

This is a peer-reviewed, accepted author manuscript of the following article: Davis, M. D. M., Lohm, D. B., Whittaker, A., & Flowers, P. (2020). 'Willy nilly' doctors, bad patients, and resistant bodies in general public explanations of antimicrobial resistance. *Sociology of Health and Illness*. <https://doi.org/10.1111/1467-9566.13111>

'Willy nilly' doctors, bad patients, and resistant bodies in general public explanations of antimicrobial resistance

Mark Davis
School of Social Sciences
Faculty of Arts
Monash University

Davina Lohm
School of Social Sciences
Faculty of Arts
Monash University
Wellington Road
Clayton VIC 3800
Australia
davina.lohm@monash.edu

Andrea Whittaker
School of Social Sciences
Faculty of Arts
Monash University
Wellington Road
Clayton VIC 3800
Australia
andrea.whittaker@monash.edu

Paul Flowers
School of Psychological Sciences & Health
University of Strathclyde
16 Richmond St
Glasgow G1 1XQ
United Kingdom

Mark Davis is Associate Professor of Medical Sociology at the School of Social Sciences, Monash University, Melbourne, Australia. Mark's research focusses on social and public policy responses to infectious diseases, including HIV, sexually transmitted infections, pandemic influenza and antimicrobial resistance.

Davina Lohm is a research assistant at Monash university, currently examining how members of the public use antibiotics and understand antibiotic resistance. Since completing her PhD which investigated how young people understood their national identity, she has participated in a range of research projects. These include studying people's response to the 2009 Swine Influenza pandemic, media representations of the zika outbreak, information available about the potential hazards of medical tourism, and the impact of housing and transport costs upon Melbourne residents.

Andrea Whittaker is Professor of Anthropology and former Australian Research Council Future Fellow at the School of Social Sciences, Monash University, Melbourne, Australia. As a medical anthropologist, she currently has research projects in antimicrobial resistance, reproductive health and biotechnologies.

Paul Flowers is Professor of Public Health Psychology at the University of Glasgow with a focus on developing and evaluating interventions to improve public health and reduce inequalities. He has interests in qualitative and mixed methods, diverse approaches to intervention development, diverse approaches to implementation science, and a longstanding passion for addressing the particular challenges, and additional complexities, associated with infectious diseases such as antimicrobial resistant infections, pandemic influenza, or sexually transmitted infections.

Abstract

Increased public engagement is a feature of policy and communications focussed on the reduction of antimicrobial resistance. Explaining antimicrobial resistance for general publics has proven difficult and they continue to endorse apparently mistaken knowledge, including the conflation of antimicrobial resistance with the notion of the resistant body. We interviewed members of the general public in Melbourne, Australia, to explore explanatory models for antimicrobial resistance and shed light on the persistence of the resistant body assumption and related concepts. In the face of AMR's complexity and the portended antibiotic apocalypse, publics rely on a heavily inscribed understanding of the body defending itself against microbes. Publics also read antibiotic misuse and overuse messages as the responsibility of other patients and medical practitioners, and not themselves. Significantly, the scientific world view that has created expert knowledge about AMR hails publics in ways that discredits them and limits their capacity to take action. Increased engagement with publics will be required to ensure that collaborative and sustainable AMR approaches are fashioned for the future.

Antibiotics, Australia, personal experience narratives, antimicrobial stewardship, communications

In this paper we examine general public engagements with antimicrobial resistance (AMR) to help strengthen the social science contribution to policy and communications. AMR was observed at the dawning of the antibiotic era in the mid-twentieth century (Podolsky, 2015). However, the production of effective antibiotic treatments has not kept pace with the evolution of bacterial resistance. Medicine is now faced with the increasing prevalence of hard to treat infections that complicate hospital care and, in some cases, the death of patients. Some have argued that AMR will lead to a bacterial apocalypse (Nerlich, 2009), if action is not taken to reduce the unnecessary use of antibiotics in human health and beyond.

Public understanding of AMR is a feature of the public health response, and foregrounds the ways in which members of the general population take on and enact scientific and medical expert advice. In this view, AMR mobilises longstanding debates and challenges concerning public engagement with science and its experts (Welsh & Wynne, 2013; Wynne, 1992), how lay publics are able to establish life strategies in light of expert, scientific knowledge (Beck & Beck-Gernsheim, 2002), and the extent to which lay and expert knowledges are profitably co-constituted (Fox, 2016). As we will see, assumptions about publics and their abilities to understand and apply expert AMR knowledge have profound ramifications for future public health.

Background

The world-wide effort to curb the rise of AMR includes public awareness campaigns. In Australia, these campaigns can be traced back to the early 2000s (Price et al., 2018), and have used social marketing techniques (for example, posters, internet materials, short videos), to alert publics and encourage them to comply with expert advice regarding prescription, for examples: “Antibiotics are losing their power”; “Don’t ask for antibiotics when you don’t need them”; “It’s

time to take antibiotics resistance seriously”; “Antibiotics are a precious resource”, and; “Bacteria become resistant to antibiotics, not people” (see also National Prescribing Service, 2016).

Social marketing approaches like these have only been partially effective. Surveys show considerable gaps in the ability of general populations to correctly identify AMR-related knowledge, for example: believing that bacteria are the same as viruses; not understanding that antibiotics are used for bacterial infections; endorsing prescription sharing (McCullough et al., 2015; McNulty et al., 2016). A persistent finding is that many individuals have the view that the body and not microbes resist antibiotics (Brookes-Howell et al., 2012; McCullough et al., 2015). These findings need to be tempered in light of systematic reviews (Price et al., 2018), which show that the knowledge and behaviours expected of publics are not always clearly articulated in campaign designs, making it difficult to align campaigns effects with general population knowledge. Research, nevertheless, indicates that AMR communications only partly support effective public responses.

Qualitative research also provides a picture of somewhat confused general publics. Parents in the USA were worried about AMR and agreed that antibiotics for their child should be only used when needed (Finkelstein et al., 2014). Australian health consumers indicated the need for more precise information to enable them to act on their use of antibiotics (Lum et al., 2017). In New Zealand, research participants focussed on the management of infections, not AMR, and were concerned about the impact of antibiotics on the “body’s ‘balance’” (Norris et al., 2013, page 465). Brown and Nettleton (2017) analysed *mumsnet.com* blogs regarding AMR and found that discussions were replete with moral discourse on the body as a site for self-care and familiar blaming of the other for overuse and misuse of antibiotics. These findings suggest that, for communications to be effective, understandings of AMR need to be located in, as yet poorly understood, real world socio-cultural contexts that enable and constrain effective action.

Catherine Will (2020) has argued that these gaps and misunderstandings are not only practical challenges: they are subject to a biopolitics of ignorance that has led AMR approaches away from efforts to engage with individuals as agential citizens. In a close analysis of UK campaigns since the late 1990s, Will has traced the rise of the narrowly conceptualised ‘behavioural economics’ that underpin AMR communications approaches. These approaches side step the challenges of engaging with general public knowledge by bracketing aside notions of reflexive self-determination and focussing on the inculcation of ‘automatic’ responses amongst individuals. The reinforcement of social norms that support the reduction of inappropriate use of antibiotics also feature, as Will shows, moral expectations of self-protection and, for parents, protection of children. Will argues that these approaches amount to selective ignorance on the part of the AMR approach, tantamount to ‘shrugging’ off of the deeper challenge of knowing more about what publics do and do not know and therefore the conditions under which they are able to enact expert advice. The effect is to encourage an AMR communications approach akin to the programming of docile individuals through ‘nudging’ behaviourism and the furtherance of moral norms. The behavioural economic approach sits at odds with other currents in public health that emphasise active subjects who craft their bodies and minds to promote health through advice provided by experts (Petersen et al., 2010). Will shows, therefore, how the AMR approach helps to empty public health of its deliberative, democratic qualities and deepens an expert-lay schism, a dynamic that does not augur well for the long-term response to AMR and for participatory public health care in general.

The expert-lay schism in AMR communications can be usefully construed in terms of assemblage theory developed by scholars of biomedical science and technology (Fox & Alldred, 2015), that is, the particular configuration of material and social factors whereby experts frame AMR as a scientific and technical problem, including so-called public misunderstanding and

misguided action. As Will suggests (2020), the dominant AMR approach glosses over how publics themselves contend with infections, immunity, antibiotics and treatments. Experts do acknowledge that some of these problems are related to the jargony, technical language of AMR (Mendelson, 2017), but the challenge of public engagement is not simply about language choice. Moreover, the apocalypse metaphor that imbues news and science discourse (Nerlich, 2009), may license approaches that conceptualise publics as themselves resistant and therefore part of the problem and help to convey to publics a sense that their own agency has limited value. This effect can be traced into a tendency to cast the social as secondary to AMR, that is, as the barrier to effective management of AMR or as simply the medium through which public health goals can be exacted (Davis, forthcoming). Another critical viewpoint is that an AMR public is hailed somewhat obliquely: AMR communications address everyone, but no-one in particular. AMR is unlike other public health challenges where biopolitical citizenship is derived from diagnosis and biography, as in the case of HIV (Young et al., 2019) or other chronic conditions that provide the basis for identity and collective action (Rose & Novas, 2005). For all these reasons, improved and nuanced insight into the explanatory models by which individuals frame their engagements with AMR is vital to provide the foundation by which to question and moderate the schismatic expert-lay relations that appear to be gathering force in the field of AMR and beyond.

Our research, therefore, focusses on how members of the general public explain AMR to generate new insight for public policy and communications and address the relations of expert and lay knowledges. We aim to explore not only what individuals know of AMR but how this particular challenge to their health is made meaningful in the real-world contexts of their lives. Our analysis will focus on why publics confuse microbial and bodily resistance alongside the other explanations they use to engage with AMR.

Methods

The analysis is based on exploratory interviews with members of the general public (n=99), in Melbourne, Australia. Individuals were invited to participate from community settings (mother's groups, community centres, social networks) according to several purposive criteria: individuals likely to have had experience with antibiotics (respiratory illness, surgery, caring for children or elderly); individuals who identified as healthy (i.e., no current diagnosis); even number of men and women; spread of ages from 18 years, upwards. We were able to recruit 58 women and 41 men (see Tables 1 and 2).

Table 1. Participants according to purposive selection criteria (cell numbers do not total 99 as the individuals can appear in more than one selection criteria)

Experience of chronic respiratory and/or immunity related illness	Experience of surgery (since 2008)	Carers (for children and the elderly)	No chronic illness identified
9 – self 3 – family members	52	46	53

Table 2. Age distribution of participants (n=99)

18 – 30 years	31 – 40 years	41 – 50 years	51 – 60 years	61 – 70 years	71+ years
9	30	18	12	19	11

Semi-structured interviews were guided by a set of discussion topics based on our reading of the AMR social science and medical literature, policy documents and communications. These included: experiences with infections; interactions with medical practitioners; prescription and use of antibiotics for self, others and pets; awareness and explanations of AMR; media use and sources of information about antibiotics and AMR. The interview approach was exploratory (Holstein & Gubrium, 1997), allowing the interviewer to follow up on themes introduced by the interviewee. To stimulate discussion, we showed participants a television news clip on AMR. Interviews were transcribed verbatim and inputted to NVivo for analysis.

We adopted an inductive, theory-building approach to analysis. First, all authors coded the same 6 interviews to generate, by consensus, a preliminary set of thematic codes derived from the texts. These codes were used by DL and MD to double code a further 14 interviews. In this phase, we used constant comparison within and between interview transcripts and between DL and MD to deepen the analysis. DL then applied the developed code list to the remaining transcripts. Interpretive memoranda were generated to assist with the process of constant comparison and provide the basis for written analysis and links with cognate literature. Approval for this research was provided by the Monash University Human Research Ethics Committee. The quotations that appear in what follows have been deidentified using pseudonyms. Our analysis focuses on the explanatory models offered by our research participants when they were asked to discuss AMR, its causes and methods of amelioration.

Findings

Table 3 summarises the themes that emerged in interviewee explanations of AMR. As Table 3 demonstrates, some interviewees were prepared to admit that they did not know about AMR. But many were prepared to engage with the challenge of explanation, creatively and reflectively. The variety and combination of explanations suggest that AMR knowledge is not necessarily singular or only tied to scientific concepts and facts. Moreover, explanations were assembled by our interlocutors in the interview context to give them a fluid, emergent quality. In what follows, we explore these explanations in further detail.

Table 3. Publics' explanations of AMR, with descriptions and examples.

Explanation	Description	Example
Absent or generalised	- vague, partial explanation - and/or self-recognised poor/lack of knowledge of AMR	But, to be honest, I don't know a lot about it except the word 'superbugs' you hear it, but we don't know anyone who's sort of had it or I don't know anything much about it at all. (Heather, 60s, respiratory illness, and Imogen, 60s, no chronic illness) No idea. It's a bit beyond me all that stuff. (Geoff, 50s, no chronic illness)

Evolution	- AMR set into context of bacterial mutation and evolution	I guess antibiotics have only been around for a relatively short period of time in evolution. I mean, you know, a hundred years is a sneeze. It's a sneeze, isn't it? I mean it's nothing. And evolution takes tens of thousands of years, doesn't it? I mean ... so yeah, long-term we might have to ... I don't know. I guess the future's uncertain. (Byron, 40s, no chronic illness)
Ecology & Climate	- changes in the ecology and climate of the world have facilitated the rise of unpredictable bacteria	Must be the surrounding is not clean or due to the environment like in the case of cutting down trees and all. There should be more plantations. Might be because of that. I don't think it's because of the environment only. The environment is changing. Sometime it's too much cold. Sometime it's too much hot. It's not perfect weather. So because of that also it must be increasing. (Riya, 30s, no chronic illness)
Agriculture	- use of antibiotics in food production has hastened the proliferation of AMR	And generally speaking about antibiotics I think, from what I believe, they're used everywhere these days, especially cattle and food sources, and as a result of that, the bugs are becoming resistant to it and we're facing some dire consequences unless we change our ways. (Danny, 50s, no chronic illness)
Mobility	- mobile populations and travel contribute to AMR (contagion theory)	Maybe many people come from different country. I think that that's a reason. I don't know. Yeah, I don't know. Maybe people that travel from other country they carry a germ. (Malai, 40s, no chronic illness)
Hygiene	- unhygienic people and hospitals OR - people too protected from exposure to dirt (hygiene hypothesis)	... you know, we're so sanitised now. You know, everyone's so concerned about hand wash or Dettol wash, or whatever the hand sanitiser is. You know, nobody ... maybe, yeah, the whole, maybe I don't, going too far the other way but whether we're, yeah, whether we're just too sanitised, so we're not getting much bad bacteria into our bodies, so we aren't able to fight it when it happens. So there's no resistance already in place maybe. Yeah. (Diana, 40s, no chronic illness)
Orthodox	- bacteria become resistant making treatment difficult	Well, as I said, I read that article, in <i>The Age</i> (Melbourne broadsheet), and I also have read articles that, you know, those shrinking percentage of antibiotics that can deal with them now, that most of them are resistant to the common antibiotics. So there's a dwindling supply for really nasty bugs. (Tyson, 50s, no chronic illness)
Overuse and misuse	- poor prescribing - inappropriate consumer demand - poor prescribing produced by inappropriate consumer demand	I think it's just been on the television and everything that our, and in the media and newspapers everywhere you go now they say that doctors are not really look after their patients and just giving out antibiotics willy-nilly instead of giving it out when they're really required. And consequently, when you do need them, you become immune to them because you've used them for so many years. (Leonard, 60s, immunity illness)
Resistant bodies	- body becomes resistant; intolerant; body becomes inured	Because people are getting too used to it (Antibiotics). Years and years ago, yes, they were a preventative or a fix, fixer. But now people are given it willy-nilly and people are becoming immune to it. The body's getting used to the antibiotics so it doesn't do anything. I never go. Never went to the doctor's with a cold or anything. It's a waste of time. (Jan, 70s, immunity illness)

Evolution, ecology & climate, agriculture, mobility

A cluster of explanations were linked with evolution, the ecosystem and climate, agriculture, the increased mobility of human populations, and hybrids of these. Byron (from Table 3) suggested that AMR needs to be seen in the context of the evolution of life. He also offered an amalgam explanation that referred to nature, migration, hygiene and the evolution of syphilis, though he mistakenly referred to the microbe as a virus:

I think it's natural. It's evolution, isn't it? I mean, because I was watching a video just last week about syphilis and how, because there was an old theory that the Americans got syphilis when they visited, when Columbus went to the US and he brought back syphilis . . . it was debunked . . . they worked out that syphilis was in the population a long, long

time but the thing is like there was a more benign version of syphilis I think in one area of the world, but it only affected the skin. It was a pest but it didn't kill. And it wasn't until people, their hygiene practices got better and stuff that that made that virus, it would have died. And it had to mutate to survive. And it mutated into this nasty virus. You know, it's venereal versions. (Byron, 40s, no chronic illness)

This interview fragment underlines the assembled quality of the explanations offered by some of our interviewees. In strict terms, Byron's and similar explanations are approximate, perhaps due to failures of language and or understanding of the biological concepts that underpin them.

Some respondents explored ecological and environmental explanations for AMR. Riya's account (see Table 3) attributes AMR to the degradation of the environment and extremes of weather. In another example, Marcia made reference to antibiotics in water:

Well, as far as I know, it's because, yeah, there is, there are so many, so many antibiotics given and then, you know, no matter if you take them and then, then that goes into wastewater or if you throw them away and it goes in landfill, or whatever, so there is a lot of antibiotics out there. And, as far as I know, so the bacteria, because they're exposed to them, get more resistant. That's the lay version of the thought. (Marcia, 40s, no chronic illness)

Marcia displayed awareness that antibiotics are water soluble and therefore pass through the human body and into the water system. Danny extended the wastewater explanation to farming practices:

Well, I believe they're there. Yeah. I believe they're put in there to stop animals getting sick and, if they don't get sick, they put on more weight and, and people make more money off it. So I'm sure it's got to do with finances and not the health of the animals. But also these days I think because the animals are farmed differently, you know, intensive farming in sheds and that sort of thing, the ... the ability for the bugs to counteract the antibiotics is probably growing, you know, at a fast rate. The other thing I notice: I think they check it by the sewer systems. So, you know, they get a sample of sewer in the cities and that's how they find out what drugs are being used, what antibiotics there are in the systems (Danny, 60s, respiratory illness).

Marcia and Danny offer partial explanations for the environmental drivers of AMR. Other informants linked AMR to migration, portending some political challenges to do with the connection between health threats and population mobility. Malai (see Table 3) implied that AMR could be explained by contagion theory and the increased movement of people in the world. Leonard, warned that adherence to an antibiotic prescription was warranted due to the threats implied by environmental conditions and travel:

Just to make sure that you, the infection's completely gone because often we think, oh, we're feeling better but then, you know, it can reoccur. And especially in this day and age, you know, with air conditioning and, you know, people from all around the world, different, you know, tourists coming in with different strains you've just gotta look after yourself. (Leonard, 60s, immunity illness)

Leonard justified the need to complete a prescription of antibiotics, not in terms of the biology of resistant bacteria, but in terms of the threats to the body and, it seems, nation. Leonard's reference to "look after yourself" indicated possessive individualism, linked with notions of immunity and the self-defensive body (Brown & Nettleton, 2017; Davis, 2019).

Hygiene

Participants linked hygiene with AMR: unclean people and practices had contributed to the failure of antibiotics (implied by Malai and Leonard above); too much cleanliness had weakened the capacity of people's immune systems to respond to infections (see Diana from Table 3).

These accounts show a loose application of the 'hygiene hypothesis' (Bach, 2018). Hygiene was closely linked with concepts of immunity, as can be seen in this interview fragment from Fred:

Fred: . . . we wash our hands and things like that before we eat and things like that. And, you know, just try to have pretty good personal hygiene. But, no, we wouldn't like hand-sanitise and all these sort of things.

Interviewer: So why wouldn't you hand-sanitise?

Fred: I don't know how effective it would be. It's the same as like, you know, some people use mouthwashes after they brush their teeth. I did an experiment at university where it shows that the bacteria after, you know, probably 15 to 20 minutes, come up to about the same level as they were before. So I'm not a huge believer. And I also believe that we want our kids' immune systems to be able to handle these things. So I think, if

you're constantly worried about cleanliness and things like that, then maybe the kid's immune system would not build as it should do. (Fred, 40s, no chronic illness)

Hygiene, then, is a duality. Too much of it can jeopardise immunity and therefore one's 'resistance' to infections, yet hygiene was also endorsed – even Fred said he washed his hands – as a method for reducing microbial risks. Public health messaging on AMR does refer to the importance of hygiene (coughing and sneezing etiquette, for example) for avoiding infections as one strategy for reducing the consumption of antibiotics (World Health Organization/Europe, 2017). The dual quality of hygiene also indicates that interviewees resorted to an underlying conception of the self-defensive body while trying to offer a view on the drivers of AMR (Brown, 2019; Cohen, 2009).

Orthodox explanations

Another set of explanations appeared to correspond with public health messaging about antimicrobial resistance, more or less. Interviewees with educational and professional preparation appeared more able to offer this kind of explanation. In this example, Simon draws on his studies in microbiology to give an account of how he explains antibiotics to his partner:

Well, the impact of over-prescribing the broad-spectrum antibiotics is it, it leads to, you know, the bacteria that have resistance start to proliferate and that leads to, you know, a population of, you know, drug-resistant bacteria, which is, is not great because we need these antibiotics as the last line of defence for people who are really, really sick. But now that we've overused them we have all these strains of bacteria that are now resistant. So when you use antibiotics for people who are in life-threatening emergencies, in some cases, it's not possible because you use that antibiotic to treat for this thing and then, bang! They're picked up by drug-resistant bacteria that's proliferated in its place.

[later]

R: I just kept explaining to her [who] that, you know, things like the common cold are, whilst they can sometimes be caused by bacteria, it's quite rare. Most of the time it's Rhinovirus. Rhinovirus cannot be killed with antibiotics. In fact, if you're using antibiotics, you're actually causing small amounts of cell damage [Right] by damaging the ribosomes. And you, because it acts not just on the bacteria but it's absorbed by your cells. And inside the ribosome you have a ... You know what? I've forgotten what it's called; it's been so long.

I: That's okay

R: Sorry.

I: It doesn't matter.

R: Mitochondrial ribosomes. That's what they are. So mitochondrial ribosomes are the same as in a bacteria and that's what most antibiotics act upon. So it damages these ribosomes and the mitochondria is what produces your energy. So by damaging the mitochondrial ribosomes, if you've got a viral infection, you're also weakening the body's innate response to the virus. (Simon, 20s, no chronic illness)

Regardless of its accuracy, Simon's explanation is heavily laced with biological knowledge used to point out the difference between bacteria and viruses. His explanation also touches on the immune system by indicating that antibiotics can damage cells in the body involved in the immune response to an infection. These types of explanations suggest how AMR links with other knowledge, for example, cellular genetics and immunity, underlining the expert knowledge linked with AMR.

Overuse and misuse

A common response to the question about AMR was to cite the overuse and misuse of antibiotics. This explanation is identifiable in public health communication on AMR (See <https://kidshealth.org/en/parents/antibiotic-overuse.html>, https://en.wikipedia.org/wiki/Antibiotic_misuse) and its recurrence in our interviews therefore suggests that the message has been incorporated into general public understandings. As Table 3 indicates, overuse and misuse of antibiotics could be explained by the willingness of clinicians to prescribe antibiotics “willy nilly”. This doctor blaming can be found in social research with publics who say that clinicians are too willing to provide antibiotics (Broom et al., 2014). Alongside doctor blaming, however, is the notion that patients are too demanding (Pan et al., 2016), or worse, that they game the doctor-patient encounter. Stephanie, for example, recounted an episode where a friend boasted about obtaining antibiotics for a hangover:

One person particularly who'll just go to the doctor for everything and always gets ... She went to the doctor for a hangover once. And got prescribed antibiotics 'cause she made it sound like it was a really bad kind of gastro thing. I said, “Oh well, Michelle, the

other night you were drinking. You had a whole bottle of wine to yourself and you were ...” I think it was a hangover but ... yeah. So she’s getting a lot of antibiotics. And she’s always sick. And I thought, “Well, if you’re constantly taking things that are, you don’t need, it can’t be good for you.” (Stephanie, 30s, no chronic illness)

Stephanie’s story gave emphasis to her friend’s errant demand for antibiotics and made her seem to have moral failings, as in AMR blogs on *mumsnet.com* blogs (Brown & Nettleton, 2017). But it was also possible to see that the responsibility for bad prescribing was shared. Cathy, for example, indicated that patients have come to expect antibiotics partly because they are so effective and that clinicians are also likely to rely on them to facilitate desirable treatment outcomes:

So do you want to explain kind of what you mean by this reliance on them?
Well, I think society in general, the one thing that comes to mind if you’re sick is, “Oh, I need some antibiotics.” And everyone knows what antibiotics are and what they do. So it’s a very, very simple thing. And for the doctors as well I think it’s a very easy solution to them. Look at something, “Yeah, it doesn’t look too good. I’ll just give you some antibiotics.” I’m pretty sure my doctor’s actually said that to me. “I’ll just give you some antibiotics, see how you go.” (Cathy, 20s, respiratory illness)

In this interview fragment, Cathy described how both patients and prescribers ‘collude’ in the potential overuse or misuse of antibiotics, a viewpoint that shared out culpability.

Overuse and misuse discourse explains AMR in social and moral terms, that is, that AMR is a reflection of human failings and not simply a biological process, as exhibited in orthodox explanations. There is also a sense in which the overuse/misuse explanation is easier to articulate than the orthodox biological ones, perhaps because it is prominent in messaging but also because it exercises a familiar narrative of the adversity that befalls those who lack moral rectitude. Blaming the other also shifts responsibility from self, a common feature of personal narratives on moral standing (Squire et al., 2014). This way of explaining AMR may serve to diminish the moral jeopardy entailed in AMR since it deflects culpability.

Resistant bodies

A set of AMR explanations revolved around notions of the ‘resistant body’. This explanation for AMR elided personal, physical resistance with messages that microbes evolve to resist the effects of antibiotics. As we noted previously, the resistant body explanation for AMR has been observed across the field of social research on public awareness (Brookes-Howell et al., 2012; McCullough et al., 2015). Our analysis suggests that the elision of AMR and bodily resistance echoes habituation theory linked with the observation that some substances – such as caffeine or alcohol – lose their effects over time (Erblich, 2019). Like other explanations, the habituation model revealed the conceptual bricolage of lay publics contending with AMR. As we will see, the habituation model also draws on the concept of immunity as self-defense (Brown, 2019; Cohen, 2009).

In the following interview fragment, Leonard spoke of AMR as analogous to the habituation associated with over-the-counter pharmaceuticals:

Leonard: If you take anything, you know, too often, it actually stops working. Doesn't matter what it is. It's like people that, you know, take a, you know, antacid tablets or if you take, you know, diarrhoea tablets, you know, if you just keep taking it ... And my mother was addicted to, years ago, to Ford pills, and that's another thing: your, you know, then your bowels stop working. It's the same as antibiotics.

I: So I'm just sort of trying to clarify. So, when you talk about it's not working, are you saying that the antibiotics stop working or your body stops reacting to them?

L: Oh, well, in antibiotics, it's, you know, it's different to the other. The antibiotics just stop working.

I: The actual antibiotic stops working?

L: The antibiotic stops working.

I: And why do you think that is?

L: I think your body just becomes resistant to it. You know, that's my understanding (Leonard, 60s, immunity illness).

Despite persistent probing from the interviewer, Leonard held onto the concept of the resistant body to explain AMR. Even though he appeared to admit that antibiotics cease having the effects they once did, he returned to the concept that the body comes to resist antibiotics. This

notion of the resistant body habituated to antibiotics was evident in the joint interview with Heather and Imogen. In this fragment, overuse is cited as a driver of resistance, not because of microbes, but because of effects in the body:

Interviewer: So you were talking about the fact that there are these new, that sometimes antibiotics don't work anymore. What do you know about that?

Heather: I think it's mainly because we overuse them over the years and, therefore, it doesn't know how to fight, you know, like it, it's got ... so your body just starts to react because it's so used to that thing that it doesn't work anymore for you. So, I assume that's why antibiotics work for me because I would rarely have them. So like I think the more you have them then the more your body's gonna be resistant to it being effective.

...

'cause I believe the more Panadol you take the less it works. Similar to antibiotics. I won't go and get antibiotics unless I feel like it's really quite serious.

...

our bodies have become used to the -

Imogen: Well, the, the bugs have got worse and they're so strong that the antibiotics aren't getting rid of them (Heather, 60s, respiratory illness, and Imogen, 60s, no chronic illness).

Echoing Leonard, Heather and Imogen draw on experience with over-the-counter pharmaceuticals, though they correct themselves at the end of the fragment to note that "the bugs have got worse". Heather and Imogen, therefore, suggest potentially contradictory explanations of AMR: both bodily and microbial resistance. Their confusion was reflected in the responses of many interviewees who spoke of resistance as simultaneously existing in bacteria and the body.

Discussion

Consistent with the international literature (McCullough et al., 2015; McNulty et al., 2016), interviewees showed partial or absent knowledge of AMR and some linked it with the overuse and misuse of antibiotics, a message that has been part of public communications for some time in Australia and elsewhere. Capacity to engage with the biological aspects of AMR appeared to depend on educational attainment, in accord with previous research (Gualano et al., 2015; McCullough et al., 2015; McNulty et al., 2016). From the point of view of AMR

communications, in general the explanations that publics offered did not correspond with official messages, indicating that much is yet to be done. At least, this is how the analysis we have developed might appear to those focused on the extent to which individual knowledge matches expert knowledge.

Alternatively, the AMR explanations we have explored can be construed as grassroots solutions to the challenge posed by being asked to explain a deeply ramified biological process with implications for health. While some admitted they knew very little about AMR, many offered explanations that inventively drew on the lived experience of managing infections and knowledge drawn from varied sources, including media, family and friends, and medical practitioners. Interviewees made reference to: evolution; the hygiene model; immunity as self-defense; habituation to substances taken into the body, and; a fluid application of notions of the resistant body and resistance in general. Interviewees provided a picture of creative appropriation of a range of concepts and therefore considerable abilities to make AMR intelligible and meaningful in the real-life contexts that they inhabit. The narratives show publics to be moved by the prospect of AMR and considerably reflective, an important basis for deliberative modes of public health communications.

The analysis also draws attention to some possible drawbacks linked with the moral norms that imbue antibiotics overuse and misuse messages. Other research has indicated that general publics do not perceive that AMR is personally relevant and located responsibility in other people (Brown & Nettleton, 2017; McCullough et al., 2015), for example, people who misuse antibiotics or medical practitioners who prescribe them too readily. It is perhaps not a surprise that individuals are unwilling to accept personal responsibility for what may seem like an overwhelmingly complex social and biological challenge. In addition, individuals may believe that prescribing is solely an expert matter and therefore not under personal control, a perspective that

may reflect the reduced emphasis on critical reflection on the part of the general public produced by the ‘behavioural economics’ increasingly favoured in the AMR field (Will, 2020). Moreover, AMR messages are reductive in the sense that they ask individuals to demand less of medicine and medical practitioners and comply with their prescription. Accordingly, the ideal AMR patient is docile or unreflexive (Will, 2020). This feature of AMR communications helps to explain why systematic reviews find that AMR campaigns are uneven or vague about what it is that publics are expected to do (Price et al., 2018): it is taken-for-granted that they are expected to suspend their agency.

The enduring importance of notions like self-defensive immunity, habituation and the hygiene hypothesis suggest how AMR messages come into a cultural context of assumptions about the body and how it responds to infection and antibiotics, most particularly, long-standing notions of the body as possession in immunity discourse and consumer culture (Brown, 2019; Cohen, 2009). For people in our research, the language of resistance connects microbes and bodies, conferring on each the property of agency formed against the power of a countervailing force. This way of conceptualising threats to health is an ingrained theory of life that can be traced into the language of the resistant body used to encode the first observations of phagocytosis (Cohen, 2009), as an expression of what was taken to be the eternal struggle of survival. Resistance discourse makes sense to lay publics because they inhabit a culture that is built on self-defensive rationality as the means of existence. Simpler language to signify AMR might have value, but the cultural organisation of agency and life – which the notion of the resistant body reflects – may be less easy to erase. Moreover, AMR messages connote dystopia as they foretell of the loss of options for the treatment of infections (Nerlich, 2009). For this reason people turn to self-protective rationalities to address the ontological threat implied by AMR. The resistant body, then, is the recourse for individuals faced by an ontological threat, particularly one inflected so heavily with notions of apocalypse.

The creative, yet partial, AMR explanations offered by interviewees raise questions about which communications approaches could be effective. One option might be to intensify public communications in an effort to correct misinformation, though it is arguable that simply increasing the volume and precision of messaging may not increase individual abilities to recount expert knowledge and if it did, may not translate into more prudent use of antibiotics. Another option and one that appears to be gathering some force in the AMR field (Will, 2020), is to shrug off engagement with what general publics do and do not know and simply nudge them into required action in combination with reliance on moral norms to shape conduct. As Will (2020), has shown, this unreflexive public health is likely to widen the schism between expert and lay publics and their respective knowledge practices and in the long run further forms of public health that limit public participation in health care. Yet another approach would be to address the social worlds of members of the general public more directly, working with their expertise to co-produce the tools they need to effectively and safely address AMR. This approach would comprise the dialogical development of hybrid lay/expert knowledge for antibiotics and AMR, better fitted to the circumstances of individuals in real world settings. This approach has the benefit of stepping away from a deficit model of publics and the related discrediting of lay world views, by collaborating with them in terms that are workable in the myriad social settings in which infections arise and need treatment.

The AMR explanations generated by interviewees also underline wider issues to do with participatory modes of public health and related scientific assumptions. AMR is an expert driven public health crisis *par excellence*. It springs from the forecasts of experts assessing what is known of the incidence and prevalence of AMR infections and the gradual but inexorable exhaustion of antibiotic treatment options. It has been, and continues to be, foremost a preoccupation of invested experts able to contend with the field's vast and emerging biomedical, veterinary,

microbiological and pharmaceutical complexities, a view underlined by the valiant, but partial, AMR explanations our interviewees were able to construct. Like a diagnosis offered by a doctor, the AMR problem comprises a particularly scientised world view that citizens are asked to endorse and changed conditions for the treatment of infections that they must accept. This feature of AMR knowledge production and dissemination, by virtue of AMR's origins in the scientific culture that has created it, automates a view that publics misunderstand AMR. Publics are in effect discredited at the moment they are hailed into being by AMR knowledge assemblages. An analogy would be setting an examination for a group of students on a topic for which they have not prepared. Success in these circumstances, even of the partial kind, would be remarkable and worthy of celebration.

The AMR as crisis world view also helps to distance experts from their publics. As Nerlich (2009) has shown, talk of AMR as apocalypse is highly biopolitical: it is a discursive tactic thought necessary to mobilise government resources, scientific inquiry, and public action. But the crisis orientation of AMR policy and communications licenses the imperative to act in the short term, most clearly expressed in Will's (2020) account of the behavioural economics that is coming to pervade AMR approaches and helping to empty AMR of participatory action. The longer-term implications for the democratic nature of public health are set aside in the face of impending apocalypse. If there is a lesson from AMR's history (Podolsky, 2015) and experience of infectious diseases like TB (Keshavjee & Farmer, 2012) and HIV (Davis, forthcoming), preparing for the 'long haul' is advisable and the best chance for effective action will be found in participatory modes of public health. In this view, what publics know and do not know about AMR may not be a primary goal, and certainly not the only one. Instead, it seems pressing to address the knowledge practices of AMR experts and the kinds of engagements they are able to have with the publics they seek to serve. The findings we have discussed, alongside the emerging critical social science scholarship on AMR (Brown & Nettleton, 2017; Nerlich, 2009; Will, 2020),

provide an important stepping stone towards sustainable and effective participatory approaches for public address to the challenges of AMR.

Acknowledgements

This research was supported by an Australian Research Council Discovery Project grant (DP170100937). The authors are grateful for the contribution of the interviewees to this project. The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to ethical restrictions.

Address for correspondence

Mark Davis
2/23 Woodside Crescent
Toorak
VIC 3142
Australia
mark.davis@monash.edu

References

- Bach, J. (2018) The hygiene hypothesis in autoimmunity: The role of pathogens and commensals, *Nature Reviews Immunology*, 18, 105-120.
- Beck, U. and Beck-Gernsheim, E. (2002) *Individualisation: institutionalised individualism and its social and political consequences*, London: Sage.
- Brookes-Howell, L., Elwyn, G., Hood, K., Wood, F., Cooper, L., Goossens, H., Ieven, M. and Butler, C. (2012) 'The Body Gets Used to Them?': Patients' Interpretations of Antibiotic Resistance and the Implications for Containment Strategies, *Journal of General Internal Medicine*, 27, 7, 766-772.
- Broom, A., Broom, J. and Kirby, E. (2014) Cultures of resistance? A Bourdieusian analysis of doctors' antibiotic prescribing, *Soc Sci Med*, 110, 0, 81-8.

- Brown, N. (2019) *Immunitary life: A biopolitics of immunity*, London: Palgrave.
- Brown, N. and Nettleton, S. (2017) Bugs in the blog: Immunitary moralism in antimicrobial resistance (AMR), *Social Theory & Health*, 15, 3, 302-322.
- Cohen, E. (2009) *A body worth defending: Immunity, biopolitics and the apotheosis of the modern body*, Durham and London: Duke University Press.
- Davis, M. (2019) Uncertainty and immunity in public communications on pandemics, In Bjorkdahl, K. and Carlsen, B. (eds) *Pandemics, Publics and Politics: Staging Responses to Public Health Crises*, Houndmills: Palgrave. pp. 29-42.
- Davis, M. (forthcoming) Making the ideal real: Biomedical HIV prevention as social public health, In Aggleton, P., Bernays, S., Bourne, A., Kippax, S. and Parker, R. (eds) *Remaking HIV Prevention: The Promise of TasP, U=U and PrEP*, London: Springer.
- Erblich, J. (2019) Alcohol use and health, In Revenson, T. and Gurung, R. (eds) *Handbook of Health Psychology*, Abingdon: Routledge.
- Finkelstein, J., Dutta-Linn, M., Meyer, R. and Goldman, R. (2014) Childhood Infections, Antibiotics, and Resistance: What Are Parents Saying Now?, *Clin Ped*, 53, 2, 145-150.
- Fox, N. (2016) Health sociology from post-structuralism to the new materialisms, *Health:* , 20, 1, 62-74.
- Fox, N. and Alldred, P. (2015) New materialist social inquiry: designs, methods and the research-assemblage, *International Journal of Social Research Methodology*, 18, 4, 399-414.
- Gualano, M., Gili, R., Scaioli, G., Bert, F. and Siliquini, R. (2015) General population's knowledge and attitudes about antibiotics: a systematic review and meta-analysis, *Pharmacoepidemiology and Drug Safety*, 24, 2-10.
- Holstein, J. and Gubrium, J. (1997) Active interviewing, In Silverman, D. (ed) *Qualitative research: theory, method and practice*, London: Sage.
- Keshavjee, S. and Farmer, P. (2012) Tuberculosis, Drug Resistance, and the History of Modern Medicine, *New England Journal of Medicine*, 367, 931-936.

- Lum, E., Page, K., Nissen, L., Doust, J. and Graves, N. (2017) Australian consumer perspectives, attitudes and behaviours on antibiotic use and antibiotic resistance: a qualitative study with implications for public health policy and practice, *BMC Public Health*, 17, 799.
- McCullough, A., Parekh, S., Rathbone, J., Del Mar, C. and Hoffmann, T. (2015) A systematic review of the public's knowledge and beliefs about antibiotic resistance, *J Antimicrob Chemo*, doi:10.1093/jac/dkv310.
- McNulty, C., Lecky, D., Hawking, M., Roberts, C., Quigley, A. and Butler, C. (2016) How much information about antibiotics do people recall after consulting in primary care?, *Family Practice*, 33, 4, 395-400.
- Mendelson, M. (2017) Antibiotic resistance has a language problem, *Nature*, 545, 23-25.
- National Prescribing Service (2016) Antibiotic Awareness Week 2016 Toolkit, http://www.nps.org.au/_data/assets/pdf_file/0019/323281/Antibiotic-Awareness-Week-2016-Toolkit.pdf. Accessed: 1 May 2017.
- Nerlich, B. (2009) “The post-antibiotic apocalypse” and the “war on superbugs”: catastrophe discourse in microbiology, its rhetorical form and political function, *Public Understanding of Science*, 18, 5, 574-590.
- Norris, P., Chamberlain, K., Dew, K., Gabe, J., Hodgetts, D. and Madden, H. (2013) Public Beliefs about Antibiotics, Infection and Resistance: A Qualitative Study, *Antibiotics*, 2, 465-476.
- Pan, X., Slater, M., Beacco, A., Navarro, X., Bellido, R.A., Swapp, D. and et al. (2016) The Responses of Medical General Practitioners to Unreasonable Patient Demand for Antibiotics - A Study of Medical Ethics Using Immersive Virtual Reality. , *PLoS ONE*, 11, 2, e.
- Petersen, A., Davis, M., Fraser, S. and Lindsay, J. (2010) Healthy living and citizenship: an overview, *Critical Public Health*, 20, 4, 391-400.

- Podolsky, S. (2015) *The antibiotic era: Reform, resistance and the pursuit of rational therapeutics*, Baltimore: Johns Hopkins.
- Price, L., Gozdzielewska, L., Young, M., Smith, F., MacDonald, J., McParland, J., Williams, L., Langdridge, D., Davis, M. and Flowers, P. (2018) Effectiveness of interventions to improve the public's antimicrobial resistance awareness and behaviours associated with prudent use of antimicrobials: a systematic review, *Journal of Antimicrobial Chemotherapy*, 73, 1464-1478.
- Rose, N. and Novas, C. (2005) Biological Citizenship, In Ong, A. and Collier, S. (eds) *Global Assemblages: Technology, Politics, and Ethics as Anthropological Problems*, Malden, MA: Blackwell. pp. 439-463.
- Squire, C., Davis, M., Esin, C., Andrews, M., Harrison, B., Hyden, L. and Hyden, M. (2014) *What is narrative research?*, London: Bloomsbury Academic.
- Welsh, I. and Wynne, B. (2013) Science, Scientism and Imaginaries of Publics in the UK: Passive Objects, Incipient Threats, *Science as Culture*, 22, 4, 540-566.
- Will, C. (2020) The problem and productivity of ignorance: Public health campaigns on antibiotic stewardship, *The Sociological Review*, 68, 1, 55-76.
- World Health Organization/Europe (2017) Hand hygiene a key defence in Europe's fight against antibiotic resistance, <http://www.euro.who.int/en/health-topics/disease-prevention/antimicrobial-resistance/news/news/2017/05/hand-hygiene-a-key-defence-in-europes-fight-against-antibiotic-resistance>, accessed 27 June 2019.
- Wynne, B. (1992) Misunderstood misunderstanding: social identities and public uptake of science, *Public Understanding of Science*, 1, 3, 281-304.
- Young, I., Davis, M., Flowers, P. and McDaid, L. (2019) Navigating HIV citizenship: identities, risks and biological citizenship in the 'Treatment as Prevention era', *Health, Risk & Society*, 21, 1-2, 1-16.