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# ARE THERE PARASITES IN YOUR H<sub>2</sub>O? SOCIOLOGY OF RISK & SCIENCE NEWS

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## **Abstract**

This interdisciplinary study draws upon science, science and cultural studies and media studies to conduct a qualitative sociological analysis of science news. Comparative analysis of 81 national and state news articles on parasites and drinking water in Australia and New Zealand reveals the 1998 Sydney water crisis is the most newsworthy event in 1996-2007 and offers several examples of the social construction of risk. Using science news, we show news reporting norms, such as newsworthiness, framing, evidence, balancing and objectivity, affect the production of knowledge and perception of risks about water contamination. Acknowledging the limitations of science and media, as producers of "objective" knowledge, we recommend constituents of each recognise and critically consider how the socio-cultural reality of each institution impacts individual and structural assessments of risk.

## **1 Introduction**

Researching how news media present science news is arguably a multidisciplinary task. Yet, despite the many existing opportunities, "surprisingly little has been written on science and popular culture over the years" (Allan, 2002, p. 3). The tendency for scientists to be "pragmatic people" (Dunbar, 1995, p. 12), that simply get on with the task of scientific inquiry, has resulted in reluctance among scientists to clarify public misconceptions and media misrepresentations (Allan, 2002). In contrast, sociological media analysis was common in the 1970s and 1980s yet subsequently lost popularity, with contemporary analysis being conducted outside the discipline (Zelizer, 2004). In general, sociological research is criticised for over-generalising, reducing actions of journalists to a singular environment and presenting news making asymmetrically (Zelizer, 2004). This study seeks to re-establish sociology as a viable option for media analysis, by showing how news production and issue framing are patterned, institutionalised activities negotiated by multiple actors.

Cultural studies (Allen, 2002 pp. 1-2) tells us

"The world of the media, at least according to statements sometimes made by scientists, is a superficial world driven by a frenzied obsession with entertainment over information, and with it style over substance. This is a world of smoke and mirrors, where nothing is as it seems, and where talk of ratings, target audiences and financial profits all but silences the voices of scientific truth. Journalists struggle to report on the scientific development, no matter how well-intentioned they may be, will more often than not succumb to the forces of sensationalism, to make their news account attract the public's wandering eye".

Consistent with Allan's (2002) directive to exercise caution, as media content alone does not define public perception of risk, we (a sociologist and parasitologist) acknowledge the central role individual agency plays in risk-assessment and highlight the media is one of

multiple and competing social institutions used in decision-making processes and knowledge production. We draw attention to the increasingly-touted poor public understanding of science in Western societies (Priest, 1999) which renders translation by a mediator (ie science journalist) necessary for public comprehension (Bucchi, 1998). Finally, we note the process of transmitting knowledge from the scientific community to the public is problematic for the media which, as messenger, is often faulted for misrepresentation or distortion (Bucchi, 1998) when scientific information is inadequately and partially communicated.

As a reporter, Dumanoski (1999) cautions reporters must be aware of and challenge their assumptions, especially regarding judgments about risk. Risk management is an activity Farland, biologist and director of the US Environmental Protection Agency (EPA), notes "requires us to consider social, political and economic factors, as well as science, as we decide how we deal with or manage various kinds of risk" (Dumanoski, Farland & Krinsky, 1999, p. 170). For example, the media's frequent use of science alone to report how the EPA deals with risk exhibits poor media understanding of risk:

"The media need to better understand risk assessment and risk management processes and to deal with the issue of personalization of risk that occurs as people read their stories about various risks. Readers and viewers need to have a sense of what risk assessment can and cannot say about individual risks versus population risks" (Dumanoski et al, 1999, p. 170).

Additionally, the context within which science is conducted informs what questions scientists ask and affects interpretation of data, particularly relating to the environment and health (Dumanoski et al, 1999). Differences in risk perception and data interpretation are confounded by a deep cultural chasm between media and science as social institutions producing knowledge. There exists peer pressure against scientists' communicating with the media and public, as well as a culture of elitism where "scientists seem to believe that their way of knowing and doing things is the right way and that other ways are not equal or as worthy" while reporters are "reluctant to examine their own assumptions" (Dumanoski et al, 1999, p.173).

As these two institutions defend their practices, the public uses science news as one of many resources to make decisions about how to deal with perceived risks (Rogers, 1999). While social and natural scientists may be aware of how methodological considerations involved with sampling, populations, error, determinants of causality and statistical relevance impact "real" risk, the media's frequent reliance on anecdotes, as a means to provide evidence, along with erroneous representation of data, are problematic, confound public understanding and can affect individual judgments (Griffin, 1999). In his review, Zehr (1999) notes scientists use contingent and empiricist discourse (Gilbert & Mulkay, 1984) to convey findings and degrees of uncertainty, employing rhetorical tactics, such as putting knowledge claims indirect quotes, relabelling observations as preconceptions and stating a claim lacks evidence (Myers, 1990) to both manage and construct uncertainty. Similarly, journalists manage and construct uncertainty by making proprietorship of statements indeterminable, highlighting scientific uncertainty about an issue (i.e. global warming), or promoting ideas that scientific uncertainty can and will be eliminated (Zehr, 1999).

Contests for meaning in news creation are contingent on a number of formal and informal institutionalised practices. The absence of systematic data on editors' publication decisions, credibility of news sources and executive decision-making processes crucial to the production of news (Sparrow, 1999) necessitate interpretive methodologies to analyse news media. Science journalists translate an often "incomprehensible subject" (Nelkin, 1995) to the public and have responsibility for framing and managing the presentation of topics. As such, journalists' representation of scientific facts is said to have a greater influence on public opinion since how journalists

"present and describe this uncertainty affects how readers, viewers and listeners interpret it" and "journalists also can foster or downplay perceptions of uncertainty by the way they construct stories" (Friedman, Dunwoody & Rogers, 1999, p. xi). As Allen (2002, p. 76) quotes, "You can point out the medical and agricultural benefits of the new biotechnology...you can also question what harm may come of the new knowledge and capabilities, discuss what safeguards will be put in place, and talk about how much big science costs and who pays for it (Blum & Knudson, 1997: x).".

Cultural analyses of science journalism argue the wide variety and volume of information delivered to science reporters augments their "gatekeeper function in the newsroom" (Allan, 2002, p. 77), compromising proclamations of news' objectivity. Journalistic adages such as "comment is free, but facts are sacred" (Holmes, 2005, p. 160), coupled with the news' industry practice of avoiding theory in preference of relying "on time-honoured traditions and practice-based craft which is best learned on the job" (pp. 161-162), reveal institutionalised norms about what "counts" as news and how it should be expressed.

Sociological analysis (Zehr, 1999) of scientific uncertainty reveals science is also subject to negotiation and argument, adding to implications of public policies requiring development prior to scientific certainty (Friedman et al, 1999). Yet, science news is where "uncertainty is paramount and most visible to the public. The mass media play an active role in influencing our perception of uncertainty...They report the discoveries and advances, but they also highlight the disagreements in both how scientists should proceed and how best to manage what they do not yet know." (Friedman et al, 1999, p. xii).

## 2 Discussion

In light of these acknowledgements, our research offers a critically-inspired comparative analysis of Australian (AU) and New Zealand (NZ) newspapers' coverage of water contamination by parasites. We seek to understand what AU and NZ news media considered newsworthy when writing stories about "parasites" and "water", how issues of risk and responsibility were framed, whose expertise was quoted and how this representation compares across locations. Our sample is drawn using the Factiva electronic database for all AU and NZ national and state newspapers. Searching the keywords "drinking water" and "parasites" on 1 May 2007 yielded 81 news articles (74 AU and 7 NZ), the first published 4 August 1996 and most recent 2 January 2007.

Findings reveal difference in NZ and AU media's newsworthy criteria for contaminated drinking water. AU media considered the presence of parasites in water newsworthy, with headlines such as *Giardia found in Warragamba – International experts hunt for source* (Benson & Robinson, 1998, p.2). In contrast, NZ media only considered this issue newsworthy when contamination levels exceeded usual, *Crypto bug hits more people than usual* (Fleming, 2003, p.9), or when actual incidents of water-derived illness were identified, *Grandmother of infected boy blames water* (*New Zealand Herald*, 2003).

Qualitative analysis enabled us to categorise the 81 articles into 5 broad themes relating to perceptions of risk associated with parasites and drinking water: 1. the 1998 Sydney water crisis 2. recycled sewerage 3. water filtration devices 4. contamination diagnostics and 5. water control. These 5 topics identify what qualified as newsworthy among all 74 of the AU articles and 2 (*Incidences of illness from drinking or swimming in contaminated water* and *Excessively high level of microbial contamination in drinking water source*) of the 7 NZ articles. The topic producing the most coverage was the 1998 Sydney water crisis, a central theme in 47 of the 74 AU articles and referenced in 1 NZ article. This crisis occurred when exceptionally high levels of *Giardia* and *Cryptosporidium* were discovered in Sydney's water system prompting authorities to instruct more than 3 million people to boil water before consumption for up to 3 months. The crisis resulted in

a parliamentary enquiry, a corporation being stripped of its power and the sacking and resignation of key public figures but yielded no confirmed cases of illness.

The perils associated with assuming an inadequately-knowledgeable public and the suitability of the media, as an economically-driven institution, for transferring and disseminating scientific knowledge, are problematic with journalist-driven accounts of scientific news. Questioning the suitability of media to create public knowledge and the assumptions media make of the public's knowledge base, social theorists have explored the ensuing anxiety media-generated news about risks poses to societies. Popularised in the early Nineties, Beck (1992) coined the phrase "risk society". Beck's theories highlight the media's influence and role in shaping public perceptions of risk, and are instructive in this case example.

The first reports of the 1998 Sydney water crisis discussed the supposed health risk the public was being exposed to via detailed description of the parasite involved in transmission of disease and steps people were advised to take to minimise personal risk of contamination. For instance, "9.20 am: Clean teeth – do not use tap water! Use bottled water or water which has been boiled for at least a minute...10.30am Drop junior off to little league football. Make sure he has bottled water and check that the bubblers at the grounds have been turned off" (Roberts, 1998, p. 46).

In contrast with traditional societies, information societies are characterised by a social reality mediated through the eyes of an ever-expanding range of experts (Beck, 1992). Increasing uncertainty and diffusion of cause and responsibility simultaneously erodes people's trust of traditional institutions, such as science. Situated in the social constructivist paradigm, Beck's work (1992; 1998) is foundational to our analysis which continues the project of deconstructing "news" by asking questions about newsworthiness, balance, expertise and issue framing.

When looking at the role of science, as used by media during the Sydney water crisis, a noticeable trend emerges. Once experts, such as *The Australian's* science correspondent, stated the risk was not new, but rather "still-improving testing technology has revealed the existence of parasites with which the Sydneysiders have previously coexisted in blissful ignorance" (Leech 1998, p.25), news media moved away from portraying the risks associated with the boggies in the water to the risks created by the Boggymen in the boardroom as they increasingly critiqued the role and actions of the corporation in charge of the water system:

"Mr McClellan [QC responsible for the enquiry into the first of the 3 contamination events] issued his second report last week. It found Sydney Water officials had mismanaged the first contamination crisis in late July and delayed telling the public of the potential danger" (Gora, 1998, p. 4).

and the government granting the contract:

"The Car government and the NSW opposition continued to deflect blame for Sydney's water contamination crisis yesterday by angrily accusing each other of cover-ups and mismanagement over the issue for the past 6 years" (Harris 1998, p. 9).

The trend is evidenced by news article focus from the first contamination incident in July 1998 until December 1998, as Table 1 displays.

Table 1: Media portrayal of risk - 1998 Sydney water crisis

1998 Month	# articles	# & Focus
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July	4	4 - reported potential health risk
August	12	11- reported health risks
		1 - reported corporate/government responsibility
September	11	3 - reported health risks
		6 - reported corporate/government responsibility
		2 - reported health risks overstated
October	7	2 - reported health risks
		3 - reported corporate/government responsibility
		2 - reported health risks overstated
November	0	
December	1	1- reported corporate/government responsibility

The media's active role in creating and presenting social knowledge about risk and uncertainty may be juxtaposed with science (Beck, 1998) while acknowledging institutional variation in objectives and execution. In addition to the media using science to legitimise their claims or opinions, we also found instances of scientists using media to further their own causes and agendas. For example, Una Ryan, biochemistry professor at Murdoch University, published an article in *The Australian* seemingly designed to create fear amongst the general population in an attempt to gain research funding support:

"Australia is a country that values highly its border security. The greatest risk to this nation may not be a plane-load of terrorists breaching airport security. It could well be a parasitic disease that sneaks in infecting our sheep and cattle stocks, our native fauna or worse, infecting our water supplies and affecting the young, old and sick...We have the expertise and the imagination - now let's have the will and the funding" (Ryan, 2004, p. 1).

Another example during the height of the Sydney water crisis shows scientists using media to promote their research and its relevance. Here we see the scientist as guilty of sensationalism as the media is often purported to be:

"Researchers at Perth's Murdoch University are developing a DNA-Style test that could pinpoint the source of the water contamination affecting Sydney...It's a breakthrough with wide-ranging implications especially considering the present outbreaks, division of veterinary and biomedical sciences director Andrew Thompson said...Sensitive, rapid diagnosis could mean the difference between life and death for some people" (O'Brian, 1998, p. 4)

The "newsworthiness" of scientific stories relies on a number of media-driven criteria. Drawing upon the literature, Allan's (2002) research details several criteria which can be applied to our analysis of the newsworthiness of parasites and drinking water. Criteria include a topic's fascination value, relative importance, interest to audience/human angle, timeliness, scientific reliability, risk potential, stakeholder influence, connection to a wider problem, ability to answer who, what, when, where, why, and both the reporters' and scientists' ability and desire to produce a good story. In news reporting broadly, it is acknowledged because "there are many times more new events circulating than any newspaper or magazine could ever print... news must reflect the diverse array of events, issues and interests that make up the everyday" (Niblock, 2005, p. 75).

Identifying newsworthiness is argued by political academics to be decided by "those in charge of the news...top editors, producers, publishers and news executives" and not reporters and low level editors (Sparrow, 1999, p. 108) and by journalism academics by a gate-keeping process where news values determine the intrinsic and extrinsic newsworthiness of the story (Niblock, 2005). Briefly, intrinsic values include prioritisation of conflict, unexpected events, spotlight issues, geographical and cultural

proximity to news audience and the issue's ease of comprehension (Niblock, 2005). Extrinsic values include targeting stories that appeal to their audience's identity and preferences, newspaper focus, competition, and production criteria such as availability of a picture, time, space and budget (Niblock, 2005). With these in mind, it is perhaps unsurprising the Sydney water crisis, compared with other topics identified, attracted so much media attention (58% of all articles) despite the absence of any demonstrated cases of illness. The crisis involved a mix of issues with intrinsic and/or extrinsic value, such as perceived personal health risk to individuals and subsequent exposure of corruption, from corporate cover-ups to accusations and questioning of government responsibility.

Along with analysing which topics made it into the news are issues of "balance" and "expertise". Balance is a relatively newer journalistic goal, emerging in the early 20th century and dictating reporters determine the quality of information, assess the merit of multiple sources and interpret findings as they struggle to appear even-handed (Sparrow, 1999). Drawing upon Tuchman's (1973) sociological analysis of news reporters' objectivity, Sparrow (1999, p. 121) argues "The norm of balanced reporting thus keeps journalists from having to determine the merits of different positions on thorny political questions or difficult issues [yet] ... the balancing is, in fact, symbolic and formulaic - a "strategic ritual" - since interpretation of political reality cannot be impartial or value neutral".

The journalistic norm of balance is arguably confounded by the norms reporters appeal to for expert sources. According to Greenberg (1997), science news sources are primarily derived from top scientific journals, scientific meetings, experts at local events, and journalists' contacts book of informed sources willing to comment. As academic and print journalist Wheeler (2005, p. 56) notes, "news happens wherever there are people" so news comes "from individuals with a good story to tell" as well as formal organisations. Press conferences, releases and unsolicited calls (Greenberg, 1997) are downplayed because of their inferior status as objective. "The challenge of balancing as many authoritative sources as possible within a news account appears to be a crucial one for the science reporter" (Allan, 2002:84), made apparent by reporters' tendency to present competing data as different interpretations to preserve balance.

Two articles demonstrate the tendency of journalists to compare contrasting findings and opinions from numerous expert sources, not all of which are logically connected. An article published in *The Sunday Mail* discusses the potential "environmental hazards lurking around your home" (Hawkes, 2003, p. 1). Hawkes uses 4 types of experts to seemingly show experts disagree and drinking water is not 100% safe:

"According to the centre [Cooperative Research Centre for Water Quality & Treatment], people living in Australian cities and many parts of regional Australia do not require a water filter because of the quality of water supplied. However, in March 2003, Choice magazine reported that water can still contain a range of chemical and microbiological contaminants that can cause health problems or affect the way the water smells or tastes. For example, while chlorinating water is essential for safety - the World Health Organisation estimates that more than nine million deaths a year are caused by unclean water - Dr Florance and Setright [Note: Hawkes does not state who these people are or what they are doctors in] say chlorination by-products have been shown to cause a small increase in the risk of bladder cancer" (Hawkes, 2003, p. 1).

In a second example, despite an extensive study finding Melbourne's drinking water safe, the reporter introduces unrelated findings from a Canadian study and a previously undiscussed potential contamination source, blue green algae. Next, a link between a common health disorder and the presence of viruses and parasites in the water is suggested, with the aim appearing to be discrediting scientific findings (ie, Melbourne



study) by introducing other scientific findings (ie, Canadian study) fitting the reporter's perception that drinking water poses health risks:

"Six hundred households were monitored, partly to determine the effects of filtering water and not filtering it. The water was found to be so safe that Melburnians would be unlikely to experience any health benefits from bottled filtered water. Research in Canada has found that tap water meeting all health guidelines still causes illness, and that people who use a reverse osmosis purifier experience 30 per cent fewer gastric disorders. It is estimated that one third of all Australians suffer from irritable bowel syndrome (IBS). The cause is unknown, but waterborne viruses and parasites are suspected, though not confirmed. One of the deadliest water conditions is blue-green algae. It can cause severe illness in animals and people. Algae (tiny plants) are commonly found in all water supplies, but generally are not a problem" (*The Age*, 2000, p. 9).

Research reveals "only a handful of sources dominate the news" and that marginalised voices challenging the status quo are overshadowed by "news media's reliance on a limited set of authoritative voices" while an identifiable set of frames are used to categorise, connect and present events (Sparrow, 1999, p. 126). Many aspects of news making are unclear to the public. In our study, NZ media restrict sources to health department officials, victims, victim's families and, once, a university scientist. More space is granted to victims' comments/opinions and/or their families than any other source, supporting Griffin's (1999) findings that journalists favour anecdotal evidence.

One NZ article demonstrates news media's effort to minimise impacting the status quo, especially the agricultural industry. The article notes, "New Zealand has the highest incidence of *Campylobacter jejuni* in the world...Victims of the diseases commonly suffer severe vomiting, fever and diarrhoea and in extreme cases die" (Thomas, 1999). However, instead of instigating mass public panic and concern, and perhaps investigate government's role, as Australian media did during the Sydney contamination crisis with organisms less likely to produce symptoms in healthy people, the reporter queries "So, why has New Zealand with its relative prosperity, fallen prey to such disease?". Thomas cites findings from Otago University indicating agricultural practices are a major contributing cause and reports, "Dr Weinstein says run-off of farm effluent, riddled with bacteria and protozoa, into catchment streams is one of the primary causes of the disease organisms entering water supplies". However, Thomas notes, "Recommendations from the research centre to combat the rise of these organisms include standard technological fixes, such as improving water treatment with better filters, in combination with ecological approaches, such as removing agricultural animals from catchment areas and replanting native forests" and quotes Weinstein saying, "That's not to say that we should wind back our agricultural industry at all, we are talking only about the very small area of land that has water catchment destined for human consumption" (Thomas, 1999).

### **3 Conclusions**

Although the norm of objectivity is said to fuel journalists' activities with balancing science news and citing experts, Trafford's (1997) insights into American health news reporting reveal belief that viewpoints should not be reported equally because sources are unequal (Allan, 2002). Newspapers use experts' names, cross-checked to prevent false information, to add authority and veracity (Wheeler, 2005). Descriptions of science reporters' concern over the hidden agendas or commitment to theories/causes scientists can bring to interviews, and fear of "allowing the 'subjective' opinions of their sources to cloud what should be 'objective' statements of fact" (Allan, 2002, p.87), demonstrate reporters' deeply held belief about their social role, indeed mandate, to produce objective knowledge. Likewise, science upholds objectivity as a professional norm. Despite this, sociological analysis shows, similar to journalism,

"most science and technology is done in socially organized settings that can hardly be described as neutral. The professions and organizations that generate scientific and technical work struggle to survive in an often turbulent environment, experiencing competition and scarcity, and thus decisions are governed by other cultural imperatives that coexist uncomfortably with those of scientific practice" (Vaughan in Sparrow, 1999, p. 15).

Consequently, while both the media and science aspire to objectivity, the socio-cultural reality of these institutions creates demands prohibiting and preventing objective knowledge production. Indeed, sociological analyses (Argyris, 1994) find the reality of news production historically entails secretive hierarchal decision-making, conflict-avoidance, cover-ups and conformity and competition and low trust among reporters as well as reliance on friends and colleagues to interpret and decide what constitutes news (Sparrow, 1999). Our study contributes to the growing body of research questioning, exploring and arguing for critical analysis of "facts" and "knowledge", asking, in the tradition of Sandra Harding, *Whose science? Whose knowledge?*, as we explore our natural and social worlds to make individual and structural assessments of risk.

## 4 References

- Allan, S. (2002). *Media, risk & science*. Buckingham: Open University.
- Argyris, C. (1994). "Behind the front page" pp.137-140 in *Behind the Times*. E. Diamond (Ed.). NY: Villard Books.
- Beck, U. (1992). *Risk Society*. London: Sage.
- Beck, U. (1998). Politics of Risk Society, (pp. 9-22), in J. Franklin (Ed.) *The Politics of Risk Society*, Cambridge: Polity.
- Benson, S. & Robinson, M. (1998, 27 August). Giardia found in Warragamba. *Daily Telegraph*, p. 2.
- Bucchi, M. (1998). *Science and the media*. London: Routledge.
- Dumanoski, D., Farland, W.H., & Krimsky, S. (1999). Science in the public arena. In S.M. Friedman, S. Dunwoody & C.L. Rogers (Eds.), *Communicating uncertainty* (pp. 167-175). NJ: Lawrence Erlbaum.
- Dunbar, R. (1995). *The trouble with science*. London: Faber & Faber.
- Fleming, G. (2003, 1 March). Crypto bug hits more people than usual. *Dominion Post*, p. 9.
- Gilbert, G.N. & Mulkay, M. (1984). *Opening Pandora's box*. Cambridge: Cambridge University.
- Gora, B. (1998, 6 September). Pressure on in water crisis. *Sunday Telegraph*, p. 4.
- Greenberg, J. (1997). Using sources (pp. 94-101), In D. Blum & M. Knudson (Eds.), *A Field Guide for Science Writers*. NY: Oxford University.
- Griffin, R. (1999). Using systematic thinking, to choose and evaluate evidence. In S.M. Friedman, S. Dunwoody & C.L. Rogers (Eds.), *Communicating uncertainty* (pp. 225-248). NJ: Lawrence Erlbaum.

- Harris, T. (1998, 10 September). Water debate plumbs the depths of conduct. *The Australian*, p. 9.
- Hawkes, H. (2003, 10 August). Grass is greener. *Sunday Mail*, Supplement, p. 1.
- Holmes, T. (2005). Creating identities, building communities. In R. Keeble (Ed.), *Print journalism* (pp. 160-168). Oxon: Routledge.
- Leech, G. (1998, 29 August). Trouble on tap. *The Australian*, p. 25.
- Myers, G. (1990). *Writing biology*. Madison: University of Wisconsin.
- Nelkin, D. (1995). *Selling science*, 2<sup>nd</sup> Edition. NY: W.H. Freeman.
- Niblock, S. (2005). Practice and theory. In R. Keeble (Ed.), *Print journalism* (pp. 73-82). Oxon: Routledge.
- O'Brien, N. (1998, 3 August). Test can determine source. *The Australian*, p. 4.
- Priest, S.H. Popular beliefs, media & biotechnology. In S.M. Friedman, S. Dunwoody & C.L. Rogers (Eds.), *Communicating uncertainty* (pp. 95-112). NJ: Lawrence Erlbaum.
- Roberts, M. (1998, 2 August). Sydney goes on the boil. *Sunday Telegraph*, p. 46.
- Rogers, C.L. (1999). The importance of understanding audiences. In S.M. Friedman, S. Dunwoody & C.L. Rogers (Eds.), *Communicating uncertainty* (pp. 179-200). NJ: Lawrence Erlbaum.
- Ryan, U. (2004, 20 July). The greatest risk may not be a plane-load of terrorists but a parasitic disease. *The Australian*, Supplement, p.1.
- The Age*. (2000, 16 October). Results from Melbourne test filter through. p. 9.
- The New Zealand Herald (2003, 19 August). Grandmother of infected boy blames water.
- Thomas, L. (1999, 20 January). Diseases that arrive through the kitchen tap. *New Zealand Herald*.
- Trafford, A. (1997). Critical coverage of public health and government. In D. Blum & M. Knudson (Eds.), *A field guide for science writers*. NY: Oxford University.
- Tuchman, G. (1973). Objectivity and strategic ritual: an examination of newmen's notions of objectivity. *American Journal of Sociology*, 77, 660-679.
- Wheeler, S. (2005). Get me a great quote. In R. Keeble (Ed.), *Print Journalism* (pp. 55-62). Oxon: Routledge.
- Zehr, S. (1999). Scientists' representations of uncertainty. In S.M. Friedman, S. Dunwoody & C.L. Rogers (Eds.), *Communicating uncertainty* (pp. 3-22). NJ: Lawrence Erlbaum.
- Zelizer, B. (2004). *Taking journalism seriously*. London: Sage.