

**The immune self, hygiene and performative virtue in general public narratives on antibiotics and antimicrobial resistance**

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## **Abstract**

This paper employs an assemblage lens to generate analyses of general public narratives on antimicrobial resistance (AMR). Global efforts to reduce AMR include communications aiming to promote general public awareness, provide knowledge, encourage careful antibiotics use, and discourage demands for them. These efforts are somewhat compromised by the assumptions they make of individual lack of knowledge and motivation and the manner in which the AMR problem is framed in isolation from the biological, social and economic structures that produce it. Conceptualising AMR as an effect of antimicrobial assemblages of which publics are but one part, we analysed interviews with the general public on the lived experience of infections, antibiotic treatments and AMR. Far from science and policy discourse on AMR, these narratives showed antibiotics to be partly solutions to the social and biomedical challenges of infection, framed by self-defensive immunity and hygiene, the affective benefits of 'immune boosting', and the imperative to sustain the moral standing of the healthy citizen. Failing public awareness and action on AMR can be attributed to public health messages that overlook the social, affective and moral dimensions of infection care and separate AMR from its socio-economic drivers.

## Introduction

This paper examines personal experience narratives on antibiotic use to inform policy and communications on the threat to health entailed by antimicrobial resistance (AMR). AMR is regarded as a serious threat to the health and economic development of the global population (World Economic Forum, 2021). The global response has included expert advice, communications and education to promote awareness of AMR among general populations with the aim of limiting the clinically-unjustified use of antimicrobials (UK Review on Antimicrobial Resistance, 2016: : 5). Social research suggests that publics have poor knowledge of AMR (McCullough et al., 2015), and that communications are partially effective (Price et al., 2018). Researchers have called for improved AMR message design and delivery using behavioural theory (Pinder et al., 2015; McParland et al., 2018).

We argue, however, that AMR interventions are compromised due to the assumptions they make about individual responses to infections and use of antibiotics. Adopting the viewpoint that AMR is an effect of biosocial assemblages (Shildrick, 2015), we consider the ways in which public health messaging separates AMR from the structural forces that produce it, positions it as an effect of individual action, and deepens responsibility for factors over which the individual has little purchase. We explore how the possessive individualism that underpins AMR messaging is strengthened by the meanings of self-defensive immunity and hygiene, which are also somewhat contradictory. Using this framework, we examine how individuals narrate their experiences with infection and reflect on how antibiotics figure in these narratives as techno-social solutions to threats that illness brings to self and healthy citizenship. On this basis, we consider how efforts to promote awareness and action

amongst the general public could be better aligned with the lived experience of infection and antibiotic treatments.

### **AMR assemblages and their publics**

The story of antibiotics reveals the combination of biological, scientific and economic factors that have led to AMR. The discovery of antibiotics just under 100 years ago led to paradigmatic change in the management of infectious diseases and relatedly for public expectations of what medicine can do. Prior to antibiotics, some surgery led to serious infections, amputation and death. Respiratory infections in childhood and older age were also potentially life-threatening. Antibiotics reversed this situation, earning them the epithet of 'miracle drugs' (Butler, 2012). For some time, most members of the general public in affluent countries could expect lives relatively untroubled by bacterial infections. US advertising from the middle of the twentieth century invited consumers to seek out antibiotics to ensure working and family life uninterrupted by common infections (Podolsky, 2015).

It is difficult to pinpoint when this narrative of triumphal medicine turned. AMR was a known feature of microbial life from the inception of the antibiotic period. In his Nobel Prize lecture in 1945 Fleming warned that bacteria could readily develop resistance to penicillin (1945). The first streptomycin clinical trial for tuberculosis in 1946 observed the development of resistance (Crofton, 2006). However, new antibiotics were discovered with some regularity between 1950 and 1960 so alternative antibiotics were at hand to treat resistant infections (Davies, 2006). But gradually, as discoveries became less frequent

(Davies, 2006), and the pharmaceutical industry turned towards more profitable drugs, it became less easy to find alternative antimicrobials.

By the mid 1990s, multi-drug resistant tuberculosis had become a significant challenge (Keshavjee and Farmer, 2012). Methicillin-resistant staphylococcus aureus (MRSA) was first detected in 1961, two years after the antibiotic was first introduced (Moellering, 2012). By 2005, MRSA was reported to have been linked with the deaths of more US citizens than was HIV (Editor, 2007). Responses to these challenges have gathered pace in the last 20 years. In 2001, the World Health Organization launched the WHO Global Strategy for Containment of Antimicrobial Resistance (2001) and in 2015 the Global Action Plan on Antimicrobial Resistance (2015). That year, the Australian Government announced its first national plan (2015), and the following year, the influential UK Review on Antimicrobial Resistance (2016), was released. In summary, these policy aspirations include: the encouragement of science and industry to discover new antibiotics and alternatives, such as vaccines and bacteriophages; conserving the effectiveness of current antibiotics through improved prescribing; and reducing the use of antibiotics in agriculture. Less obvious in these policy framings is that general publics, once encouraged to enjoy the reassurance that comes with miracle cures, are now expected to absorb the notion that antibiotics are gradually becoming less effective. The address to AMR is, then, a far-reaching reversal of the antibiotic cum miracle cure paradigm, with ramifications for how members of the general public think and feel about their health and illness.

AMR's short history reveals that it is an effect of the biosocial assemblages on which life depends. AMR is the focus of policy and communications, but it is not an object in itself; it is

the effect of combinations of forces. Margrit Shildrick has explained life assemblages in this way:

Each of us is caught up in multiple and unpredictable webs of interconnections—what Deleuze calls assemblages—in which life itself is characterized as a non-personal vitalist force that exceeds the unique experiences and composition of each individual (2015: : 104).

In this framing of life, the human individual is one element of AMR assemblages that comprise, among other elements: continual microbial striving for existence; the diversity of microbes, themselves; the scientific and practical pursuit of human and animal health; changing possibilities for biomedical interventions into healthcare; trajectories in scientific inquiry on microbes, antimicrobials and treatment discovery; the economic rationality of public health and the pharmaceutical industry; reduced investment in public health; and how these matters are depicted and debated in public life.

This assemblage framing is significant because communications directed to members of the general public generally focus on AMR as a deracinated object. For example, public health messages for the general public comprise: keeping healthy to avoid infection; not pressuring doctors for antibiotics, and, when prescribed, strictly adhering to instructions for their use (Australian Government, 2017). Social marketing materials used during the international 2019 Antibiotics Awareness Week included messages such as “The future of antibiotics depends on all of us” (communitymedicine4all, nd). The 2020 Antibiotics Awareness Week Slogan was “Antimicrobials: handle with care” (World Health Organization, 2020). In 2019, a

flyer was headed 'Do I really need antibiotics?' (Australian Commission on Safety and Quality in Healthcare, 2019), clearly placing responsibility in the hands of the individual consumer. Catherine Will's analysis (2020), of UK AMR messaging demonstrated how citizens are assumed to be responsible for inappropriate antibiotic use but also somewhat ignorant and unmotivated to change their behaviours, assumptions that may lead to some demonisation of publics. AMR is depicted in these social marketing campaigns as the responsibility of each individual, when AMR is produced by biosocial dynamics, many of which remain outside of personal control. Moreover, these messages also gloss over a more fundamental challenge to public trust in medicine and sense of being-in-the-world that the prospect of failing antibiotics generates, particularly when these technologies have been invested with such great powers over life and death. How general publics contend with this declinist AMR story, the individualisation of its implications and threats to self is a key theme for this paper.

### ***AMR and possessive individualism***

This focus upon the responsibility of the individual in AMR communications reflects neo-liberal framing of health (Ayo, 2012). In this framing, people are expected to be active citizens (Rose, 2007), autonomously seeking information and acting to self-govern their behaviours to maintain and enhance their health (Gibson et al., 2015). Biopolitical power is not externally imposed, but is applied by the self to the self (Ayo, 2012), such that individuals are encouraged to seek self-management of their health, recognise that health is not simply bestowed, that it is a personal quest, and the materialisation of judicious decisions and action.

In keeping with the neo-liberal rationality of health, individuals compliantly invest time and money in the acquisition of healthcare products to craft the healthy body (Ayo, 2012).

Andrew Jardine (2004), proposes that direct-to-consumer marketing of over the counter pharmaceuticals represents an example of this flourishing industry. In the United States, longitudinal research shows that 52% of the population had used multivitamins to supplement their diet in the 30 days before the survey (Kantor et al., 2016). In Australia, 69% of university student respondents reported having used multivitamins in the six months prior to the survey (Barnes et al., 2016).

The fabrication of the healthy body is also a response to a world permeated with risk (Beck, 2009; Giddens, 1991), imbued with ontological and moral meanings. Risk cultures force individuals to reflect on their futures and therefore shape their presents to manage the potential threats that they may face, including to their health. This focus on managing futures can extend to one's sense of being-in-the-world, since risk management can be an effort to produce a sense of safety in the face of risks which the individual is not able to control (Armstrong-Hough, 2015). By taking action people may be able to feel less vulnerable (Davis and Lohm, 2020). Such action may also have the benefit for individuals of fulfilling their responsibilities as citizens (Jardine, 2004), to protect themselves from ill health and avoid becoming a burden upon the community. An instance of ill health that befalls the good citizen is unfortunate, while those who fail to take care and become ill face the imperilment of their moral standing. Brown and Nettleton (2017), found such 'immunitary moralism' in *mumsnet.com* blogs on AMR.

### ***The immune self and hygiene***



These imperatives of healthy citizenship and individual responsibility map onto the sociocultural meanings and practices of immunity and hygiene, both of which have particular resonance for AMR. Immunity is commonly understood to be the capacity of the body to defend itself against infections, though other meanings of immunity exist in the law and politics. As Cohen has shown (2009) biological immunity establishes some of its metaphorical potency through links with the liberal self and its meanings of individual right to property through law, including one's body. Nik Brown (2019) has noted how the influential Darwinian theory of evolution and related concepts of survival and fitness aligned with economic reason, locating immunity at the nexus of biology and economy. As Emily Martin (1993) pointed out, the immune self, particularly when articulated with neo-liberal economic rationality, is an ideal that most are unable to reach. Unfit bodies, in the senses of both health and economy, can be seen as a sign of a failure to manage oneself properly. How individuals respond to a possible infection, then, is imbued with perils not only to more serious illness but to one's identity as fit to thrive in economic systems.

In addition, microbiology has provided an understanding of the immune response of the body as a drama of the 'milieu interieur' (Cohen, 2009: : 132) – as a phenomenon that takes place inside the body – an understanding that synergises with possessive individualism to create a focus on the body within and its management. It is also a vision of immunity that mobilises resort to pharmaceuticals that can be ingested to assist with interior self-defence, an important bridge between immunity and antibiotics.

Immunity as self-defence is implied in the plethora of information assisting people to promote their health. A Google search using the term 'building immunity', produced pages of sites providing information about immunity from public health organisations, science journals, news services and commercial enterprises. The abundance of such sites demonstrates that immunity is a widely circulated metaphor linked with advice and products used to promote health. Examples include: bedding companies (Forty Winks, 2018), vitamins (MEDSimplified, 2020), and yoghurt (The Healthy Chef, undated).

Hygiene is a key AMR message. For example, the UK Review on Antimicrobial Resistance (2016), nominated "improved hygiene" (page 4) as a key strategy. The 2020 Australian national strategy (Australian Government, 2020), referred to the need for better hand and food hygiene. The 2020 World Antimicrobial Awareness Week campaign materials produced by the WHO included a poster with the message, "Drug resistance has made infections harder to treat. Good hygiene can help stop its spread" (2020). Hygiene forms a strong alliance with self-defence immunity, as Martin pointed out (1994), in the imaginary of the body as fortress assailed by pathogens from outside its boundaries. This way of aligning hygiene with immunity, however, is complicated by the notion of immunity's milieu interieur, which implies that hygiene is not sufficient to protect the individual body. Like vaccination, too, hygiene is a public health strategy that helps to reduce the circulation of microbes in social networks, over and above what it might offer to the health of the individual.

The relationship between immunity and hygiene for general publics is further complicated by the provisional quality of the scientific assumptions that underpin them, and, in

particular, support for ‘immunity boosting’ and the ‘hygiene hypothesis’. There is no strong scientific support for the view that the individual can build their immunity by adjusting their lifestyle and consuming health care products (Harvard Medical School, 2020). Too much hygiene may also be unhelpful. David Strachan suggested that cross-infection from siblings could be the reason that children with older siblings are less likely to have allergies (Rook, 2009). This led to the hypothesis that too clean an environment fails to stimulate children’s immune systems and leaves them vulnerable to later infections and allergies. References to the hygiene hypothesis are readily accessible via search engines, though these messages do not arrest the tension between hygiene as self-defence and the perils of too much cleanliness (see for example DiLonardo, undated). Thus, people can be easily exposed to ambiguous messages that advocate the need to be clean, but not too clean.

These contradictory qualities of both immunity and hygiene draw attention to their foundation in the biopolitics of self and not-self. The immune self is understood as defending itself by excluding the other (Burnet, 1969) and hygiene can be construed as a method of sustaining boundaries and bodily purity (Douglas, 1966). But the exclusion of what is not the self is led into self-defeat since the self depends on its relation with what it is not (Esposito, 2013). By logic, to reject what is not-self is to destroy the conditions that make the self possible. Roberto Esposito (2013), therefore argues for community, as opposed to immunity, and an acceptance of the interdependence of selves and not-selves. This conceptualisation of immunity and community Thomas Lemke explains in terms of ‘affirmative biopolitics’ (2010):

In place of a self-destructive logic of immunity, it presents a new concept of communality—a concept recognizing the individual/collective body’s constitutive

vulnerability, openness, and finitude as the very foundation for the community, instead of permanently struggling against such qualities as a perceived threat to it. (p169)

This notional affirmative biopolitics is not simply a matter of bio-philosophy. As we have seen, there are biomedical reasons to suppose that self and other constitute immunitary life assemblages. To disavow community is also to lead the self into paradoxical 'autoimmune' illness, since self-protection leads away from the interdependent conditions that sustain life. How individuals contend with these biopolitics is an important theme for the analysis to follow.

In the following, therefore, we consider how members of the public, in Melbourne Australia, narrated their experiences with infections, using antibiotics and knowledge of AMR, framed by assemblage theory and the complexities of immunity and hygiene socio-cultures. Our aim is to generate a richly-nuanced document of individual experiences and understandings to supply new ways of conceptualising how public awareness and action to prevent AMR could be strengthened.

## **Methods**

From December 2017 to December 2018 DL interviewed 99 members of the general public about their use of antibiotics and their understanding of antimicrobial resistance. Guiding questions were used to steer the discussions in the informal interviews, which included: understanding of antibiotics, management of infections, and explanations of antimicrobial resistance. Participants with a range of ages, cultural backgrounds, educational

achievements, geographic locations within Melbourne and a mix of males and females were sought using flyers placed in community organisations, Facebook promotions, presentations to community groups and snowballing. Ethical approval for the research was given by Monash University Human Research Ethics Committee. The transcribed interviews were analysed using NVIVO. Deductive and inductive themes were generated to code the material, based upon our reading of the immunity and AMR literature and themes arising in the interviews. Themes were refined through constant comparison and discussion with researchers. All participants have been allocated pseudonyms.

### **Narrating immunity, hygiene and resistance**

Immunity talk was threaded through the interviews, which were ostensibly focussed on antibiotics and antimicrobial resistance. As in research on pandemic influenza (Davis and Lohm, 2020), and colds and flu (Prior et al., 2011), immunity is important to understanding how the body responds to infections and treatments and, relatedly, how the individual should undertake selfcare. Bec, aged in her 30s and the mother of two young children, provided a detailed explanation of immunity:

As soon as your body registers that there's something foreign or that might harm, the body goes into overdrive and produces your white blood-cells to, you know, sends out the army to try and kill it. I think that's really important to build up your body's resistance. And like every new infection that the body has – just, for example, a bacterial infection – the body has to produce a different antibody to it. So your white blood-cells will learn how to fight off a particular infection and the body has a memory so that if you ever develop that infection again, it automatically knows how to fight that infection again. So if the same, bacterial strain repeats itself or you find

yourself with something that you have suffered previously, the body already remembers it and can hit it straight away. Sometimes, if the infection is mutating too quickly or spreading too quickly, or if your body's having too much, you know, immunity suppressed for some other reason, it might not have the capacity to fight the bacteria by, the infection by itself, in which case antibiotics will just help boost the body. So they'll come in. They'll start killing them so that your body can continue to fight off what it can.

Bec, like many of our interviewees, used the imagery of otherness, invasion, and a violent struggle between the body and microbes to stage her narrative of the body's response to infection. Central in Bec's account was "... build up your body's resistance", which is an engineering metaphor that is also widely used in scientific and popular science accounts of immunity (Haraway, 1991) and genetics (Steinberg, 2015). The concept of the body's ability to resist infection pervades narrative on infection, as we and others have noted (Davis and Lohm, 2020; Brown, 2019). However, bodily resistance has a confusing relationship with the language of antimicrobial resistance, which relates to the capacity of microbes to evolve their own immunity to antimicrobials. Forced choice surveys of individual knowledge about antimicrobial resistance often find that publics conflate antimicrobial and bodily resistance (McCullough et al., 2015) and, on that basis, researchers call for improved information and education (McNulty et al., 2016). This conflation of resistant bodies and microbes, however, is not limited to 'uneducated' publics. Advertising for so-called immune boosting products reinforces the concept of the resistant body (Barnes et al., 2016; Koteyko, 2010). In addition, "your body's resistance" mobilises the possessive individualism that lies at the heart of immunitary biopolitics, a link that explains how resistance is understood in terms of the

individual body's response to infection. The problem here, then, is not necessarily poorly educated publics, but the variant usage of 'resistance' across the field of immunity, antibiotics and antimicrobial resistance coupled with the meanings of interspecies violence, engineered bodies, and agential resistance tied to self and liberalism.

Another feature of Bec's narrative was the manner in which it drew on knowledge very possibly gained during her university education. Her use of 'white blood cells', "memory" and "immunity suppressed" contrasted with many of the immunity narratives we collected, which, for the most part, were more generalised. For example, Paula, who was healthy, aged in her thirties with a young child, spoke generally about her notion that her body was able to recognise and thus more quickly respond to unfriendly bacteria:

Paula: As a child, I had terrible food poisoning when I was in Malaysia. I was probably six or seven years old and spent two or three days vomiting and super-sick. Thinking about it years later, I think my ability to travel to countries where the food and the water is of different quality to what I'm used to meant that I have fared much better in those places.

DL: So why do you think that is?

Paula: I think my body has some sort of level of immunity. Has seen these bugs before and, therefore, knows how to deal with them a bit better.

Paula appeared to endorse the view that her life experience had formed her immune system's ability to respond to infections, underlining both the notion of educable immunity and its personalised quality.

### ***Consuming immunity***

Shared across the interviews, then, was a commitment to some notion of immunity as manipulable and, therefore, a plethora of selfcare strategies utilised to avoid infection and enhance immune systems. These included: increased hygiene to avoid infection; exposing the body to microbes to stimulate the immune system; eating a nutritious diet; and keeping fit. These strategies enjoy considerable support in commercial advertising and health advice, though, in strict terms, immunological science support for them is partial (Harvard Medical School, 2020). Importantly, these strategies represent methods for performing selfcare figured around possessive individualism and therefore reinforce a more general notion of immunity tied to economic reason and the consumer self. These interview fragments are reflective of narrative on selfcare and immunity:

Kevin: Lucy (wife – name changed) used to run a restaurant, so she's always, she always cooks real healthy meals. And we, you know, go to yoga once a week. We go walking as much as we can. And, you know, we ride our bikes around. So, yeah, we're well-aware of the need to keep fit and healthy as we both get older. (Kevin aged 60-70 had recent surgery and cares for an elderly parent)

DL: So you were talking about immunity. How do you build up your immunity to try and make your body strong?

Aneesa: By eating good food. I'm eating vegetables and all that but eating proper food. And that will give your ... and multivitamins; that helps. I think that would give you a boost in your body to build your immune system. So mostly vegetables, you know, fruits, healthy food. That can make a difference. (Aneesa aged 31 – 40 is the



healthy mother of 2 children)

These comments reflect widely promoted health messages (see for example, Bedosky, 2020). The respondents' comments also reveal no evidence of querying the value of these selfcare activities. Rather, the faith that these actions would serve them well was evident, despite the lack of wholehearted scientific endorsement of immunity-building (Harvard Health, 2018).

### ***Immunity care as performative virtue***

Immunitary selfcare also had a moral undertone. The adoption of personal responsibility for well-being was unquestioningly embraced by our interviewees, reflecting the powerful norm of possessive individualism mingled with immunitary rationality. Evident in some comments was the desire to separate the narrator from irresponsible others. Ingrid made the following comments about her husband:

People eat so many convenience foods that, you know, I wonder how many people are deficient in vitamins that your body needs to fight off minor illnesses? Like my partner gets sick all the time. I reckon once every six weeks. Particularly, when he's stressed. But compared to me he doesn't eat particularly well. Doesn't eat a lot of vegies and stuff like that. You know, eats a lot of dairy and gluten. Drinks a lot of beer. If he gets sick, he gets the 'man flu' something chronic. Like he'll get hot and cold sweats. He can't keep his eyes open. (Aged 31-40 Ingrid is the parent of a toddler and suffers from autoimmune disease)

Ingrid judges her partner's health regime as lacking, revealing that selfcare is understood as

a personal responsibility and that it is subject to appraisal by others. Marcia spoke of her strategies to build her health and compared herself to others:

So, you know, instead of saying like, “I don’t know, I don’t do any sport and I’m a couch potato, and eat processed food all the time, and take-away,” and whatever, “and if I have a problem I go to the GP, take a pill and it’s fixed,” to sort of, you know, take a bit more responsibility. (Healthy and aged 42-50)

In this selfcare culture, use of antibiotics could be construed as a mark of failed self-discipline. Frances was critical of people who had come to rely on antibiotics instead of taking care of their own health:

So, if they don’t have to, if they don’t have to cook good, if they don’t have to do that, they know a drug’s there that can save them from being, you know, or get rid of the illness and they don’t have to do much, well, they’ll take antibiotics. (Aged 61-70 and had undergone recent surgery)

These interview fragments show that selfcare is understood to be a mark of moral virtue and therefore, ill health becomes a sign of having failed oneself. In their analysis of blogs posted to *mumsnet.com*, Brown and Nettleton (2017), noted how the effective management of immunity was understood to be a reflection of moral virtue, deepened also by moral expectations associated with parenting. Selfcare to protect oneself from infection and to build immunity has, therefore, significant cultural support. Science, as we have noted, is able to only partially endorse notions of immune boosting (Harvard Medical School, 2020). To perform immunity care is to establish one’s moral standing even in the face of some scientific uncertainty with regard to whether or not it is possible to produce

immunity through one's actions. This moral dimension of immunitary selfcare helps to explain the values that healthcare products have for consumers. In this sense, providers sell to consumers, not actual immunity, but immunitary moral standing.

### ***Paradoxical hygiene***

Selfcare as performative of virtuous health citizenship was also seen in narrative on hygiene and its contribution to efforts to minimise infection. But as with other features of these narratives on infection, immunity and antibiotics, a contradiction was apparent since it was held also that too much hygiene could damage one's health. Aneesa who described herself as healthy, the mother of two children and married, outlined how she encouraged her children to always wash their hands to prevent infection:

DL: So how do you stop them getting infections?

Aneesa: Like, for example, we went to a family friend's house. They had a dog. So, as soon as they touched the dog, even though it's a clean, little puppy, I make sure they wash their hands ... .. So I'm more concerned with them not washing their hands. So I make sure he's, because they always touch something and the mouth, and they lick their fingers or ... I make sure they wash it. So that's how I do that. Even when they get dirty I just tell them to, "Wash your hands." So give them a shower, you know, so they can be nice and healthy, and clean, of course. That's the strategy I use.

This comment and others like it from our participants are not surprising given the variety of hygiene messages that are widely circulated. Hygiene and the avoidance of infection is endorsed by government supported consumer advice services (Health Direct, 2018).

Commercial advertising also promotes the notion that hygiene prevents infection (Aiello and Larson, 2001). However, also widely endorsed is the hygiene hypothesis that purports that children need to be exposed to microbes to stimulate the development of their immune systems and that a lack of such exposure can lead to poor immunity and allergies (Rook, 2009). Many of our interviewees also queried the value of cleanliness, noting that it may be detrimental to immunity and infection control. Marcia's comments laid out this view:

I'm not overly clean with her (12-month-old daughter). I don't keep this house as a sterile environment. I'm not constantly pulling out antibacterial wipes. I do let her get out and get dirty, and touch the dogs and the play equipment, and then have a snack. I'm not necessarily gonna pull out antibacterial wipes in-between all of that, because I want her to be exposed to a lot of different things. I don't know if I'm making the right decision or the wrong decision when I think about this but it seems to have worked well so far. She hasn't been gravely ill. I don't feel stressed about the decisions that I make when I go out and I'm not constantly questioning myself when I think about them. (41-50, healthy, parent of young child)

The fragment from Marcia's interview echoes previous examples that show an investment in the moral virtues of selfcare, but in this example, linked with parenthood and raising a child. Her daughter's immune system and its welfare is in frame, indicating that good parenting extends to the interior of the child's body, an indication of the powerful norms of immunity, self and care. Marcia, however, draws on the hygiene hypothesis – "I want her to be exposed" – to explain how the immune system of her daughter is in training. This is another one of immunity's powerful metaphors: that the immune system is acquired

through experience and therefore educable. Nigel, aged 41-50, the healthy father of three children, had a similar view and explained children's immune systems could be stimulated by exposing them to microbial life:

And another thing I think is causing an issue is being too clean. You know, they say in the seventies and eighties, "Let your kids play in dirt". I know the people that live on farms appear to have a better immune system. You could squirt hands with antibacterial hand-wash, thinking we're cleaning them. But you need a small amount of nasties. That's what our immune and how a vaccination works, isn't it? You have small amounts of the, the disease and then your body fights it, and then overcomes it, and then you don't get it again.

Nigel supported his ideas with reference to vaccination, arguing that exposure to 'nasties' or bacteria enables the body to develop the necessary antibodies to provide future protection from similar infections.

Hygiene, then, is narrated as a paradox. It is an important means of preventing infection but too much of it might harm health and, more specifically, the healthy future of the developing child. Respondents remarked on this contradiction in hygiene messages. Yvonne who was healthy and aged 41-50 with two children commented:

I grew up in the country and, you know, the conversation around bugs, it's fine for you to have, you know, it's healthy. People that live in too sterilised an environment probably have increased issues. I don't know. It just feels really synthetic and gross. I just, I don't know.

Paula aged 31-40 who was the mother of an infant and had undergone recent surgery also noted her lack of certainty:

Paula: My mother-in-law is always getting out the, you know, the, the little bottle of hand sanitiser. I don't really like it.

DL: Right. Why not?

Paula: I guess I'm, I don't know if I'm making the right decision or the wrong decision when I think about this but it seems to have worked well so far.

While these respondents readily accepted responsibility for maintaining their own health and that of their children, they also show awareness that the basis for guiding action is somewhat troubled. Respondents thus spoke of confronting the risks of infection linked with expectations of responsible citizenship in the context of messaging cultures that, under some scrutiny, are shown to be contradictory. Boosting immunity is adopted by individuals, even though science is unable to endorse the concept of life style based immune boosting. Hygiene is also encouraged, but is a threat to the education of the young immune system. Antibiotics are understood to enjoy scientific support, but experts now warn publics to reduce unnecessary use of antibiotics.

## **Discussion**

Our assemblage-oriented analysis of participants' narratives on infection, antibiotics, and AMR show that the underlying socio-cultures of immunity and hygiene influence how they explain their healthcare practices. Our respondents' stories reflect their sincere commitment to safeguarding their own health and that of those in their care through deliberate and considered actions. Comments about building immunity were pervasive

amongst the respondents suggesting wide endorsement of the belief that one is able to take action to enhance one's immunity.

Immunity-work also set those who undertook it apart from those who did not. Those who were seen to not care of their health were open to condemnation, as was evident in the comments made by Ingrid, Frances and Marcia. Not only were they open to criticism for their lack of action but could also be regarded as not fulfilling their citizenly responsibilities. By being vulnerable and becoming ill they became a burden upon the 'good, responsible' healthy citizens. It would seem that the belief was that one must take care of one's health; it was not an option but an expectation. Those who diligently undertook this work situated themselves as exemplary citizens playing their part in the protection of themselves and the wider community.

Moreover, immunity has significant affective benefits. Taking steps to build immunity, even if its efficacy is unproven, affords an impression that one is not totally vulnerable to infections. Our respondents were able to take comfort in the immunity building actions that they undertook. They saw these as building a form of protective shield around them and their families. This affective immunity is visible in public health discourse addressing populations deemed to be vulnerable to COVID-19. In the UK, for example, older citizens and those with specific immunity vulnerabilities offered social isolation to prevent infection are said to be undergoing "shielding" (Department of Health & Social Care and Public Health England, 2021).

Immunity work and hygiene, however, have the quality of performative virtue. They do not

comprise straightforward, biomedical assemblages since they are subject to contradictory messages of efficacy: immunity building is advocated by health product advertising but questioned by science; hygiene is advocated to prevent infection, but is also seen as necessary for the development of immunity. Given that immunity is also the site for considerable moral and affective benefits for the individual, we argue that immunity building and hygiene form an important socio-biomedical function for the performance of virtuous health citizenship. Messages about antibiotics and AMR may gain some support from these affective and moral undercurrents, but may also be subject to the contradictions and condemnations we have identified. AMR policy and communications need to attend to immunity and hygiene cultures, and assist individuals to make efficacious choices in the face of biomedical uncertainties. In this regard, the AMR communications challenge is not what individuals know and do not know about antibiotics and AMR, as many have argued. Our analysis suggests focus on the situated material and symbolic conditions of antibiotics use in relation to immunity and hygiene. Moreover, AMR is an effect of antimicrobial assemblages, of which the individual citizen is one part. Indeed, the focus of individuals appear to be on immunity and hygiene and therefore antibiotics as solutions for ontological and moral challenges. These affective elements of antimicrobial assemblages and their implications for virtuous health citizenship are implicit in AMR communications, but their significance is rarely acknowledged and addressed directly. Will (2020), has found that UK AMR messaging for the general public assumes ignorance and lack of motivation on their part. As Will explains, such assumptions help to draw attention away from the social and economic drivers of AMR. Publics would be better served in the global effort to reduce AMR if policy and communications engaged more directly with their lived experiences.



Our interviews were conducted prior to the advent of the COVID-19 pandemic, which has disrupted health care across the world. Increased antibiotic use has been documented in some countries among COVID-19 patients who are likely to not benefit (Strathdee et al., 2020), and news media have carried stories of immunity passports (Proctor et al., 2020). Social distancing, quarantine, masks and handwashing have all been deployed to reduce the transmission of the virus (see for example: State Government of Victoria, 2020). It is an open question how the pandemic has impacted on the immunity and hygiene practices of members of the general population and therefore how they think and feel about antibiotics and AMR. We can surmise, based on our analysis, that the practical and moral imperatives of good pandemic citizenship intersect with the immunity, hygiene and antibiotics and the contradictions they entail. In an era of rife pandemic risks that include coronavirus, Zika, Ebola, SARS, swine flu, bird flu, MDR-TB and HIV, it is difficult to sustain narrative on microbes becoming immune to antibiotics without inflaming crisis discourse. It is no surprise, also, that individuals resort to their immunity in this context and the implied individualisation of responsibility energised by encroaching risks. Moreover, this dynamic makes it difficult to speak of a general public, since social worlds are so highly individualised and predicated on self-protection. As Esposito and Lemke have argued, the biopolitical rationality of self-defence immunity needs to be countered by the valuing of interdependence and community as a way of life. The widespread adoption by publics of pandemic control practices has helped to reduce the spread of infection and indicates that publics can be mobilised to act in the name of affirmative biopolitics.

AMR policy continues to recommend public awareness and action, despite weak effects amongst publics. The UK Review on Antimicrobial Resistance (2016), argued for “A massive

global public communication campaign” (page 4), to ensure that members of the general public responded to the new conditions for the use of antibiotics and the global effort for AMR. In Australia, the 2020 national strategy (Australian Government, 2020), asks for “whole-of-society” (page 9) approaches to AMR communications. Remaining absent so far is government commitment to integrated and well-resourced strategies, apart from social marketing and social media campaigns that have weak effects (Price et al., 2018), and largely reach those working in the AMR sector (Newitt et al., 2019). As our analysis has suggested, ‘whole of society’ engagement will require a sustained and planned effort that sets messages about antibiotics into the context of immunity and hygiene and the socio-cultural context of good health citizenship. Policy and communications need to be integrated with socio-cultural theory of immunity and hygiene if they are to resonate with the lives of members of the general public.

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