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Hendra in the news: Public policy meets public morality in times of zoonotic uncertainty

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ABSTRACT

Public discourses have influence on policymaking for emerging health issues. Media representations of unfolding events, scientific uncertainty, and real and perceived risks shape public acceptance of health policy and therefore policy outcomes. To characterize and track views in popular circulation on the causes, consequences and appropriate policy responses to the emergence of Hendra virus as a zoonotic risk, this study examines coverage of this issue in Australian mass media for the period 2007–2011. Results demonstrate the predominant explanation for the emergence of Hendra became the encroachment of flying fox populations on human settlement. Depictions of scientific uncertainty as to whom and what was at risk from Hendra virus promoted the view that flying foxes were a direct risk to human health. Descriptions of the best strategy to address Hendra have become polarized between recognized health authorities advocating individualized behaviour changes to limit risk exposure; versus populist calls for flying fox control and eradication. Less than a quarter of news reports describe the ecological determinants of emerging infectious disease or upstream policy solutions. Because flying foxes rather than horses were increasingly represented as the proximal source of human infection, existing policies of flying fox protection became equated with government inaction; the plight of those affected by flying foxes representative of a moral failure. These findings illustrate the potential for health communications for emerging infectious disease risks to become entangled in other political agendas, with implications for the public's likelihood of supporting public policy and risk management strategies that require behavioural change or seek to address the ecological drivers of incidence.

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Introduction

Hendra virus is a *zoonosis* – which means it can be transmitted across species boundaries from its natural host (flying foxes or fruit bats) to cause infection and disease in domestic animals and people. Emerging bat-borne infections such as Hendra are a pressing global public health concern (Wong, Lau, Woo, & Yuen, 2007). Hendra is highly lethal to humans and endemic in Australian flying fox populations. Like other new and re-emerging infectious diseases, changes in the incidence and cross-species transmissibility of Hendra are likely to hinge on the ecological impacts of natural events and human activities (Jones et al., 2008). Indeed it is clear that Hendra has 'spilled' over from flying fox populations into horses, and then people and pet dogs through

their increasingly intense interaction in rural and peri-urban areas. Importantly, the impacts of these interactions are bi-directional; anything that induces 'stress' in flying foxes is thought to amplify viral shedding into the environment (Parrish et al., 2008). Efforts to disrupt flying-fox encroachment on human settlement, therefore, are likely to increase the risk of human infection. Current hopes of prevention rest on the development of a vaccine for horses, the only confirmed intermediate host for Hendra transmission to humans. In the interim, public health responses to Hendra have focussed on education and behaviour modification amongst high-risk groups such as veterinarians, horse owners and people who work in equine industries, and the institution of disease surveillance and quarantine measures involving both human and animal health sectors (Adamson, Marich, & Roth, 2011).

Since Hendra virus first emerged in 1994 there have only been four human deaths and seven human infections. However concerns in Australia about the risks to human health escalated sharply in 2011 when outbreaks in horses occurred over a greater geographic area and at a far higher frequency than past 'Hendra seasons' (Field, Crameri, Kung, & Wang, 2012). Concern about the risks posed by

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the bat-borne virus were further heightened by the subsequent and unexpected discovery of a pet dog with a naturally acquired infection (Tapim & Withey, 2011).

Many Australians, particularly those living in regional areas, already consider flying foxes to be a noisy and unhygienic pest. Towns and city suburbs in north-eastern parts of the country can find themselves 'under siege' from large groups of roosting 'fruit bats' – with these 'camps' or colonies sometimes comprised of several thousand individuals. Aside from the impacts of noise and faeces, flying fox colonies can 'fly in and feed' on commercial orchards causing significant economic losses for fruit growers. For this reason there has been a longstanding practice of shooting flying foxes and disrupting their colonies with sirens, smoke bombs and helicopters to deter them from congregating in agricultural and residential areas.

Whereas in the past diseases of wild animals were thought to pose limited risk to humans, the connection between human activity – particularly changes in land use – and changes in patterns of infectious disease is becoming increasingly clear (Newell et al., 2005). The urbanisation of coastal habitats is thought to have had a number of effects on flying fox populations in eastern Australia – restricting access to their normal foods and forcing them to both turn to, and increasingly rely on, commercial orchards and urban gardens for sustenance (Plowright et al., 2008). And because food is scarce flying foxes are also less inclined to migrate, leading to the formation of permanent camps in agricultural and residential areas. These effects are also exacerbated by natural events that further limit the availability of natural and horticultural food resources, such as cyclones and floods (Plowright et al., 2011). As large groups of flying foxes congregate in and around human settlements this gives the impression that the population is thriving, whereas this is more a result of reduction in their natural habitat, and several species of flying foxes are, in fact, vulnerable to extinction (Welbergen, Klose, Markus, & Eby, 2008).

For this reason, since 1986 in NSW and 1994 in Queensland, flying foxes camps have been legally protected from human interference to try and rehabilitate the population. In 2008 the Queensland government took the further step of refusing all applications by farmers for permits to shoot flying foxes to protect their crops, both on ecological grounds and because attempts to break up established camps may be counterproductive. It was argued that any measures that stressed flying foxes would increase the risk of Hendra spilling over into horses; and dispersing specific camps would likely be ineffective as there would be nothing to stop the colony re-establishing itself nearby, and once again in conflict with human settlement. Thus, what was designed to be legislation to protect a vulnerable species of native animal became a policy instrument with which to try and limit zoonotic risk exposure. This transition from conservation-focussed environmental policy to public health policy has been incremental, such that the policy aim was not to solve either problem but manage areas of emerging concern. Yet as people directly affected by flying foxes have struggled to 'live with' the growing throngs of unwelcome neighbours, many have come to believe that by protecting flying fox populations and advocating the adoption of low risk behaviours towards them, governments and health authorities have put the health and welfare of another species above that of human populations.

Experiences with Bovine Spongiform Encephalopathy (BSE) and Severe Acute Respiratory Syndrome (SARS) indicate that policy-making for a new zoonotic disease is always difficult and prone to polarising different stakeholders in affected communities (Phillips, Bridgeman, & Ferguson-Smith, 2000; Singer et al., 2003). A key feature in matters surrounding animal disease control is that radically different policy responses – such as wholesale culling or

vaccination – can typically be presented as plausible points of intervention. For this reason decisions surrounding what should be done about new or pressing zoonotic risks are often contested, and finding the right balance between over-caution, laissez-faire approaches, and determining the weight given to different socio-economic factors can be difficult. For example a lack of due diligence can expose the population to the risk of infection for far longer than necessary, as was the case with BSE. Conversely, the overzealous application of the precautionary principle can destroy the livelihood of a population, impact its food supply, limit development, and entrench or exacerbate socioeconomic disadvantage (World Health Organization, 2004). Furthermore, when the zoonotic risk is new, attempts to explain the choice of policy are likely to be further complicated by uncertainty regarding the precise risk of infection, the drivers of disease emergence, and the measures needed to control the risk of infection. Therefore public support for policies that disrupt people's lives and communities or place precautionary limits on the development of natural resources might depend on their understanding of the causes and risks of zoonotic outbreaks, their trust in government agencies, and the likely consequences for them of different public health responses.

In this regard news media are an important source of information for the public (Brodie, Hamel, Altman, Blendon, & Benson, 2003), particularly with regard to the complex relationship between the environment and human health and with regards to the risk posed by animals. For not only does the media reflect the issues that concern people, it also impacts upon the issues the public thinks about, and the criteria through which they think about them – influencing people's understanding of what is at stake, of who or what is to blame, of who is at risk, and of what can be done to address the situation (Entman, 1993; Scheufele, 2000). In this regard, while individual journalists may privilege independence, accuracy and balance, media organisations are rarely neutral and can both influence public opinion themselves, or be used by industry, politicians and interests groups to influence public perception of particular issues and/or promote their own ends (Callaghan & Schnell, 2001; Terkildsen, Schnell, & Ling, 1998). Therefore the effects of how the media chooses to raise to public prominence and then 'frame' events and opinions surrounding a new health issue such as an emerging zoonosis can be recursive. For example because elected officials, politicians and policy advisors are responsive to public opinion, public perceptions about the causes of a disease threat like Hendra virus might influence the level of public support for specific health policies, and, thereby, ongoing political debate (Gollust, Lantz, & Ubel, 2009; Harrabin, Coote, & Allen, 2003).

In this paper we analyse representations in the Australian media of the causes and consequences of the emergence of Hendra as a zoonotic risk, focussing on how the unavoidable uncertainty about its causes and likely consequences shaped perceptions of the health policies put in place in the attempt to mitigate the risk of human infection. In short we seek to examine media representations of an infectious threat within a broader policy context. Because flying foxes are a highly visible, widespread and relatively novel source of infectious risk for humans, the emergence of Hendra virus presents an opportunity to track and compare media representations of disease 'events', health policy goals, political discourses and public opinions in ways that are difficult for non-communicable diseases. In this our research is consistent with other reports examining media portrayals of the health risk and scientific and policy uncertainty associated with contested environmental exposures (Mayer, 2012) and Emerging Infectious Diseases (EIDs) (Daku, Gibbs, & Heymann, 2012; Hilton & Hunt, 2011; Washer, 2010).

Data and methods

To identify Australian media coverage of issues surrounding the emergence of Hendra virus, the database *Factiva* was searched using the following terms as textwords: (Hendra virus) or (flying fox*) or (fruit bat*) for the period 1 January 2007 through 31 December 2011. A *News Filter* limiting content to the region of Australia was then applied identifying more than 10,000 items. Because we were focussing on representations of Hendra and associated public policy, further *Subject Filters* were applied to restrict the sample to *Political and General News*, limiting the corpus to just over 6000 articles. Full-text reports from 9 news media sources from areas affected by Hendra virus outbreaks were then downloaded. The sample includes 2 national media organizations [N] as well as articles appearing in the 3 major provincial [P] newspapers and 4 of the 103 local [L] newspapers in Queensland and New South Wales. They are: *The Australian Broadcasting Corporation Online News Service* [N]; *The Australian Newspaper* [N]; *The Courier Mail* [P]; *The Daily Telegraph* [P]; *The NewsMail* (Bundaberg) [L]; *Sunshine Coast Daily* [L]; *Sydney Morning Herald* [P]; *Townsville Bulletin* [L]; and, *The Warwick Daily News* [L]. Pretesting confirmed that this search strategy would produce a larger and more heterogeneous sample of news reports, while still including coverage that focussed more narrowly on specific zoonotic events. From the resulting corpus of 1383 articles we discarded 43 duplicates and 356 reports that were not immediately relevant to Hendra virus or flying fox populations (such as those that refer to the zip-line apparatus known as a 'flying-fox' or businesses or products with 'flying fox' in the title), after which 984 unique articles remained to be analysed.

The media sample was then read, catalogued manually, and cross-compared by the lead author in order to identify and track prominent concepts, differences, and themes. Next, both authors manually cross-coded a pilot sample ($n = 40$) of the media corpus for specific types of content to confirm and to extend the preliminary thematic analysis. Articles then were coded for:

- mention of horses, flying foxes/fruit bats or Hendra virus
- mention of debates about flying fox control

- report of distal ecological causes (loss of natural habitat) for the emergence of Hendra virus or the possibility of viral mutation
- mention of ignorance about Hendra virus amongst scientists, healthcare providers or members of the public
- reference to government inaction as a factor contributing to the Hendra problem
- reference to people's health and welfare not being high enough on the political agenda.

These codes were both emergent and informed by similar media analyses (for example Gollust & Lantz, 2009; Washer, 2004). Because Hendra events tend to occur seasonally (from winter-spring), the calendar year was chosen as the unit of analysis. The results from coding were then tabulated in matrix form, cross referenced and displayed visually as descriptive statistics in charts to aid interpretation. Regular discussions among the authors served to generate additional enquires and to validate insights as they emerged. This approach is consistent with ethnographic content analysis, a qualitative research method for interpreting documents within the context of their use, which enables researchers to generate insights about how documents promote particular ways of understanding, interpreting and responding to an issue or event such as the emergence of a new disease from both numerical and narrative data (Altheide, 1987).

With these concepts and types of content in mind, our analysis of the 984 articles proceeded through several cycles of immersion and crystallization of insights – a research process comprised of repeated readings and comparisons across and between news-sources, discussions amongst the authors, periods of testing of alternate explanations, and then re-immersion within the research materials (LeCompte & Schensul, 1999).

Results

Coverage of issues surrounding Hendra virus and flying fox populations in the media sample more than doubled in 2008, then plateaued before rising sharply in 2011 (Table 1). This two-phase pattern can be attributed to the tragic deaths from Hendra virus of the veterinarians Ben Cuneen [2008] and Alister Rodgers [2009]

Table 1
Results of media sample cross-coding – (rounded percentages of totals in brackets).

	2007	2008	2009	2010	2011
Number of reports in sample	44 (4.5)	167 (16.9)	169 (17.2)	164 (16.7)	440 (44.7)
<i>Hendra virus in relation to flying foxes</i>					
Both flying foxes and Hendra mentioned in report	2 (4.5)	32 (19.2)	53 (31.4)	34 (20.7)	242 (55)
Flying foxes mentioned without referring to Hendra virus	40 (90.1)	46 (27.5)	32 (18.9)	72 (43.9)	75 (17)
Hendra virus mentioned without referring to flying foxes	2 (4.5)	89 (53.3)	84 (49.7)	58 (35.4)	123 (28)
<i>Hendra virus in relation to horses and flying foxes</i>					
Hendra, horse and flying foxes all mentioned in the report	1 (2.3)	28 (16.8)	49 (28.9)	32 (19.5)	162 (36.8)
Hendra virus mentioned without referring to horses or flying foxes	0	3 (1.8)	17 (10.1)	6 (3.7)	9 (2.0)
Hendra virus and horses both mentioned, no reference to flying foxes	3 (6.8)	80 (47.9)	65 (38.5)	48 (29.3)	111 (25.2)
Hendra virus and flying foxes both mentioned, no reference to horses	0	5 (2.9)	5 (2.9)	8 (4.9)	70 (15.9)
<i>Lack of knowledge about Hendra virus</i>					
Lack of knowledge – "Science"	0	14 (8.4)	14 (8.3)	7 (4.3)	49 (11.1)
Lack of knowledge – Health professions	0	2 (1.2)	5 (2.9)	10 (6.1)	2 (0.5)
Lack of knowledge – Members of the public	0	2 (1.2)	3 (1.8)	5 (3.0)	11 (2.5)
<i>Mention of a distal cause or virus mutation for emergence of Hendra</i>					
Clearing of flying fox habitat	6 (13.6)	8 (4.8)	17 (10.1)	27 (16.5)	21 (4.8)
Natural events: cyclones/floods/drought	4 (9.1)	8 (4.8)	12 (7.1)	18 (10.9)	23 (5.2)
Virus mutation	0	3 (1.8)	2 (1.2)	2 (1.2)	4 (0.9)
<i>Debates about control of flying fox populations</i>					
Report refers to ongoing debate about management of flying fox populations	10 (22.7)	28 (16.8)	30 (17.8)	43 (26.2)	128 (29.1)
Report on Debate about Flying Fox control does not mention Hendra virus	10 (22.7)	22 (13.2)	17 (10.1)	34 (20.1)	38 (8.6)
Report on debate about flying fox control does mention Hendra virus	0	6 (3.6)	13 (7.7)	9 (5.5)	90 (20.5)
Report suggests that people's welfare is not high enough on the political agenda	4 (9.1)	6 (3.6)	8 (4.7)	6 (3.7)	47 (10.1)
Report suggests that 'government' inaction is contributing to the problem	3 (6.8)	5 (3.0)	1 (0.6)	9 (5.5)	38 (8.6)

during the one or two outbreaks that occurred in each of these years; and to the unprecedented number and geographic spread of Hendra events in 2011. Table 1 shows the results of cross coding for types of content and the frequency with which specific constellations of information appear each year in the media sources sampled.

Portrayals of animals as Hendra risks

Given that flying foxes were first identified as the natural host of Hendra virus in 1996 (Young et al., 1996) it is surprising to find that until 2011, the media paid little attention to the link between Hendra virus and flying fox populations. In previous years reports about flying foxes tended not to mention Hendra, but focussed on the impact of flying fox populations on horticultural enterprises and residential areas. In these reports first hand testimony and events on the ground were used to frame public perceptions of this animal's protected status, and the bureaucratic and 'hands off' approach of the government agencies to this issue. At the same time reports that are primarily about Hendra virus during this period typically focus on 'unfolding' zoonotic outbreaks, suspected cases of Hendra infection, quarantine orders, human exposure and disease, experimental treatments, and the impacts of these incidents on individuals. It is not until the unprecedented number of Hendra outbreaks in 2011 that the relationship between Hendra virus infection and contact with flying foxes becomes an item of sustained interest in our media sample.

In 2011 with 17 zoonotic events across two states, 21 dead horses, and upwards of 70 people potentially exposed to the virus through their dealings with sick and dying animals, discussions about the potential role of flying foxes as Hendra carriers became firmly established as a central part of the media discourse. Although the relative prominence given to different types of nonhuman animal changed across the years sampled. By 2011 news about Hendra virus and flying foxes suddenly began to be described in reference to each other in the majority of news reports (Table 1).

The nonhuman species most often linked to Hendra virus in the media sample was the horse, both as a victim of zoonotic outbreaks

and as the intermediate host for human infection (See Fig. 2). As the link between Hendra and flying foxes was given greater prominence in the media, representations of the position and status of flying foxes and horses also began to change. An article in *The Sydney Morning Herald* in 2009 provides a typical example of the more cautious approach taken in the earlier years sampled:

Hendra is not highly contagious but is very often fatal. Carried by fruit bats, it infects horses, which can then transmit the disease to humans through bodily fluids. (Marriner, 2009, p.2)

In this quote flying foxes are identified as the source of the virus and the role of horses as intermediate hosts is well defined, as is the mode of transmission for human infection. At this stage the media are at pains to make it clear that Hendra virus is a fatal and devastating disease of horses that can, on occasion, infect and kill people who work in equine industries. Flying foxes are not portrayed as an immediate or direct risk to human health but as an environmental factor, they are to be understood as the inadvertent reservoir of equine infection.

Although horses continue to be a feature of Hendra news stories, by 2011 it was not uncommon for some subtle distinctions in the natural history of the disease to be dispensed with. Rather than intermediate hosts, horses began to be portrayed as victims of a dangerous 'bat-borne' disease; their role as intermediate hosts is implied rather than explicitly stated, as shown by this 2011 report in *The Australian*:

The outbreak of Hendra virus that has killed six horses and exposed 26 people to infection has reached the outskirts of Brisbane and is the most virulent in the known history of the fruit bat-borne disease. (Barrett, 2011a, p.3)

At the same time as the media start to problematize the role of flying foxes in Hendra outbreaks column inches begin to be devoted to identifying the source of each equine case. Reports begin to note forensically significant details, often with direct quotes from the investigating scientists, much in the same way a crime reporter might ask a detective to profile a likely suspect and then "set the scene" of a murder.

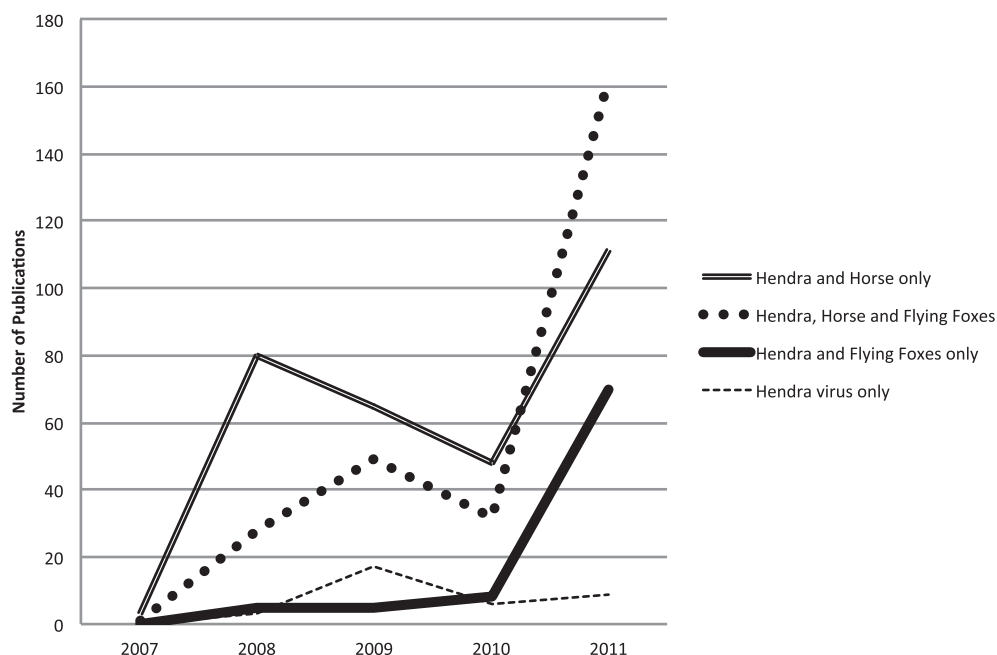


Fig. 1. Reports linking Hendra virus to horses, flying foxes, or both.

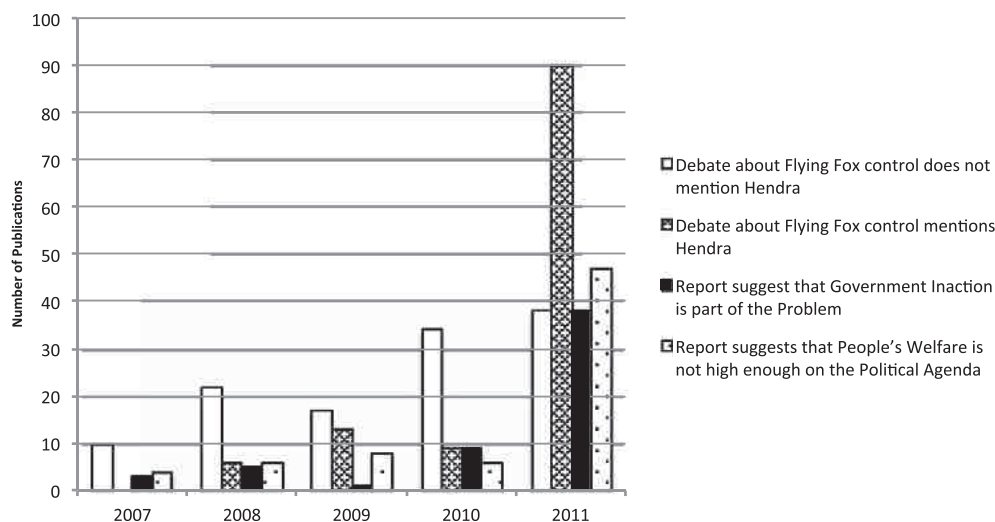


Fig. 2. Media coverage of debate about flying fox control men/ons Hendra virus.

"The infected horse was grazing in a small paddock containing flowering and fruiting trees, where flying foxes were active." ("National snapshot: Almost 50 waiting for Hendra results," 2011, p.14)

These descriptions of 'place' resonate closely with public health recommendations given to horse owners to place feeding bins and water troughs under cover and keep their horses out of paddocks with flowering or fruiting trees, if possible. Yet translating this advice into practice sometimes only served to increase people's sense of anxiety and powerlessness, and their anger with the government. For example one property owner in Gayndah told *The Courier-Mail*:

"The head vet of Queensland is saying, 'Keep your horses away from the bats'. Well, I'm doing that but the bats aren't keeping away from my horses" Mrs Robertson said. "Fifty thousand infected bats are pooping on my horses, their grass and their water every day." (Robertson & Hall, 2011, p.8)

Portrayals of uncertainty, risk, and the drivers of incidence

Public acknowledgement of scientific uncertainty about Hendra virus was also a feature of the media coverage in 2011, heightening the sense that events were out of control (Table 1). In previous years, statements about expert uncertainty were either general reflections about the lack of knowledge of how horses acquired the virus, or they had a sharp clinical focus – describing how little experience health professions had in dealing with human Hendra infections. The former were typically framed as a matter of scientific curiosity, the later a matter of critical urgency that had immediate impact on people's lives.

But during 2011 the media spotlight on Hendra returned to unanswered questions surrounding the health and management of other species. Even as scientists and veterinarians were described as being "baffled" by Hendra virus, they were required to publically speculate on two issues: the implications of finding a pet dog with a naturally acquired infection, and theorise as to why there were so many equine cases that year. That scientists interviewed by the media appeared to be taken aback by the discovery of the canine case drew this response from the Queensland Premier, at the time, Anna Bligh:

"The scientists themselves are being very honest with us. They're telling us that science does not fully understand every part of this

disease. We, as human beings, have had to cope with that in our past, we've conquered diseases before, I believe we will conquer this one." (Miles, MacDonald, & Helbig, 2011, p.2)

Throughout the same period members of the public were increasingly portrayed as being forced to deal with the effects and risks of Hendra outbreaks with inadequate information about the disease. Reflecting the statements of the experts, the concerns of the public expressed in the media were, for the most part, articulated around what people should do to protect themselves and their animals from Hendra events, particularly as pet dogs now appeared to catch the disease, and therefore might be a risk to humans. As reports emerged that the infected dog had been destroyed and the media sought to highlight existing scientific literature that showed that dogs, cats and guinea pigs could be infected with the virus under "controlled" laboratory conditions, repeated assurances by health authorities that there was minimal risk of catching Hendra from animals other than horses began to wear thin. With this single canine infection, in the words of one reporter: *"the bats' presence has become all the more sinister"*. (MacDonald, 2011, p.5)

Despite increasing attention to the link between Hendra virus and flying fox populations, for the most part media reports of the Hendra outbreak in 2011 infrequently gave any consideration to non-proximal factors for disease emergence. While earlier reports, in 2007 and 2010, regularly pointed to land clearing and environmental events such as prolonged drought, floods and cyclones as explanations for flying foxes congregating in residential and agricultural areas, and approximately one in four articles describe habitat loss as inevitably increasing the risk of Hendra jumping species, there is a clear and precipitous decline in such reports in 2011. Of the 440 reports analysed from 2011, only one in 10 has any mention of these types of ecological drivers for disease emergence or the increasing prevalence of Hendra outbreaks (Table 1). Indeed by 2011 the media focus is almost always on events 'as they happen' – the vast majority of reports doing little more than point to the presence of flying foxes and horses in the same locality as the most important characteristic of a causal story of disease or of public health risk.

Portrayals of scientific research and the appropriateness of public policy

Finally cross-coding the media sample revealed that issues surrounding the risk of Hendra virus to human health became

a dominant feature of reports that specifically address, or at least in some way refer to, the continuing controversy about the control of flying fox populations (Fig. 2). While the frequency with which media reports describe the level of dissatisfaction with the government's policy of flying fox protection remains much the same from 2010 onwards, in 2011 heightened uncertainty about who and what was at risk from Hendra virus increasingly became a factor of some importance to assessments of the Queensland Government's response to the unfolding situation. As the lack of knowledge about Hendra virus became an increasingly prominent feature of debates about what should be done about the encroachment of flying fox populations on human settlement and agriculture, so did assertions in the media by members of the public and politicians that concern for the health and welfare of people affected by flying foxes was being ignored in deference to the interests of another species.

In 2011 key features of the justification for the policy of not moving or culling flying foxes increasingly became contested in the media – particularly the claim that flying fox numbers were in decline and the claim that attempts to disperse flying fox colonies would spread the disease. For those wanting to repeal protective legislation, assertions that flying fox numbers were not falling could be backed up by simple first hand observation. People just had to come to affected areas and look for themselves. What they would find, according to the Mayor of Charters Towers, was:

"These bats aren't endangered, they are in plague numbers and more and more communities are feeling the effects of bat infestation." (Gilham, 2011, p.5)

Proponents of policy change to protect the public against bat-borne diseases also dismissed in the media claims that culling or dispersing flying foxes would spread Hendra virus. Even as the Premier or a government spokespersons re-iterated publically that they would: *"respond to the outbreak of Hendra virus on the basis of the best-informed science that we can access"* (Barrett, 2011b, p.7), what constituted evidence became a point of contention. Those seeking to remove protections told the media that current policies were based on a set of (unproven or unsound) assumptions. In support of this, scientists themselves, as is their fashion, acknowledged the limits of scientific certainty – noting that they did not know how horses caught the virus, and that they lacked incontestable proof that disrupting bat colonies would lead to its spread – something admitted by the chief veterinarian of Queensland (to the significant discomfort of the previous Labor government). In contrast, politicians supporting the 'rights' of land-owners to government protection from flying foxes, such as the independent Member of Parliament, Bob Katter, were able to tell press conferences that fruit bats had been removed from towns for years before the current ban without causing an outbreak. And of claims by scientists, health authorities and government spokesperson that these types of interventions could heighten zoonotic risks, Katter noted in the *Townsville Bulletin*:

"If you were looking for a more stupid claim you couldn't find it... we've got empirical evidence on our side, all they've got is conjecture on theirs". (Galloway, 2011, p.15)

A prominent advocate for bat culling known for his theatrical turn of phrase, one week earlier Katter framed the deeper issues in the following terms in *The Courier-Mail*:

"If it comes to a choice of our children dying or us going out there and killing flying foxes, then I have a very grave moral problem about not going out there and killing the flying foxes," Mr Katter said. (Miles, Helbig, & Michael, 2011, p.11)

Pointedly, a number of other politicians even claimed that calls by scientist and the government for more research on Hendra was further evidence that current policies put the needs of flying foxes above the health and welfare of 'real' people:

"Why don't we, as an immediate first response, reduce flying fox numbers? ... Why is the government throwing money at research, which will not protect families now?" ("Hendra virus claims another victim," 2011, p.3)

The newsworthiness of the Hendra outbreak in 2011 and the growing sense of uncertainty expressed by those charged with managing the situation created a media forum in which previously distinct health and environmental issues related to flying foxes became redefined as one and the same problem. Consequently, even as a large pool of research funding was announced for projects related to protecting people and communities from Hendra virus, this only served to highlight the absence of direct government action.

Discussion

This study employs ethnographic methods to evaluate news coverage of Hendra virus and flying foxes in Australia. Past studies indicate the Australian media have a tendency to use alarmist headlines in matters relating to infectious disease (Holland, Blood, Imison, Chapman, & Fogarty, 2012). Nonetheless our impression is that the Australian news media did not 'over-hype' the risks posed by Hendra virus; a finding that echoes UK media coverage of the recent Swine Flu event (Hilton & Hunt, 2011). What is noteworthy however was the way politicians, interest groups and other 'policy entrepreneurs' used the media to challenge the established policy community surrounding public health, animal disease control and wildlife management to put controlling flying fox populations higher on the public agenda (Kingdon, 2011). As the number of Hendra outbreaks increased in 2011, the values and expertise of public health officials, epidemiologists, wildlife ecologists and environmentalists were questioned, as was their current choice of actions. Several features of how Hendra outbreaks and debates about flying fox population control were reported in the media permitted opponents of the current policies and practices to reframe the issues, recast debate about what types of actions needed to be taken, and then prime the public as to how these actions could and should be justified in the face of imperfect scientific knowledge. Media representation of Hendra virus enabled the issue to become not simply a policy or public health issue – but a moral one. By this we mean the discourse surrounding Hendra virus and flying fox populations became a debate about what *is* and *should* be valued, what is important and worth protecting, and, more broadly, what is the 'right' thing to do.

Throughout the period sampled media reports increasingly depict the encroachment of flying foxes on human settlement as being the source of the Hendra problem. Thus while horses remained a risk to human health, rather than being the intermediate host they become fellow victims of the disease. In contrast, the role of flying foxes in Hendra transmission and disease ecology becomes increasingly prominent in media coverage, as shown by Fig. 1. As a species they were stigmatized and pathologized. News media increasingly depicted flying foxes as an invasive plague, both reflecting and potentially re-enforcing community sentiment that they are unhygienic disease carrying vermin. And ecological drivers that bring these native wild animals into increasing contact with human settlement, such as land clearing, were increasingly backgrounded. The small number of articles that did identify distal causes for emergent disease neither suggest, nor reflect upon, the relationship between human activities and novel zoonotic events

as being a point for plausible preventive interventions. In contrast to the number of reports that advocate some form of control for flying fox populations, only a handful of reports raise the possibility completely removing horses from flying fox habitats as a possible solution.

Instead by emphasising proximal causes, flying foxes become increasingly blamed for the emergence of poorly understood and increasingly unpredictable emerging zoonotic disease. Only a handful of reports offer any attempt to describe the implications of habitat loss for planning policy and disease prevention. This pattern of media reports externalising the origins and threats posed by new infectious diseases is, of course, not unique, but is consistent with media representations of other zoonoses and Emerging Infectious Diseases (EIDs) (Joffe, 2011). Unlike previous studies of zoonotic events such as SARS or Swine Flu, where the strength of the human-to-human link dominates media representations of risk, in the case of Hendra virus the role of nonhuman animals in disease emergence was the most salient feature. Rather than being characterised and understood as a consequence of modernity and globalisation – such as is said to be the case for other EIDs (Washer, 2010) – the threat posed to human interests by another species of animal became the dominant ‘frame’ in the media. As was also the case in news reporting about issues surrounding other late 20th century diseases, analysis and critique of the policies, actions and inactions of the government eventually become a central part of the causal story, and, thereby, of increasing moral significance.

Against this background calls for further research, and for nuanced responses to Hendra virus that took account of human, animal, and ecological factors only seemed to reinforce the idea being put forward in the media by opponents of the current policy responses that scientists and environmentalists, rather than the concerns and plight of the very people at risk of disease, were dictating the terms of flying fox and Hendra management strategies. Questions in the media about the value orientations of those in authority offered an alternative framework through which their actions could be judged, potentially eroding public trust in the government and their stated commitment to evidence-based policymaking. According to this view, the risk of Hendra virus was not voluntarily assumed by affected individuals, but forced on them by current government policies. Such causal stories, of course, tend to have far greater political potency than discourses reflective of aetiological uncertainty as harmful consequences are viewed as being the product of human intentions, rather than the products of chance (Stone, 1997).

In policy terms, the unprecedented number of outbreaks in 2011 seems to have served as a “focussing event” that raised the public visibility of both Hendra virus and flying fox management and made them a pressing public health issue (Birkland, 1998; Kingdon, 2011). The policy rationale of seeking to protect and promote the collective interest was poorly represented in the media; the focus instead was on the immediate impacts on individuals and discrete communities. In these terms the costs of current protections for flying foxes were being borne by an increasingly visible and vocal segment of the population; the benefits were diffuse, unpredictable, unrecognised by the electorate, and therefore difficult to defend politically (Oliver, 2006). As the amount of coverage of Hendra related issues escalated throughout 2011, government spokespersons began to struggle to frame the terms of the debate. Those charged with providing information to the public fell into the trap of emphasising the scientific aspects of the health threat, rather than the real world implications. From a public health perspective, the message then became that Hendra virus and flying foxes presented a serious but unquantifiable risk to human health, and, as a consequence of the government’s cautious and “hands off approach”, an imminent threat to communities.

At the heart of this transition, media portrayals of scientific uncertainty, moral ambiguity and inconsistencies in descriptions of the government’s policy position became linked to a wider political discourse surrounding the control of flying fox populations. Opponents of current policies were able to use the media to point to how government legislation was protecting flying foxes, while discounting the implicit policy goals of limiting the environmental drivers of Hendra risk exposure. In these terms opponents of the current policies were able to appeal to a set of established norms, tropes and ‘rhetorics’ for rescue in public health interventions, creating a moral weight for action against flying fox populations in ways that economic arguments and environmental policies had not. As novel zoonotic events such as canine infection remained unexplained, Hendra virus and the increasing presence of flying foxes in residential and horticultural areas increasingly became portrayed as a pressing moral issue that required a moral, rather than a scientific solution. Against the government’s scientific uncertainty and apparent inaction in deference to what they thought was likely to happen in the future, their political opposition offered moral certainty and direct immediate action. People’s livelihoods and their ‘way of life’ were being sacrificed for the good of another species of animal: one that posed a threat to human health. For the safety and wellbeing of humans, particularly those being forced to live in and around flying foxes, had to be prioritised over the welfare of another species of animal, irrespective of whether interventions intended to resolve their health risks and promote their wellbeing actually did so.

Limitations

This research has several limitations. First given our focus on reactions in selected news media to zoonotic events, health communications and public policy, we were not able to capture the nuance that a broader analysis of press releases, policy documents and the grey literature on Hendra virus and flying fox population control would illuminate. Second we did not seek to include the political leanings, funding relationships and commercial affiliations of the news organisations examined in the analysis. In this regard Australia, and especially Queensland, does not have a competitive and diverse media market. Ownership of news media is highly concentrated. Aside from the news provided by the Government funded national broadcaster, the ABC, many major towns and cities are served by only one newspaper. This may have coloured how statements by member of the public, politicians, scientists and other experts were framed and presented in the media. Finally our focus was on Hendra virus in Australia. Without further research it is doubtful our findings can be generalised to the coverage of other bat-borne emergent zoonotic diseases such as Nipah virus in Malaysia and Bangladesh or SARS-like corona virus in South-East Asia.

Conclusions

What this study reveals is the extent to which the media can be used to construct the risks of Hendra virus not as a scientific problem but as a moral question; that is, a problem that requires moral solutions. Given that any government measure aimed at protecting public health involves moral judgements that are legitimated through political processes (Leichter, 2003; Oliver, 2006), the infectious risk posed by wild animals to agricultural production and human populations is undoubtedly both a political and a moral issue. But the moral dimensions of this issue, and the development of policy responses to it, are deeply contested and heavily influenced by media representations of the link between human health, animals and the environment. Our findings illustrate the potential

for health communications around emerging infectious disease risks to become entangled in other political agendas and conflict with widely held human values, with implications for the public's likelihood of supporting public policy and risk management strategies that require behavioural change or seek to address the ecological drivers of incidence. More broadly, our research illustrates the value of methodologies from the social sciences to expand the relevance of the One World One Health public health agenda to reflect lived realities and the needs of communities.

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