Infection, Disease & Health (2019) **24**, 23–31

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: http://www.journals.elsevier.com/infection-disease-and-health/


Research paper

# Media representation of the antimicrobial resistance (AMR) crisis: An Australian perspective

**S.L. Bouchoucha [a,*], E. Whatman [a], M.-J. Johnstone [b]**

[a] *Deakin University, School of Nursing and Midwifery, Centre for Quality and Patient Safety Research, Australia*
[b] *Deakin University, Alfred Deakin Research Institute for Citizenship and Globalisation, Australia*

Received 20 July 2018; received in revised form 16 September 2018; accepted 25 September 2018
Available online 22 October 2018

**KEYWORDS**
Public health;
Anti-bacterial agents;
Drug resistance;
Mass media
qualitative research

**Abstract** *Background:* Antimicrobial resistance and the rise of 'super bugs' has become a major threat to public health worldwide, with authorities warning of an 'apocalyptic future' unless addressed as a matter of urgency. Mass circulation media has traditionally taken an active role in informing the public of important public health issues and the measures needed to address these. The key objective of the larger project informing this article was to describe Australian media representations of the AMR crisis and its role in informing the public about the AMR crisis.
*Methods:* Undertaken as an unobtrusive qualitative research enquiry, existing data from Australian media, the websites of select partisan groups and government health departments as well as discipline literature were sourced and analysed using content analysis strategies.
*Results:* Overall, media coverage was well informed, accurate, balanced, responsive to the issues at stake, and highlighted the seriousness of the issue without being alarmist. Intriguingly, reports relied heavily on the use of content and conceptual metaphors to frame their narratives.
*Conclusion:* The media reports analysed in the context of this study were substantive and well informed. Just what impact they have had on the public in terms of improving its knowledge of the AMR issue or motivating behaviour change to mitigate the AMR crisis was unable to be ascertained. The strategic use of the media to galvanise an effective public response to the AMR crises thus requires further investigation.


* Corresponding author. Deakin University, School of Nursing and Midwifery and Quality and Patient Safety Research Centre, Geelong, Australia.
*E-mail address:* s.bouchoucha@deakin.edu.au (S.L. Bouchoucha).

https://doi.org/10.1016/j.idh.2018.09.084

**Highlights**

- Antimicrobial resistance and the rise of 'super bugs' has become a major threat to public health worldwide.
- Mass circulation media has traditionally taken an active role in informing the public of important public health issues.
- Evaluating the impact of media coverage on the public in terms of improving its knowledge of the AMR issue is essential.
- Media coverage was well informed, balanced, responsive, highlighting the seriousness of the issue, without being alarmist.
- The strategic use of the media to galvanise an effective public response to the AMR crisis needs further investigation.

## Introduction

The world has entered into a 'new dark age' of antimicrobial resistance (AMR), with a warning by the World Health Organisation (WHO) that: 'A post-antibiotic era—in which common infections and minor injuries can kill—far from being an apocalyptic fantasy, is instead a very real possibility for the 21st century' (Fukuda, 2014 p. ix). [42] This prospect is also underscored in a recent UK report Tackling drug-resistant infections globally [1] which estimates that antimicrobial resistance could kill as many as 10 million people a year by 2050 — being 'one person every three seconds' — more than the number of people killed by cancer in the same period. Responding effectively to the threats and future realties of AMR and its harmful impact on the everyday lives of people is going to require a 'whole of society' response, not just from those at the forefront of infection prevention and control in health care settings.

Mass news media (also termed 'the media') traditionally have taken an important role in informing the public on public health and public health emergency events, including events caused by communicable disease (e.g., SARS, MERS, Avian influenza, Ebola, etc.). In doing so, the media has had a significant role in shaping the public's perceptions, understandings and responses to the events reported [2—4]. In sum, the media is an important vector of information to the public with the capacity to shape public perception of an issue and its responses to it [2—4].

In keeping with global trends, AMR is emerging as a serious public health issue in Australia [5]. Considering the traditional role mass media has played in raising public awareness about important public health issues, there is considerable scope to suggest that it has an important role to play in informing the public about AMR in the Australian cultural context and the measures being used to manage it. Just what its role has been or should be, however, is not known. Accordingly, a key objective of the larger study informing this article was to explore and describe Australian media representations of the AMR crisis and the measures being taken to address it. To this end, the component of the study being reported here sought to answer the research questions as shown in Box 1.

## Clarification of terms

Before continuing, it is necessary to first clarify our use of the term 'mass media'. For the purposes of this study, the term 'mass news media' has been used to refer to the traditional and online news media — newspapers, radio, television, newspapers websites — which play a central role in public life in western society and help set agendas for public discussions. According to the foundational and much cited work of McCombs and Shaw [6] and McCombs [7], what most people know about a given issue can be sourced to mass media and such media are capable of influencing people's opinions and as such, set an agenda in response to the issue in question. In the context of the global AMR crisis, the media's representation of the AMR issues thus stands as an area worthy of investigation.

## Methods

This study was conducted as an unobtrusive qualitative research enquiry, using existing and publicly available data sources. The data were sampled and collected in three steps: sample selection, data collection and data analysis. Table 1 presents the keywords used to search databases. These keywords were selected as they captured the breadth of the issues surrounding AMR.

**Box 1.**

What attention has the media given to the issue of AMR since the WHO first started issuing warnings about the problem?
What policy documents have been devised by infection prevention and control authorities to guide media responses to the AMR issue?
What interpretive frames have been used by the media when covering the AMR issue?
What are the potential risks and benefits to the public of media coverage of the AMR problem?

**Table 1** Key words used to guide the search.

| Keyword |
|---|
| Antimicrobial Resistance |
| Superbugs |
| Antibiotic resistance |
| MRSA |
| Media/Mass media |
| Healthcare associated infection |
| Hospital acquired infection |
| Infectious diseases |

Data were sampled and collected from six main data sources (below). Search strategies were tailored to the specific databases and used defined keywords (Table 1). These search strategies were designed to enable optimal retrieval of data sources. The date range (1st January 2002 - 7th February 2017) was determined on the basis of the date the first warnings on AMR was issued by the WHO (2002), and the designated completion date of the project. The data sources searched were:

- Discipline, professional and academic literature databases.
- Media databases (for Australian mass circulation news publications, television, radio, documentary, film and online news).
- Public opinion polling databases.
- Homepages of select partisan groups, notably infection prevention and control organisations and consumers' advocacy groups.
- Legal databases.
- Government websites, notably health department sites.

In addition to this, random additional and ad hoc searches were performed and comprised:

- Google and Google Scholar search engines.
- University library holdings.
- Reference lists and bibliographies from relevant journal articles located during the project.

The data were analysed using an analytical framework designed for the study, where data were examined in view of each research questions. The data were examined through a philosophical inquiry lens, where after having been quantified, the retrieved data were searched for fundamental ideas and metaphors were identified.

A summary of data units sourced is given in Table 2.

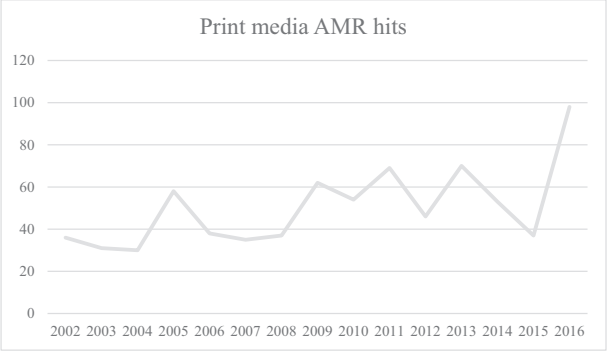


**Figure 1** Hits per year in print media.

The number of citations per year was analysed and is represented in Fig. 1. Although there was a steady increase of AMR reporting in the print media, and a peak at 98 in 2016, a substantial increase in 2005 before a dip was also seen, with no events that could have given rise to an increase identified.

## Results

This article reports the overall findings of a larger project which sought to explore and describe Australian media representations of the AMR crisis and its role in informing the public about the crisis. The three findings of this study were: (1) overall reporting by the media was balanced and well informed; (2) human interest stories were used to add power to the reports; and (3) content and conceptual metaphors were used in creative ways as interpretive frames to inform both media headlines and the content of reports aimed at conveying to the public the seriousness of the AMR crisis. Findings in response to the key questions guiding the study are presented under the following three separate subheadings: Media representations of the AMR issue; Media communication policies, and The use of metaphors as interpretative frames.

### Media representations of the AMR issue

Overall, although using headlines that could be described as sensationalist at times, the media coverage was well informed, accurate, balanced, responsive to the issues at stake, and highlighted the seriousness of the issue without being alarmist. Accuracy of the reports was characterised by the fact that microorganisms were accurately named, for example methicillin-resistant *Staphylococcus aureus* (MRSA); *S. aureus*; *Pseudomonas* sp., *Acinetobacter*

**Table 2** Results per categories searched.

| Category | Discipline professional, academic literature | Media — news publications, TV, radio documentary, film | Public opinion polling | Law report/legal databases | Homepages of partisan groups | Political parties websites |
|---|---|---|---|---|---|---|
| Number of references/Unit for analysis | 12 | 1312 | 2 | 0 | 2 | 1 |

*baumanii* or *Klebsiella pneumoniae* [8,9]. In multiple instances, the reports referred to authoritative sources and experts in the field, which served to add veracity to the reports. Examples include the citation of:

- Director of the Australian Capital Territory (ACT) Health -Professor Peter Collignon [10].
- Professor David Paterson, renowned international expert, from the University of Queensland's Centre for Clinical Research [11].
- England's Chief Medical Officer - Dame Sally Davies [8].
- WHO Director General - Margaret Chan [8].
- Keiji Fukuda, WHO's assistant director general for health [12].
- Professor Mark Woolhouse, Professor of infectious disease epidemiology at the University of Edinburgh, UK; European Medicines Agency; UN General Assembly ("Antibiotic resistance hits crisis point") [13].

Reports also sometimes included actual 'human interest' case studies where people or relatives of people infected with resistant microorganisms shared their stories. For example:

> She became one of the 180,000 Australians who pick up an infection in hospital, in her case the potentially fatal superbug *Staphylococcus aureus*, or golden staph. The metal screws that held her spinal brace together became home to the bacteria and for years refused to die as one antibiotic after another was tried but failed to kill the infection [10].

These case kinds of studies were used to emphasis the vulnerability of people together with the seriousness and potential impact of AMR. However, although focussing on actual case studies highlighting the human element of the issue, these reports also often contained the opinions of experts, adding to the credibility and impact of the cases reported [9,10,14].

Some reports included scientists accounts of new discoveries to curb resistant microorganisms, such as Tasmanian devil's milk [15], Australian honey [16] or a century old antiseptic made from coal tar being rediscovered [17]. Alongside reports calling for innovative approaches or detailing old and new substances — or miracle substances - that could be used to curb antimicrobial resistance, strategies seen as mitigating the antibiotic resistance crisis were also detailed in media reports. These included the need to examine the role of antibiotic use in livestock's food and a call for *One Health* (being a systemic approach to health and wellbeing through the collaboration of human medicine, animal health and the environmental sciences) to be more prominent [18—20]. In addition, calls for more research and the public to be better informed were also made, especially in relation to visits to general practitioners and expectations of antibiotics prescriptions for common colds [21,22].

Although coverage was balanced and incorporated the opinions of experts and case studies, its impact on public awareness or on strategies that might otherwise be used by public health authorities to inform the public could not, however, be ascertained.

## Media communication policies

In the context of this study, no polices specifically guiding a media response to the AMR issue were located. Although both local and international authorities e.g., the World Health Organisation (WHO), the Centers for Disease Control and Prevention (CDC), and the Australian federal government have each devised documents outlining the principles of effective communication to the public during public health emergencies and/or outbreak situations (e.g., WHO, 2005 [23]; WHO, 2008 [24]; CDC, 2014, [26] Australian Government, 2017), [25] these have all stopped short of providing guidance specific to the AMR crisis.

## Use of metaphors as an interpretive frame

Analysis of the media reports selected revealed the consistent use of six key metaphors to communicate information about AMR to the public. For the purposes of this report we have identified them as follows:

- The 'superbug' metaphor
- The military metaphor
- The criminal metaphor
- The epidemic metaphor
- The doomsday metaphor
- The blaming others metaphor

A brief account of each of these is provided below.

### The superbug metaphor

The superbug metaphor was the most common metaphor used in all media in the discussion of AMR. The superbug metaphor was used to evoke a sense of superbugs as all-encompassing and overwhelming, as sentient and intelligent with the capacity to overcome, outsmart, and outwit the human being. Some examples of the use of the 'superbug metaphor' are:

- "Superbugs set to beat antibiotics" (Courier-Mail, 30th September, 2003)
- "Superbug fears rise — Flesh-eater outwits experts" (The Courier-Mail, 10th September, 2008)
- "Superbugs besiege NSW hospitals" (The Sydney Morning Herald, 22nd September, 2011)
- "Rise of the superbugs" (The Sydney Morning Herald, 28th December, 2013)
- "Rise of the SUPERBUG" (The West Australian, 10th December, 2014)
- "Superbug threat on the rise" (Daily Telegraph, 16th March, 2015)
- "Hospitals gain ground in halting deadly superbugs" [also under military] (Sydney Morning Herald, 9th April, 2015)
- "Malaria superbugs rampant" (The Sydney Morning Herald, 3rd February, 2017)

Related to the superbug metaphor was the analogous portrayal of superbugs having independent intelligence and being 'clever':

- "Race on to outwit 'clever' killer bugs" (Hobart Mercury, 3rd January, 2008)
- "Superbugs find way to beat drugs" (Hobart Mercury, 3rd January, 2008)
- "Superbugs pretend to be vulnerable to medication" (The Australian, 10th May, 2016)

**The military metaphor**

In this study, the military metaphor was found to be widely used in the print newspaper media, with two 'subframes' mostly used: the *enemy frame* and the *battle frame*. Both frames had the capacity to evoke anxiety, a sense of a lack of control, uncertainty about the future where antibiotics are no longer effective, and the fears associated with the inevitable mortality of human being. While evoking anxiety, the use of the military metaphor also emphasises the need to enter into a battle to counteract the AMR menace. Some examples of the use of the military metaphor are:

- "Battle of the staph super bug" (The Sydney Morning Herald, 22nd May 2003)
- "Resistance will be futile unless we keep our eyes on the enemy" (The Sydney Morning Herald, 30th September 2010)
- "Specialist is 'pessimistic' about fight" (The West Australian, 3rd August, 2011)
- "Hope for weapon to blast away the bugs" (The Australian, 13th July 2015)

**The criminal metaphor**

Criminal metaphors (which overlapped with the military metaphor) were also widely used in media reports. As with the military metaphor, the criminal metaphor evokes a sense of anxiety but also highlight that AMR can take the form of a sentient organism, ready to pounce or strike as soon as we let our guard down. People might be robbed of their health by a lurking killer. Not all criminals are killers, but most are lurking and waiting to profit from one of our vulnerability. Some examples are:

- "Stronger superbugs lurking in our home" (Canberra Times, 18th April 2009)
- "Stalked by silent army of unseen killers" (The Australian, 15th January 2011)
- "A lurking killer" (The Courier Mail, 15th March 2014)
- "The health detectives tracking superbugs" (Sunday Age, 3rd July 2016)

**The epidemic metaphor**

The epidemic metaphor was also widely used, with descriptions such as plague used to convey the global spread of antimicrobial resistance. Epidemics and the term epidemic have come to be strongly associated with, if not stand as, death and the use of such metaphor evokes deep anxieties associated with an unstoppable and non-discriminatory threat. Some examples of the use of the epidemic are:

- "A plague upon us" (The Age, 28th December 2013)
- "Experts fear deadly superbug plague" (Canberra Times, 18th March 2013)
- "Antibiotics crisis hits a high" (Canberra Times, 2nd May 2014)
- "Superbug catastrophe risk as antibiotics fail" (The Age, 2nd June 2016)
- "Superbugs the cancer of 2050" (Daily Telegraph, 20th May 2016)

**The 'impending sense of doom' metaphor**

A doomsday metaphor was also used, although print media tended to use them more than electronic media (i.e., television documentaries). Also evoking a deep sense of anxiety, this metaphor underscores the role we have in the forthcoming destruction of humankind. Some examples include:

- "Killer bugs we can't stop — Alarm, as deadly infection spread through community" (Daily telegraph, 24th April 2006)
- "Experts warn of return to Dark Ages" (The Sydney Morning Herald, 17th June 2016)
- "Antibiotic apocalypse on way as superbugs multiply" (Courier Mail, 18th January 2017)

**The 'blaming others' metaphor**

An 'othering' metaphor was also used where the blame for AMR was shifted to others. This allows people to minimise the seriousness of the issue and also to sidestep responsibility for changing their own behaviour. The blame in print media tended to be directed towards medical practitioners, and the Australian government. While much more prominent in television documentaries, the print media did show blame towards other countries, and in particular tourists travelling from China, India and south-east Asian countries. Some examples of print media include:

- "GPs 'help superbugs to thrive" (Courier Mail, 19th November 2014)
- "Superbug monitoring ignored" (The Australian, 25th February 2006)
- "Inaction allows superbugs to spread" (The Sydney Morning Herald, 23rd February 2007)
- "Travellers spreading resistant superbugs" (The Sydney Morning Herald, 16th September 2010)
- "Doctors failing on infection control" (The Age, 8th December 2010)
- "ASIA—PACIFIC 3 INDIA bug in water" (The Advertiser, 16th April 2011)
- "Only half of doctors was hands properly" (The West Australian, 10th November 2011)
- "Travellers warned on infection risk" (Canberra Times, 19th March 2013)
- "Superbug threat grows and governments do nothing" (The Courier-Mail, 17th July, 2013)
- "Health threat as tourists bring home world's lethal superbugs" (The Sydney Morning Herald, 3rd February 2014)

- "Doctors share blame for rise of killer infections" (The Advertiser, 19th November 2014)
- "Excuse me nurse, are your hands clean?" (The Age, 18th June 2015)

In contrast to newspapers, television documentaries were more reticent in their use of most metaphors. An exception was the use of the *blaming others* metaphor, describing the Indian subcontinent as: "superbug's perfect petri dish" [27]. When not using metaphors, they were inclined more to use actual case studies and images to convey information about the issue. While these documentaries raised an alarm about the issue, they were not overly dramatic, focussing instead on just 'presenting the facts' [27–29].

## Discussion

Overall, this study has found media coverage of the AMR issue to be accurate, fair and balanced, and made appropriate use of case studies to highlight the impact of antimicrobial resistance on individuals.

Over the period studied (2002-2016) there was a steady increase in media attention given to the AMR issue. This increase could not be attributed to any specific events, however. Contrary to what was anticipated, analysis of the data failed to find any clear indication of peaks and troughs in media coverage as, for example, might be associated with a political election where authorities could take the opportunity to lobby for more health care funding. The only notable exception to this was the occasional sporadic increase in reports associated with AMR-associated deaths in a healthcare facility. In such instances, the media would report on them as part of a case study. This finding concurs with a similar one made in a 2006 UK study involving an examination of that country's Sunday newspapers over a 10-year period [30]. In this study, the researchers' found that, in the context of MRSA, the human interest's story remained a key feature of the coverage. This was because human interest stories tend to evoke a sense of identification.

As well as personal stories, media coverage was concerned with the incidence and spread of microorganisms and 'blaming others' for this spread (termed 'othering'). It has been suggested that 'othering' is a form of denial that allows people to minimise the seriousness of a public health issue and also to sidestep responsibility for changing their own behaviour. For example, in an analysis of the media framing of the 2003 SARS epidemic, Washer [31] contended that 'othering' was used to define SARS as a disease of 'Chinese origin', which led to a perception that people not of Chinese origin or identifying with the Chinese community would be less at risk of being affected by the disease. A UK study by Wallis and Nerlich [32] similarly found the use of othering featured in media reports, but did not feature strongly.

Conceptual metaphors, in our findings, involved the use of one idea to describe another. Discourse metaphors, in contrast, go further than just linking ideas (cognitions). They worked by embodying patterns of experience. As Nerlich and Richard [33] explain, discourse metaphors:

> highlight salient aspects of a socially, culturally or politically relevant topic. Like conceptual metaphors, discourse metaphors activate specific emotional commitments. They evoke an emotional or affective stance, position or reaction in the listener and user — what Aristotle called "pathos" (p. 577).

Discourse metaphors are influenced by social and cultural history and going further than the conceptual metaphor have the potential to also influence social and cultural futures [34]. There were six distinct metaphors identified in the media representation of AMR in Australian media. The most prominent one was the 'superbug metaphor'. The genesis of the term 'superbug' is unclear. Commentators suggest, however, that it was used in the media as early as the mid-1990s in the context of antibiotic use in agriculture [35]. The term entered the general lexicon after this, and has been widely used since [35].

The use of superbug terminology was originally restricted to the description of the Methicillin Resistant *Staphylococcus aureus* (MRSA) [36]. Today, however, it has evolved to depict AMR as a whole rather than just being a synonym for MRSA. The idea of a *superbug* has probably gained currency because it "makes concrete an abstract and invisible threat" [35], p. 97. Since the use of the superbug metaphor very often implies that 'we are running out of time against a sentient menace', and that 'superbugs are taking over our world' it may yet prove to be a useful device in media strategies aimed at galvanising a concerted public response to the issue. While the metaphors identified in this study can be likened to conceptual metaphors, the Superbug metaphor itself due to its prolonged used in the context of MRSA and now AMR could now be classified as discourse metaphor.

The use of the military metaphor is not new in healthcare discourse, with its first use dating back to 1627 [37]. Its capacity to imply the inherent weakness of the human kind [38] makes its use particularly pertinent in media coverage of the AMR issue. The use of these metaphors further emphasises the representation of AMR as a 'sentient individual', having the capacity to act on its own, lurking in the shadows, ready to pounce on us, strike us as soon as we let our guard down. The use of criminal metaphors arguably serves evoke an awareness of the unsafe nature of the environment, where people might be 'robbed' of their health at any time by a lurking killer.

As stated above, the criminal metaphor has some overlap with the military metaphor as they both portray a killing discourse. It is acknowledged that not all criminals or army personnel are killers. Nonetheless it is difficult to conceive that killing is completely absent from either metaphor; not only do both rely on force but also to some extent some stalking, hunting and tracking and having tactics. A sense of threat is evoked with the use of the criminal metaphor and this threat is made more real by the possibility that AMR is represented not as a simple criminal but as a criminal with a killing intent (see examples above): not only are we at risk of these killer infections, but we have somebody to blame and can absolve ourselves from any responsibility. This seems to be a key feature of the criminal metaphor, where the blame is put upon other individuals/group of people. The criminal metaphor has been used extensively in legal writing, in cases of intellectual property disputes for example, and draws heavily

on images of predators who by stealth remove what is not theirs from an innocent victim or innocent owner [39]. This feature can be identified in the use of the criminal metaphor in relation to AMR issues.

With regard to the epidemic metaphor, the term epidemic originally meant "the rapid and episodic onset of infectious diseases such as those historically associated with fear and sudden widespread death" [40], p. 892. The epidemic metaphor was found to convey a sense that AMR is the newest plague to hit humankind and it might be an accurate metaphor to use in the context of AMR. While some of the pathogens that have become resistant and multi resistant might not cause outbreaks in an epidemic sense, they can be transmitted from individuals, in a resistant form.

The doomsday metaphor (or 'impending sense of doom' metaphor) encompasses aspect used in other metaphors to underscore the inevitability of the future of a world without antibiotic where "resistance is futile".[1] This becomes apparent when considering the origin of the doomsday metaphor, which is related to the "doomsday clock" set up circa 1947. Since this time a panel of experts have used the clock as a metaphor to represent how well we alleviate existential threats such as global nuclear threats, climate change or cyberattacks [41]. Originally, the metaphor was used to describe the threat to civilisation of a potential nuclear conflict. Its use in the context of AMR has the capacity to evoke deep anxiety and also a sense that we are playing a part in the forthcoming destruction of the humankind.

As already noted, a significant and distinct finding of this study was the media's use of conceptual and discourse metaphors to frame its reports. Although the coverage was accurate, questions can be raised with regard to purpose and effectiveness of using metaphors. Whether these metaphors are being used to evoke panic and *ought* to evoke panic (e.g. to effect behaviour change) is beyond the scope of this present paper to discuss and will be examined later in a future companion article.

Healthcare professionals have a responsibility to inform their patients of the risks AMR poses to the future of humankind and healthcare as a whole. Having an informed and substantive understanding of the ways in which the media represent the AMR issue would better equip them to work in collaboration with the media to ensure that the public is appropriately informed of the development and threats posed by the AMR problem and how these might be mitigated. Guidelines specific to the public communication of the AMR issue need to be devised and disseminated by authority and professional bodies. Such guidelines could take the form comparable to that already used to guide and govern public health emergencies.

## Limitations

An original aim of this study was to explore the possible risks and benefits to the public of media coverage of the AMR issue, including its effectiveness in influencing the public's knowledge of AMR and fostering the behavioural changes recommended by authorities to help mitigated the problem. While the use of metaphors in the media was widespread, whether or not they had an impact on public perceptions of the AMR threat and motivated change (e.g., reduction in requests to GPs for antibiotic prescriptions for viral infections) could not be ascertained in the context of this study.

A US study by Bekalu, Bigman [3], in which a representative sample of 627 adults were surveyed, found that non-narrative messaging (structured, didactic, factual messaging format) was more effective than narrative messaging (story telling which is emotionally evocative). As the study being reported here was undertaken as an unobtrusive text-based study, it is not possible to draw conclusions about the impact of either the narrative or non-narrative formats of the reports analysed. This is an area that would benefit from a future empirical inquiry.

## Conclusion

The first WHO Global report on antimicrobial resistance was only published in 2014, despite the threat of growing antimicrobial resistance having been described for decades earlier. The first global strategy for containment of antimicrobial resistance was however only published in 2001 [43]. In this document, antimicrobial resistance was described as an urgent problem, in need of coordinated and global action [43]. Recommendations were formulated following the resolution on Antimicrobial resistance in 1998 [44], where calls to raise awareness, promote the sharing and understanding of information on AMR, provide strategic and technical guidance as well as to assist research to address the knowledge gaps were made. These were emphasised in the global strategy, although recommendations with regards to patients and the general public only highlighted the need for education. While calls for countries to develop regulations, prescription guidelines and surveillance systems were made, communication strategies were not mentioned in the strategy document. There have been calls to develop communication frameworks for specific use with social media in time of emergencies [45], but again these have stopped short of providing guidance on communication strategies relating specifically to AMR.

This study has provided new insights into the media representations of antimicrobial resistance in the cultural context of Australia. The findings indicate that while the media has, in general, taken a responsible and well-informed approach to reporting on the AMR issue it remains unclear what impact it has had in regard to increasing public awareness, motivating behaviour changes, and motivating the public to take responsibility for their own behaviours that are known contributors to the AMR crisis. This stands as a fertile area that would benefit from future research.

## Ethics

This project was granted an exemption from ethics review (number 2016-312) by the Deakin University Human Research Ethics Committee (DUHREC).

[1] From Star Trek Voyager series, part of the message broadcasted by the Borg when they encounter an alien race.

## Authorship statement

SB and M-JJ participated equally in the conceptual design of the study and this manuscript. All authors contributed to the manuscript preparation and have seen and approved the final version.

## Conflicts of interest

The authors declare that they have no conflicts of interest.

## Funding

This study was supported by an Australasian College for Infection Prevention (ACIPC) Early Career Research grant.

## Provenance and peer review

Not commissioned; externally peer reviewed.

## References

[1] O'Neil J. In: Government H, editor. Tackling drug-resistant infections globally: final report and recommendations. London: HM Government; 2016.
[2] Davis M. "Is it going to be real?" Narrative and medica on a pandemic. Forum Qual Soc Res 2017;18. Art. 18.
[3] Bekalu MA, Bigman CA, McCloud RF, Lin LK, Viswanath K. The relative persuasiveness of narrative versus non-narrative health messages in public health emergency communication: evidence from a field experiment. Prev Med 2018;111:284—90.
[4] Desilva M, Muskavitch M, Roche J. Print media coverage of antibiotic resistance. Sci Commun 2004;26:31—43.
[5] Fasugba O, Mitchell BG, Mnatzaganian G, Das A, Collignon P, Gardner A. Five-year antimicrobial resistance patterns of urinary Escherichia coli at an Australian tertiary hospital: time series Analyses of prevalence data. PLoS One 2016;11. https://doi.org/10.1371/journal.pone.0164306. e0164306.
[6] McCombs M, Shaw D. The agenda setting function of mass media. Publ Opin Q 1972;36:176—87. https://doi.org/10.1086/267990.
[7] McCombs M. A look at agenda-setting: past, present and future. J Stud 2005;6:543—57.
[8] Scott L. Jagged little pills. The courier mail. 2014. 15 March 2014.
[9] Skilton N. Infections can be death sentence; Hospitals act to assert control. Canberra Times; 2008. 1 June 2008.
[10] Davies JA. Rise of the superbugs. The Sydney Morning herald; 2013. 28 December 2013.
[11] Miles J. Superbugs find way to beat drugs. Courier Mail; 2015. 22 November 2015.
[12] Antibiotics crisis hits a high. The Canberra Times; 2014. 2 May 2014.
[13] Mackenzie D. Antiobiothic resistance will hit a terrible tipping point in 2017. New Scientist; 2016. p. 32—3.
[14] Spooner R. How we lost mum to a superbug. Sunday Age; 2016. 13 November 2016.
[15] Kempton H. Devil of a medical find. Hobart Mercury; 2016. 18 October 2016.
[16] Strom M. Australian honey as potent as NZ manuka for fighting germs. Canberra Times; 2016. 29 December 2016.
[17] Smith B. WWI antiseptic 'could fight cold. Canberra Times; 2016. 28 November 2016.
[18] Goode A. Cut the drugs and spive up our animal feed. The advertiser; 2006. 2 March 2006.
[19] Riley T. Danger from your four-legged friend. The West Australian; 2012. 28 November 2012.
[20] Zinsstag J, Schelling E, Waltner-Toews D, Tanner M. From "one medicine" to "one health" and systemic approaches to health and well-being. Prev Vet Med 2011;101:148—56. https://doi.org/10.1016/j.prevetmed.2010.07.003.
[21] Dunlevy S. Doctors share blame for rise of killer infections. The Advertiser; 2014. 19 November 2014.
[22] Ross J. Germ war breakthrough. The Australian; 2015. 21 January 2015.
[23] World Health Organization. Effective media communication during public health emergencies. Geneva: WHO; 2005.
[24] World Health Organization. World health organization outbreak communication planning guide. Geneva: WHO; 2008.
[25] Australian Government. National pest & disease outbreaks. Media arrangements during an outbreak. 2017. http://www.outbreak.gov.au/for-media.
[26] Reynolds B, Seeger W, Centers for Disease Control and Prevention. Crisis and emergency rsisk communication. 2014 Edition. Atlanta: CDC; 2014.
[27] Thompson G, Jolley MA. In: Australia A, editor. Rise of the superbugs. ABC Four Corners; 2012.
[28] Brockie J. In: Brockie J, editor. Insight: superbug. Insight; 2011.
[29] Horstman M. In: McKenna G, Lawrence R, editors. Antibiotic resistance. ABC Catalyst; 2016.
[30] Washer P, Joffe H. The hospital superbug: social representations of MRSA. Soc Sci Med 2006;63:2629—39.
[31] Washer P. Representations of SARS in the british newspapers. Soc Sci Med 2004;59:2561—71.
[32] Wallis P, Nerlich B. Disease metaphors in new epidemics: the UK media framing of the 2003 SARS epidemic. Soc Sci Med 2005;60:2629—39. https://doi.org/10.1016/j.socscimed.2004.11.031.
[33] Nerlich B, Richard J. "The post-antibiotic apocalypse" and the "war on superbugs": catastrophe discourse in microbiology, its rhetorical form and political function. Publ Understand Sci 2009;18:574—90. https://doi.org/10.1177/0963662507087974.
[34] Zinken J, Hellsten I, Nerlich B. Discourse metaphors. In: Ziemke T, Zlatev J, Frank R, editors. Body, language and mind. Berlin: Walter de Gruyter GmbH & Co; 2008.
[35] Washer P. Mad cows, modern plague and superbugs. In: Washer P, editor. Emerging infectious diseases and society. Basingstoke: Palgrave Macmillan UK; 2010.
[36] Nerlich B, Koteyko N. MRSA - portrait of a Superbug: a media drama in three acts. In: Mussolff A, Zinkwn J, editors. Metaphor and discourse. UK: Palgrave Mcmillan; 2009. p. 153—69.
[37] Sontag S. Aids and its metaphors. London: Allen Lane; 1989.
[38] Hanne M, Hawken SJ. Metaphors for illness in contemporary media. Med Humanit 2007;33:93. https://doi.org/10.1136/jmh.2006.000253.
[39] Loughlan P. Pirates, parasites, reapers, sowers, fruits, foxes... The metaphors of intellectual property. Syd Law Rev 2006;28.
[40] Saguy A, Riley K. Weighing both sides: morality, mortality, and framing contests over obesity. J Health Polit Pol Law 2005;30:869—921.
[41] MacKenzie D. Doomsday Clock: the retro metaphor that's still relevant today. New Scientist; 2016.
[42] World Health Organization. Antimicrobial resistance: global report on surveillance. Geneva: World Health Organization; 2014.

[43] World Health Organization. Global strategy for the containment of antimicrobial resistance. Geneva: WHO; 2001.
[44] World Health Organization. World Health Assembly: emerging and other communicable diseases: antimicrobial resistance. Geneva: WHO; 1998.
[45] Flew T, Bruns A, Burgess J, Ben-Harush O, Potter E, Newton J. Support framework for the use of social media by emergency management organisations. Brisbane: QUT Digital Media Research Centre; 2015.