different forms of sex and pleasure, through the entanglement of drugs, people, reduced fears of HIV, and the practices entailed therein (see also Crath et al., 2023). However, this also represents a paradoxical arena, marked by tensions and contradictions, where new measures intra-actively produce safety (against the viral), opportunities for pleasure, as well as potentially new risks (in the form of exposures to bacterial resistance).

Such transformations have (re)shaped the emphasis on testing for STIs as an important practice in how people reconfigured safe sex (see also anonymised, 2021). In Australia, a culture of regular testing is promoted through LGBTQ+ organisations and health services that actively endorse such surveillance, as well as through PrEP prescription guidelines, which recommend quarterly testing for HIV, syphilis, gonorrhoea, and chlamydia (ASHM, 2023). As Hunter (59 yrs, man, RMAB) explained:

> *Sometimes you hear people describing using condoms as safe. But I regard safe sex as taking PrEP, being regularly tested for STIs, and then if you get an STI, telling other people that you've had an STI. That's what I regard safe sex as, or responsible sex as.*

PrEP prevents the acquisition of HIV, whilst bacterial infections like gonorrhoea and chlamydia can be tested for and treated, making testing of bacterial STIs increasingly important to contemporary safe sex entanglements and intra-actively delineating the new boundaries of safe sex. The notion that testing constitutes safe sex also informed participant's understanding of measures to address bacterial resistance. As Dante (33 yrs, man, RMAB) explained, '*For me, they [people] should get tested [to curb resistance]. Getting tested more often*'. Mallesh (37 yrs, man, RMAB) said that although he knows about resistant STIs and is particularly concerned about them, he can take care of himself, '*As long as you're aware, your partner's tested and you get tested regularly and practice safe sex, I think you should be OK with that [resistance]*'. This means existent practices, such as regular testing, are entangled with participant's 'safe sex imaginaries', illustrating that resistance is through these understandings of safe sex.

Rising (Pharmaceutical) Tensions

The turn towards pharmaceutical solutions is an unfinished process (or continually 'becoming') in the STI space. Within this context, Doxy-PEP represents a continuation of the pharmaceutical turn in safe sex entanglements. However, greater variations in attitudes to Doxy-PEP areas entangled with individuals' assessments of risk, including imaginaries about antibiotics and their implications for resistance and broader wellbeing (e.g., the gut microbiome/health). Some participants were early adopters of Doxy-PEP, and others were not taking doxycycline as post exposure prophylaxis themselves but had partners or friends who were using it. Any comfortableness around Doxy-PEP was nascent – often connected, for example, to its widespread use and endorsement in the US, or its recommendation by trusted parties such as health practitioners or friends:

> *… I have two friends who are in open relationships and are quite sexually active […] And one of them works in an STI screening clinic, and the other is a researcher and very knowledgeable, and both of them take it, take Doxy-PEP. […] I would be remiss not to say that part of my logic is just going, "Hey, these people are smart. They seem to know what they're doing. They seem to have relevant qualifications, they choose to do this, maybe it's fine for me to do." (David, 38 yrs, man, RMAB)*

> *Well, it's [Doxy-PEP] huge in the US. It's available. If it wasn't fine, it wouldn't be available, right? That seems to be their [partner and friends'] rationale. (Emma, 35 yrs, woman, RMAB)*

Knowledge and usage of Doxy-PEP are transmitted through personal networks, including via international flows of information, or what Appadurai (1990) calls 'mediascapes'. Such processes have also been noted in the existent health communication literature on experiences of PrEP (see Kerr et al., 2024: Schwartz et al., 2017). Information and rationalisation of pharma technologies are actively being assimilated, deployed, and entangled with one another to iteratively 'make' safe sex. For example, Harry (30 yrs, man, RMAB) spoke about weighing important considerations when deciding if he needed to use Doxy-PEP after a sexual event. This included thinking about factors such as what sexual act he had engaged in, the apparent risk of the partner, and how many partners he had been with. He explained:

> *… the only probably two situations where I would not use Doxy-PEP is if I gave one person oral or one or two people oral and then did a gargle afterwards, or if someone came in me that I kind of knew that they were on PrEP and that means that, you know, I was assessing my risk with them. But, if it's more than one person who came in me or like in my arse or, yeah, anything further, 100 per cent Doxy-PEP.*

Harry was using a risk calculus to decide when to use Doxy-PEP, where the medication was situationally mattered given its entanglement with multiple considerations. However, as suggested, the (im)possibilities of Doxy-PEP also has potentially differential outcomes, as many interviewees were also concerned about the potential for emergent negative effects of Doxy-PEP. This included the impact of antibiotics on bacterial resistance and gut health. Two participants explained:

> *It's just another way to increase the antibiotic resistance, isn't it? I mean first of all, I'm not convinced that doxycycline is an effective treatment for all of the different bacterial STIs that are around. So my impression – it might only prevent some of the STIs and not others. And I just don't think, in the current situation, it's a responsible thing to be using antibiotics when you don't have a bacterial illness to treat because that's how we got antibiotic resistance. Like antibiotics should be reserved for when you have a confirmed or highly probable bacterial infection where it's probably a bacteria that's specifically going to get killed by that antibiotic. Like just willy-nilly kind of like, "I'm going to just take some antibiotics just in case," like that's why there's antibiotic resistance. (Roman, 43 yrs, man, RMAB)*

> *No. Hard pass [on Doxy-PEP]. Hard pass for me, personally, because I do feel that firstly, personally, I don't want to be on antibiotics that much. I really – it does a lot to your gut health. (Avery, 28 yrs, transgender man, RFAB)*

Harry – who, as stated, is currently a Doxy-PEP user – also spoke about the importance of including considerations about resistance into Doxy-PEP's roll out, explaining:

> *I think it [Doxy-PEP] 100 per cent needs to be implemented but with research alongside it. I think it's too good of […] a way to reduce a lot of those bacterial STIs to not use it right now. And then alongside that screening patients for their own genetic changes to the bacteria in their gut and on their skin, you know, in their body. But, also, tracking*

> *just in general the resistance of those STIs that are still occurring, looking at their resistance because of the increased use of Doxy-PEP.*

Such observations suggest challenges and limits to the pharmaceutical turn in safe sex. Prior understanding about antibiotics, including resistance and implications for the whole body's wellbeing (anonymised, 2024), inter-actively shape approaches to safe sex; a more than STI approach, creating (im)possibilities for sexual health.

Troubling Condoms

The pharmaceutical turn in safe sex practices is critical business, and the intra-action between contexts, subjects, and objects means some people *do* continue to use condoms, as they 'matter' differentially in comparison to people who may not (as above). A preference for condoms can be for a range of reasons, including limited sexual activity, the risk of pregnancy (e.g., for trans men), aversion to bodily fluids, and the wish to avoid bacterial STIs. For Diego (34 yrs, man, RMAB) PrEP meant add-on safety to condoms, rather than stand-alone safety:

> *This is why I think people get incorrect knowledge about PrEP, because they think PrEP has been created to make people have sex with no condoms. But it's not this. [laughs] It's to have a plus. You still have to use condoms. You still have to have protection. But in our community in general, you see people just using it as an excuse. Even if you go for a date or for anything, the first question you'll be asked is "Do you use PrEP?" So if you use PrEP, they understand, "OK, you can have sex with no condom." But this is not the purpose of PrEP. This is why I think people get too many STIs – because of this.*

Thus, the use of pharmaceuticals, and other STI prevention measures (i.e., condoms), are emergent and take on a multiplicity of meanings and materialisations in relation people and contexts (see also Michael & Rosengarten, 2013). For example, some interviewees explained that while someone may prefer to use condoms, contexts such as sex on premises venues, group sex situations, poor mental health, use of drugs or alcohol, and being 'in the moment' means this technology will not always be deployed:

> *… someone who I've been fucking for a while where we've been – and it kind of won't be a conscious – there's no conscious discussion around will we do it or not without a condom, it's just happened that we've just gone and we've just – in the heat of the moment have just gone for it. That's kind of driven that behaviour, I guess, where it's just – things have been – it's just been fairly intense and we'll just keep on going rather than pause, grab the condom, put it on. (Archie, 46 yrs, man, RMAB)*

> *… with that previous encounter I talked about […] I wanted to do it with a condom but then he was, "Oh, no, it's fine," like whatever. And it's like, it's kind of like heat of the moment. It's kind of like, "Oh, I don't really feel good about myself. I'll just like, if he wants me like this, I'll just do it," whatever. So, I think that does, that did have something to do with low self-esteem. So, I was just like, "Yeah, whatever." Like, "Just for like three minutes or whatever like I'll just, I'll just like give up my self-respect and self-esteem for three minutes," or whatever this was. (Abdul, 23 yrs, man, RMAB)*

Importantly, while condoms may appear to play less of a role in some people's sexual practices, the threat of antibiotic resistant STIs was seen as potentially re-mattering their importance for others, due to shifting contexts. For example, several respondents explained that if they were to note that bacterial STIs were becoming increasingly resistant (harder to treat/incurable), or rates of transmission of resistant STIs began to escalate, then they would be prepared to redeploy condoms for anal sex. For example, Oscar (31 yrs, man/non-binary, RMAB) explained:

> *... if we're looking at really, really resistant gonorrhoea, I'd probably use condoms again or probably restrict my sexual practices to like a kind of closed group of people.*

Certain participants were also open to using condoms for oral sex as well if resistant STIs were spreading more rapidly. As David (38 yrs) explained, *'I don't think the infection cares'*. However, others explained they would not use condoms for oral sex even if resistance was becoming more prevalent. They said oral sex would not be pleasurable with a condom and would rather abstain from oral sex, whilst others felt STIs were less transmissible through this route:

> *Well, first of all, from the perspective of the one doing the sucking, it's like who wants to suck on a piece of latex? And from the perspective of the other person, it just doesn't feel as good. (Roman, 43 yrs, man, RMAB)*

> *I haven't in the past [used condoms for oral sex]. I don't know, I feel like – and I might be wrong, but I feel like the risk of transmission is so much lower with oral compared to anal. (Mia, 19, woman, RMAB)*

Condoms occupy a complex position, where they are important to certain people's practices, whilst acting as a 'back-up' in the context of resistant STIs for others – namely for anal intercourse, although having more limited appeal in oral sex. As such, community attitudes to safe sex are responsive, nimble, and continually 'becoming' as has historically been the case in Australia. For example, the Australian state Leon (36 yrs, non-binary/genderqueer, RMAB) lives in (along with others) is currently experiencing a syphilis outbreak. They explained that people had noticed the rise in cases before the information campaign about it within his state. Leon explained that anecdotally they knew that the community had shifted sexual practices and increased condom use, stating:

> *... the amount of condoms the bathhouse [sex on premises venue] went through in a given week, I guess, would probably – once word had got out, I imagine that there would have been more – they would have had to buy an extra box that week ...*

Leon explained that, given the outbreak, they are more likely '*to use barrier methods at the bathhouse rather than perhaps otherwise relying on PrEP and testing*', including for oral sex, which they normally do not use condoms for. However, they would be tempted not to use condoms for oral sex now if, for example, '*the person is really hot*', illustrating how safe sex is entangled with multiple subjectivities, including the libidinal desires, which situationally matters objects like condoms. Overall, findings suggest that resistant STIs may differentially re-matter the importance of 'old measures' – condoms – through the intra-action of increased bacterial resistance, and desires to protect oneself from them. Importantly, resistant STIs also have the potential to shape less traditional approaches (e.g. rejection of oral sex in favour of

anal sex with condoms if needed for some) and constitute new forms of sexual practices. This would produce new permutations of safe sex and redraw the boundaries around what is simultaneously an open-ended practice.

Biographical Entanglements

Importantly, participants' relationship to STI prevention measures were mediated by their subjectivities and the broader socio-historical contexts of their biographies. For a couple of interviewees this was especially pertinent when they discussed the influence of shame on their ability to negotiate safe sex, illustrating the entanglement of matter (i.e., PrEP) and meaning, and how social conditions intra-actively produce selves and safe sex practices. Liam (51 yrs, man, RMAB) grew up in rural Australia, with a Catholic upbringing, which he associated with a sense of shame around sex. He felt this was compounded by messaging during the 1970s and 1980s that was particularly negative towards gay men. Such experiences of shame were also tied to a childhood history of sexual abuse. Liam explained how moral narratives counter to positive messaging about sexuality and homosexuality got in the way of him using PrEP for safe sex:

> *… because of, you know, my own almost internalised homophobia around what does this mean about you or something like that, you know, in terms of being sexually promiscuous, or things like that …*

Liam also explained that this shame has an impact on being able to negotiate condom use with partners, stating that it means:

> *… not feeling that you can make a, you know, for example, if my plan is to use condoms or things like that and the other person has a very different plan, not feeling that you're able to say no to that or, you know, say, you know, "That I'm not on PrEP. I'm not …" whatever. "I …" you know, "I would like to …" yeah. So, not taking that proactive or feeling you can do that.*

Importantly, Liam explained that whilst he logically understands being gay is not wrong, and has been open about his sexuality since his early twenties, he still carries shame around sex and his sexuality. As such, social forces intra-actively shape subjectivities, leading to embodied dimensions of shame, and can be conceptualised as a process of mattering bodies. This produces possibilities and impossibilities of safe sex that emerge through the intra-action of different subjectivities, objects, and contexts.

In a similar manner, Axel (22 yrs, man, RMAB) also felt shame has mattered PrEP for him with associations of 'promiscuity', which he was not taking at the time of the interview but had taken in the past. He explained that taking PrEP was difficult for him, and he chose to take PrEP on demand as opposed to a daily dose, because:

> *… it was just like a shame thing. It was I don't want to admit that … yes it's like I didn't want to admit that I was casually having sex with people. In the same way that I didn't want to quit my gym membership because I didn't want to admit that I didn't want it. It's like a guilt and a shame thing.*

Axel felt this shame resulted from his 'religious background' and 'repressed background', stating:

> *I don't think it was necessarily about it being gay. I honestly think it was just about sexuality in general. Maybe it's a bit of both. I spent so many years not wanting to be the person who ends up in hookup culture. Then when I did, I felt a lot of shame about it. I guess there's also the fear of falling into the stereotype. Just like the propaganda, like getting an STD and dying of being gay. All the old homophobic things.*

For Axel, the shame about sex associated with hookup culture was produced through a moral lens that condemned 'unbridled sexuality' and 'sexual excess'. Much like Liam, Axel also experienced embodied dimensions of shame, poignant in his reflection that '*when I finally ended up having sex my body would shake violently because of how repressed I was*'. Of analytic note is the approximately 30 years age gap between both participants who reported such shame. This demonstrates that despite progress in gay rights in Australia (anonymised, 2021), ongoing homophobia and sexual shame are entangled with people's biographies, and their relationship to STI prevention. This leads to the mattering of objects, subjectivities, and practices in particular ways, which will have a bearing on how to address the rise of antibiotic resistant STIs.

Discussion

This study contributes to our broader research agenda of understanding the social dimensions of AMR, including its political, economic, cultural and technological mediations (anonymised, 2021; anonymised, 2018; anonymised, 2017). It builds on clinician perspectives on antibiotic resistance in the context of STIs (anonymised, 2024; anonymised, 2024) by engaging with the perspectives of GBTQ+ people. In doing so, we have unpacked the implications of ongoing pharmaceutical developments in STI prevention, understandings of safe sex, and what this means for antibiotic resistant STIs. Critically, this includes an understanding of how the intra-action of contexts, subjects and objects produce one another, and safe sex, where agency and im(possibilities) are emergent at the intersections of these dimensions.
Theorising safe sex as an entanglement allows us to understand it as an open and 'incomplete process' – an ongoing *relational* process of becoming that is being iteratively made as different elements in the equation change (i.e., bacteria becoming more resistant). Historically speaking, the appearance of HIV was initially a critical and devastating 'ingredient' in transforming 'sex' into 'safe sex' through the use of condoms. In one sense, it brought particular safe sex entanglements into being in the 'gay community'. In recent years, access to PrEP and U=U knowledge has seen a shift in these entanglements. Condomless sex has become an increasingly viable option, reducing the chances of HIV transmission and redrawing boundaries around the construction of 'safe sex'. Within these safe sex entanglements, bacterial STIs have previously represented – and still represent – a 'minor inconvenience', whilst HIV is afforded greater significance. Whilst this may swiftly change with widespread last line drug failures, it is still a common perception, and one that also fuels the de-prioritisation of efforts to address resistance within an STI context (anonymised, 2023; anonymised, 2024).

The relatively recent rise of the pharmacology of safe sex, via modern technologies and diagnostics, has also transformed the temporal dimensions of safety. While testing has always been an important part of STI management, the introduction of PrEP has shaped this in new ways. As stated, PrEP relies on taking medication daily, or, in case of on-demand use, 2-24 hours before sexual activity and then for another two days after. In a similar manner, the conceptualisation of 'testing as safe sex' also makes what happens *outside* of the sexual interaction increasingly significant. Importantly, health authorities play an active role in these

processes, by brokering access to PrEP and the testing regimes that shape it (i.e., quarterly testing to obtain a prescription for PrEP). Taking PrEP and regular testing increase the importance of the 'before' and 'after' of sexual events, and the production of safe sex as a result, by (re)shaping its temporal dimensions. Where in the past condom use *during* sexual activity might have been more important, now what happens on either side of the sexual event becomes increasingly significant, due to greater opportunities for condomless sex because of PrEP. This means the past and future dimensions of sexual activities are re(shaped) through a re-mattering of condoms, entangled with access to PrEP.

As the disparate parts of sex – objects, subjects and institutions alike – become entangled with one another, this opens new domains of pleasure and (im)possibilities – albeit ones that are open to transformation in light of bacterial threats. People can live out sexual fantasies, engage in new forms of sexual exploration, and find different types of sexual pleasure. For certain interviewees, this meant discovering pleasure in semen exchange, which until the uptake of PrEP was deemed risky due to the possibility of HIV infection. In such circumstances, objects like semen are mattered intra-actively with PrEP and take on new meanings, moving from association with danger to association with pleasure, and in doing so intra-actively constitute new possibilities for subjectivities (i.e., one who now enjoys semen exchange) and sex. As such, subjectivities and sexual practices are *moving with* objects (i.e., PrEP) in a process of becoming, and in relation to the new temporal dimensions of sex identified above. However, the threat of antibiotic resistance may undo these new configurations. As the threat posed by resistant infection transforms and moves (for example, becoming more ubiquitous), individuals may become more open to the idea of consistent condom use for anal sex (and oral sex for some), re-mattering the importance of condoms within safe sex entanglements, since available evidence suggests their use has dropped with the introduction of PrEP (Holt et al., 2018).

Furthermore, people move differently with objects (or not) and institutional forms depending on their entanglement with factors such as their complex subjectivities, connections, and histories. This is evident in the variations in communal attitudes to Doxy-PEP. Personal relations and international flows of information make this a viable form of STI prevention for some and therefore a part of their approach to safe sex, whilst, for others, concerns about gut health and resistance means Doxy-PEP feels unviable, or there is weariness about it (anonymised, 2023). In other words, Doxy-PEP is mattered and takes on meaning and significance through its entanglement with factors such as people's subjectivities, personal connections, and access to information, much like PrEP (Michael & Rosengarten, 2013).

Importantly, community use of health information, considerations about the impact of antibiotics on the body and resistance, and overall engagement with complexity, demonstrates the importance of working with people to address resistant STIs. People can actively engage in the production of their safe sex practices, processing and synthesising information about treatment interventions, STIs and resistance. At least within the Australian context, this represents a historical continuity as the community has always played a critical role in making and shaping safe sex through such practices of reflexive mediation (Race, 2003). Importantly, our findings support existent health communication scholarship (Kutner et al., 2021), highlighting pleasure should be an important frame in future messaging about antibiotic resistant STIs, as it shapes how people relate to (im)possibilities of safe sex. However, people's ability to practice safe sex is also relationally shaped by the mattering of subjectivities in contexts of homophobia and shame, which shapes (im)possibilities for practicing safe sex, and has implications for potential measures to reduce resistance (i.e., increased condom use). Moreover, this also centres the importance of addressing such social attitudes, as they play a

key role in relationally shaping people and their ability to experience sexual safety. In short, sex positivity and acceptance of GBTQ+ lives *are* safe sex as they matter subjectivities, relations to objects (i.e., condoms) and (im)possibilities entailed therein, informing the production of safe sex.

Limitations and Future Directions

The findings of this study are limited to an Australian context, as are its implications. More specifically, the results also speak to GBTQ+ populations, and sexual health as it relates to these groups, and their histories, in particular. As a result, further research on antibiotic resistant STIs should expand across locales, including Global South contexts, and also contexts, including heterosexual populations. Moreover, we also recommend that to build on this work, future studies more systematically consider the impact of health communication and messaging pertaining to STI risk (see Bernays et al., 2021). This will be instructive for how messaging regarding Doxy-PEP, and increasingly resistant STIs, can be more effectively communicated to different publics. Such future studies will also benefit from explorations of how Doxy-PEP and resistant STIs play out differently within GBTQ+ sexual (sub)communities (see Prestage et al., 2015), and the implications of these contexts for notions of safe sex and sexual practices.

Conclusion

The use of pharmaceutical solutions for STI treatment and prevention, and the growing threat of antibiotic resistant STIs, demonstrates that safe sex is not a closed process; rather, it is an open and evolving entanglement that is being made and re-made as different elements shift over time and relationally shape one another. The uptake of PrEP has made condomless sex an increasingly viable option, mattering new possibilities for sexual pleasure. However, as communities actively create safe sex, they exercise a critical reflexivity about ongoing pharmaceutical interventions, evident in concerns about Doxy-PEP use. Interviewees' considerations about gut health illustrate that, for certain people, safe sex is more than STI prevention, extending to include broader deliberations about the whole body. Findings also suggest that if the threat of antibiotic resistant STIs was to materialise to a greater degree, such as via increased rates of transmission, this could result in a large-scale transformation of safe sex through the re-addition of condoms in sex safe practices more so. To develop a better understanding of how people can be included in efforts to curb the rise of resistant STIs, ongoing research is required on what populations feel would constitute best practice, including potential collaborations with governments, clinicians, organisations, and services. This will be instructive for the development of engaged, ground-up solutions, that will work with and for communities in ways that are contextually appropriate to them, and built from their experiences. In particular, this includes developing communication practices across public health, civil society and clinical contexts engaging with diverse, evolving and emerging concerns about such things as gut health, resistance vis-à-vis Doxy-PEP, pleasure, and the shifting meanings of safe sex.

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Highlights

Pharmaceuticals for STI prevention have transformed GBTQ+ approaches to safe sex

Conceptualised as entanglement of pleasure, subjectivity and temporality

Concerns raised about ongoing use of pharmaceuticals for STI prevention

Antibiotic resistant STIs may transform safe sex practises once again

Essential to work with populations to address antibiotic resistant STIs

Ethics Approval

Ethics approval was sought and granted from by The University of Sydney Human Research Ethics Committee (Reference number 2024/060), and the ACON Ethics Committee (Reference: Number 202336).