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A Tale of Two Cities: Who has the cleanest drinking water, Melbourne or Sydney?

Abstract (122 words)

Tracing the history of social analyses of drinking water contamination, this globally-informed interdisciplinary research uses primary and secondary data to qualitatively examine perceptions of Sydney and Melbourne's drinking water quality from authorities and consumers. Data from 51 face-to-face interviews conducted in Melbourne and Sydney (December 2007-February 2008) is presented in light of publicised water contamination issues and publicly available microbial water analyses. Among those interviewed, 11% of the Melbourne and 21% of the Sydney sample assert no concerns about their drinking water. Contextualised within existing news media coverage of drinking water contamination from the onset of the 1998 Sydney Water Crisis through February, 2008, socio-cultural analysis highlights differences in water quality perceptions exist among interviewees, despite a lack of significant microbial contamination.

Keywords – drinking water, sociology, microbiology, contamination, Melbourne, Sydney water crisis

Introduction & Literature Review

Hardly any studies (see Ejechi & Ejechi 2008; Ragusa & Crampton 2007) have combined the expertise of sociologists and microbiologists to explore public satisfaction with drinking water quality. Although Robertson et al's (2000) public health study drew upon social science and microbiology to examine drinking water in Australia and New Zealand, the study focused on the reliability and validity of

telephone questionnaires versus diary data to gauge water intake estimations. Most recent social science analyses of drinking water comes from the fields of public health and environmental studies and examines developing countries, such as Nigeria (Ejechi & Ejechi, 2008), India (Rahman et al 2005; Singh & Kaur 2006), Ghana (Hunter 2006), Sri Lanka (Biswas, Jayatilaka & Tortajada 2005), and Mexico (Steinitz et al 2005).

A growing body of international environmental management research has argued the benefit of integrated research involving the natural and social sciences (Aranzabal, Schmitz, Aquilera & Pineda 2008; Macleod, Scholefield & Haygarth 2007). In Australia, environmental management research exploring definitions of community, social values and drinking water catchment areas (Broderick 2005) demonstrates an ideological shift from prioritizing singular disciplinary foci to acknowledging the important role social values and communities play in understanding biophysical realities. Even research by the World Health Organization (WHO) (Yang et al 2006), which examined drinking water source, prevalence of human alveolar and cystic echinococcosis in China and parasitic transmission, highlighted the importance of education and community engagement for control and prevention of infections.

Although environmental management of public health research provides models for interdisciplinary analysis and arguments for including cultural and social analysis amid natural science research, few studies examine drinking water issues in developed nations, and even fewer examine Australian drinking water issues. International research prioritizing sociological analysis, such as the examination of an environmental disaster in Romania (Argeseanu 2004) and sanitation and the

environmental movement in Brazil (Tesh & Paes-Machado 2004), give cursory attention to drinking water as a central issue. Hence, room exists for sociological insights to inform knowledge about drinking water quality in Australia.

Social theory, particularly that under the umbrella of reflexive modernization which includes the works of Ulrich Beck, Jurgen Habermas, Niklas Luhmann and Anthony Giddens, has advanced the broad notion that social analysis, particularly self-referencing (Luhmann 1984) and reflexive sociology (Bourdieu & Wacquant 1992) can facilitate new forms of knowledge about ourselves and society. Drawing upon Beck's (1992) argument that we increasingly live in a "risk society", it is not simply that our socio-physical environment is unprecedentedly shaped by industrialization, modernization and ever-new technologies, but moreover that at both an individual and collective level we must systematically plan and manage the deleterious risks and effects of the hazardous products we create on a global scale. Our research puts forth drinking water as one such environmental hazard that, because of its subjection to microbiological pathogens is not immediately observable by the general public yet remains subject to contamination despite our global pursuit, desire and capacity to master Nature, as begun at least since the Enlightenment project.

In Australia, we tend to take the presumably good quality of our drinking water for granted. Perhaps this is because the associated risks remain abstract and invisible (Beck, 1992), warranting continuous reflection, or social reflexivity, on issues such as health regulations and other individual concerns that stem from an increased failure in abstract systems (Giddens, 2006). Historically, despite public ignorance, poor quality drinking water contributed largely to the spread of infectious diseases which claimed

approximately 30% of all deaths in Australia just a century ago (Lowe 2004). Today, Australia remains the only developed nation without federal legislation protecting drinking water quality; except for Victoria, Australia's drinking water quality is dependent on providers voluntarily following the Australian Drinking Water Guidelines (NHMRC 2004; Sinclair & Rizak 2004). Yet, according to a Melbourne economist, substantive issues relating to water quality in Australia include "the damaging effects of irrigation on water quality for farmers, as well as urban consumers" (Watson 2003: 219). Since 2005, the Safe Drinking Water Regulations and Act provide further protection for Victorians (The State of Victoria, 2008). Still, many regional Victorian towns lack a reliable and safe water supply (The State of Victoria 2007). In 2008, the centrally supplied water of 46 Victorian towns was classed as unregulated (non-drinkable) water (The State of Victoria 2008).

Drinking water is one of many environmental concerns individuals may have. Research about environmental concerns has a long history of fragmentation, disorganization and complexity due to the multidimensionality of social psychological beliefs and attitudes (Xiao & Dunlap 2007). Public attitudes and beliefs about environmental concerns in the US are related to awareness of global and national environmental problems (Xiao & Dunlap 2007) and are increasingly more dependent upon and informed by media coverage than personal experience (Dunlap & Jones 2002; Rohrschneider 1988). Such findings illustrate the important role media play in shaping knowledge production in post-industrial societies and information economies (Bell 1973; Castells 1989) and compliment media studies (Cunningham & Turner 2002) highlighting increased linkages among industrial and socio-cultural policies due to unprecedented changes in communication norms, digital and global information

systems. Cultural analyses of science journalism (Allan 2002) and sociological media analysis of science news (Ragusa & Crampton 2007) show the cultural relativity of knowledge production, the social construction of risk and the impact of both on public perceptions. Hence, differences in perceptions of risk are not only due to a collapse in self-legitimation and confidence in experts (Beck 1992) but the changing nature of science, as a social institution, and its relationship with other social institutions and individuals, is impacting how individuals appropriate expert knowledge (Giddens 1994), about risk and otherwise, into their everyday lives. These social theories inform our sociological and microbiological analysis of residents sampled from Sydney and Melbourne to explore what drinking water issues the public identifies as risky and examines from where their information is sourced.

Methods & Findings

Secondary data relating to water contamination events in Sydney and Melbourne from January 1998 – February 2008, gathered from public records (scientific reports, policy and media coverage of drinking water contamination) is juxtaposed alongside data collected from 51 face-to-face interviews with Sydneysiders (N= 24) and Melbournians (N= 27) between December 2007-February 2008 from interviewees' responses to three questions: 1) Have you heard of any issues relating to drinking water in (Sydney/Melbourne)? 2) What issues have you heard of? 3) From where do you get your information that your drinking water is safe?

Quota sampling (Sarantakos 2005) was used to achieve a relatively proportional number of Australian men (43%) and women (57%) and to achieve a diverse sample including those born in Australian (Melbourne 63% Sydney 62.5%) and elsewhere.

Ages ranged from 18 to 80 with 34 being the average age in Sydney and 40 in Melbourne. 87% of the Sydney sample and 67% of the Melbourne sample were employed either part or full-time, with the remainder identifying as being not employed, a student or retired. All sampled had some formal education, with Melbourne having a relatively equal dispersion of degrees (high school or TAFE 37%, University 30% and postgraduate degrees 26%) in contrast with Sydney (high school or TAFE 37%, University 25% and postgraduate degrees 25%), with the remaining individuals having Year 10 or trade certificates. Finally, 61% (Sydney) and 44% (Melbourne) were married or partnered yet a surprisingly large percentage had no children (74% Melbourne and 79% Sydney).

When individuals were asked if they had any concerns about the quality of their drinking water, 11% of Melbournians and 21% of Sydneysiders sampled initially said they had no concerns. Despite this, 30% of Melbournians and 42% of Sydneysiders said they filter their drinking water at home. Among those identifying some concerns with their drinking water, Melbournians consistently raised more specific concerns about the quality of their drinking water than Sydneysiders. In Melbourne, 26% readily thought of two concerns and 48% thought of three concerns whereas just 17% in Sydney could identify two concerns and 25% three concerns.

[Table 1 about here]

Juxtaposing residents' drinking water concerns alongside Sydney and Melbourne's compliance with the Australian Drinking Water Guidelines (see Table 1) reveals only Melbournians have limited cause for concern relating to microbial contamination of their drinking water according to scientific analysis. Only Melbourne failed to achieve 100% compliance, and only in one water quality measure in one zone.

Despite the reality of Sydney and Melbourne achieving 100% compliance for organoleptic issues (colour taste and smell), processing and chemical additives (including chlorine, fluoride and disinfectant products) and non-microbial contamination, public perception failed to demonstrate equal levels of satisfaction. Although the public exhibited concerns for all areas, most notably, 31% of Melbourne and 18% of Sydney respondents identified drinking water contamination concerns.

Given the influence of media, whereby the information and images put forth may be theorized to exist as merely signs of what is real (Baudrillard 1981), we next examined respondents' ability to recall drinking water issues and their vocalized concerns. Given that the average length of respondents' residency in each city was 23 years in Melbourne and 25 years in Sydney, we expected many city dwellers in these often rivaling cities would be able to at least recall the 1998 Sydney Drinking Water Crisis, publicized widely by media (Ragusa & Crampton 2007) and which continued to receive news coverage until just one year prior to when the interviews were collected (see Vermeer 2006).

The background to the 1998 Sydney Drinking Water Crisis is briefly as follows. In 1998, the quality of Sydney's drinking water came under acute review when high levels of microbial contaminants, *Giardia* and *Cryptosporidium*, were found causing a public announcement on 30 July 1998 for all residents to boil their tap water. "Three million Sydney residents woke on July 31 to instructions from the New South Wales Health Department to boil their water" (Loff & Fairley 1998: 465). On 4 August 1998 the warning was removed only to have it reimposed on 25 August with identification of further contamination. As Rae Wear (1999: 6) from the Department

of Government, University of Queensland details, the water supply was progressively being declared safe when, for the third time, harmful contamination levels were discovered resulting in more than three million Sydney residents again having to boil a drinking water until 19 September. The political repercussions were enormous, particularly as 80% of Sydney's water comes from an expensive state-of-the-art, privately owned filtration plant which began operating at Prospect in 1996. A costly and long-running marketing campaign had promoted city water as among the world's best. There was much public questioning of why the quality of the Olympic city's water supply was now revealed to be like that of a Third World country. Investigations found Sydney water failed to take adequate action concerning public health, appropriate testing and discharge obligations to the Minister (Wear 1999). In response, state legislation was passed and an Act created a separate Sydney Water Catchment Authority (Wear 1999).

When asked if they could remember any recent events in the area that occurred relating to drinking water, 73% of Sydney, compared to 29% of Melbourne, interviewees could recall an event. Relating specifically to the 1998 Crisis, just 12% of Melbourne and 30% of Sydney interviewees independently recalled threats of Giardia or Cryptosporidium contaminating Sydney's drinking water supplies. This low expression of public knowledge existed while simultaneously the Dow Jones Factiva database yields over 100 news articles (excluding republished news, press and market data, obituaries, sports and calendars) were published since 1998 that make reference to the Sydney Water Crisis.

So then, from where did our respondents gain their information about drinking water quality and, if only 12-30% recalled the 1998 Crisis, to which other drinking water issues are respondents referring? Respondents gained information about their drinking water from a range of sources. [Insert Table 2 about here]

Table 2 lists from where individuals obtained their knowledge about drinking water. Sydney residents sampled were more likely to get information from television (75%) and printed media (ie, newspapers and magazines) (78%) than those in Melbourne (56% from television and 55% from printed media). Melbournians were nearly twice as likely to get their news from the Internet than Sydneysiders yet no one from Melbourne reported listening to the radio for news in contrast with 8% of the Sydney sample. However, as a simple Google search (15 July 2008) yields 111,000 results for “1998 and Sydney water crisis”, lack of Internet-sourced news about this event seems an unlikely reason for Melbourne's low recall-rate of this event. Such findings reveal the degree to which we are living in a universally mediated world (Baudrillard 1982).

Media coverage of drinking water contamination more generally (beyond the 1998 Crisis) between January 1998-February 2008 yields (from the Factiva database) 158 news articles relating to drinking water contamination and Melbourne and 698 news articles mentioning drinking water contamination and Sydney. Clearly, the risks associated with drinking water are newsworthy. However, the newsworthiness of stories appears to vary considerably by media type. According to Informit, a television database, just three news programs broadcasted drinking water issues relating to Sydney or Melbourne: the actions various companies (Hydro Tasmania,

South Australia Water) and governments (NSW, South Australia, West Australia) may be forced to face as a response to drought, Green appeals to reduce plastic drinking bottle usage by drinking tap water, and objections to the additional fluoride in water.

Even with widespread media coverage, all respondents cited different years for the 1998 Sydney Water Crisis, with only one person remembering the year correctly and many failing to recall much detail, “was a few years ago, it started with, there was something in the water and we couldn’t drink water, for a good three months. And it was all bottled water” (Sydney 48); “In 2000 or was it 1998 there was the issue of Cryptosporidium which we understand is the result of animal faeces getting in the water.” (Sydney 57). Just 22% of Melbournians interviewed, in contrast with 62% of Sydneysiders, were able to think of any issues they had heard about drinking water.

Among those who could recall an event, Melbournians identified four specific issues:

1. the Sydney water crisis
2. privatization and waste runoff contamination
3. “movement” and desalination
4. quality of the Murray Darling River.

Melbournians lacked the ability to recall any specific information about each drinking water issue they identified, offering vague recollections. For example, in attempting to describe their knowledge of the Sydney Water Crisis, one Melbournian recalled “the Sydney water that had that bug in it. About six or five years ago” (Melbourne, 90) while another noted “in Sydney, yes, when they had...the dams and something happened to one of their water filters over there and that was years ago.” (Melbourne, 93). News media were the primary source of expertise recalled, “in Sydney, I believe it was a

dead dog was it? It's a few years ago now. A serious bacteria thing. It was on the news and such things." (Melbourne 109).

Giddens (1994: 91) asserts 'expert knowledge is open to reappropriation by anyone with the necessary time and resources to become trained'. In our contemporary 'risk society', science no longer retains the same authoritative voice it once enjoyed; the explosion and dispersal of information makes anyone a possible expert (Beck, 1992). Although the Melbournians interviewed exhibited little scientific knowledge about drinking water, and despite water's centrality to their personal well-being, some did seem empowered (Giddens 1994) by their casually-obtained knowledge to offer their expertise on a range of water issues they identified as important. One Melbournite cited privatisation as the source of Adelaide's poor water, "...I know Adelaide would have problems with quality and also the smell of the water because it's all been privatized" and runoff as a contamination source for other states, "some of the other states occasionally get a bit of a runoff of waste into the water supply" (Melbourne, 97). Another faulted Sydneysiders for the state of their water, "Well Sydney just had a problem with its water - to admit the water doesn't move enough, when they don't take care of it enough" and offered personal perceptions about desalination, "I do have some concerns about desalination...I see reports on television and they say when they take the salt out of it they just put it back to the sea and that concerns me a lot." (Melbourne 104). Others expressed a sense of disconnection from water issues in Australia, highlighting the centrality of place to perceptions of 'ownership', despite the media's coverage of national issues, "I know that in Adelaide for example there is a really major problem with the quality of the water coming through the Murray and the fact that people have to use more water in Perth. You know these kinds of things

I'm vaguely aware of but I haven't had to live with these sort of things so...you pick it up from the media I suppose." (Melbourne 148).

In Sydney, three specific drinking water concerns were identified: 1. Sydney water crisis 2. blue-green algae 3. dirty pipes and 4. health merits of tap versus bottled water. In contrast with Melbournians fairly neutral mentioning of the Sydney water crisis, Sydneysiders varied in their views on the issue. Some made negative reference to the media, blaming media for overemphasizing risks of drinking water contamination, "Yes there were a few there was a Giardia and some algae things but they're all beat ups by the media" (Sydney 55); "The Giardia scare. My kids were still little that would have been, I'm guessing, before the year 2000. It was on the news, the radio, you know we were told not to drink the tap water" (Sydney 152).

Beck (1992) reminds us that risk societies extend beyond physical and natural dangers. Much of the risk Beck's pioneering theory describes has to do with socially constructed risk which is fabricated by modernity, especially the advances of science and technology. Understood in this fashion, risk becomes something to be managed at both a personal and societal level. Yet, because it is ever-present and unable to be completely known, exposure to risk is uncontrollable. Over-exposure to risk, promulgated by the media seems to foster a sense of cynicism, and even joy in rebellion, among some, "I remember the Cryptosporidium thing a couple years back...I drank it all the way through. I thought it was a bit of beat up potential" (Sydney 52); "Giardia was a big one a couple years ago. It was a big, big filtration issue. They whacked chlorine in and I can't stand drinking water that's obviously tasting and smelling of chlorine... Like that...Giardia type of thing and once it gets

too big, it becomes a public health issue, it goes to the press it goes to the news” (Sydney 61); “It was the issue of *Cryptosporidium*...about 18 months to 2 years ago. At the time, it didn’t really affect me a whole lot as I felt that the risk wasn’t great enough to worry about” (Sydney, 50);

Aside from individual health concerns, namely, “that pipes are dirty or something when the water goes through it” (Sydney 53) and “until the floods become more regular, as on the news and the TV where the water was polluted, since then 10- 15 years, I’m just scared, my health is important” (Sydney, 45), blue-green algae was the only other drinking water issues Sydneysiders recalled. Every respondent who mentioned the algae also mentioned the media which again documents the centrality of media as the primary source of contemporary public knowledge of health issues relating to water: “Only the algae situation that happened not long ago and that dog nearly died. On the news. TV news” (Sydney 64); “there’s been reports that the dams have a green algae floating on it [in] the media” (Sydney 58); “it goes to the press it goes to the news...Contamination and of course you’ve got blue-green algae on the dam now. It *looks* awful. Doesn’t necessarily mean it *is* awful. But what it looks like is the impression people have been the impression people have in their mind will affect what the use for water...Or they see it, or that have friends who see it. So you see the blue-green, or people are getting sick” (Sydney 61).

Aside from media coverage and public perception, the toxins produced by *cyanobacteria*, commonly known as blue green algae, have been responsible for deaths in Australia and overseas (Billings 1981; Bourke et al 1983; Turner et al 1990). While WHO guidelines exist for some of the toxins, developed through vigorous

scientific analysis of toxicity levels in animal models, for many of the toxin combinations released by Australian blooms, the true toxicity is unknown. Hence, overall toxicity is estimated in relation to the characteristics of toxins with known toxicity levels. No analytical methods are currently able to measure the concentration of complex mixtures of toxins in relation to known toxins (Nelson & Burch 2001; Burch 2008). Therefore, adequate measurement of the true level of toxins presently in water systems, and subsequent effect of long term exposure to low concentration levels, remains unknown (Funari & Testai 2008).

Existing scientific research on *cyanobacteria* reveals Australians may be well placed to have concerns about their drinking water getting contaminated by blue-green algae. Once again, however, since this issue received minimal media coverage (which is where most Melbournians and Sydneysiders obtained most of their drinking water knowledge), public concern remained minimal.

Conclusions

This research has demonstrated how the media influences risk perception amongst the general population in line with the 'risk society' theories espoused by Beck (1992) and others. This reliance on the media as an authoritative voice exists despite the media typically having a poor understanding of risk when it comes to reporting scientific news (Dumanoski et al 1999). Our research reveals public knowledge of drinking water issues in Australia is influenced more by media than by any other social institution. While the most publicised drinking water contamination issue in recent Australian history, the 1998 Sydney Water Crisis, remained the most recalled event as of February 2008 among respondents, scientific analysis revealed no

recorded increases in water-borne illness. In contrast, potentially more heinous issues, such as blue-green algae contamination, were found to be largely ignored by water consumers and disregarded as another media “beat-up”. This perception of an overstated risk was viewed as an indication that people have become empowered by information presented by news media to such an extent that they take on the role of being their own water expert. However, although environmental risks traverse local and national boundaries and ‘real’ risks are increasingly challenging to isolate and determine (Beck 1992), most interviewees failed to exhibit the uncertainty proclaimed by Beck. Although a handful of Melbournians and Sydneysiders raised concerns, the majority seem proud of their drinking water, with even a bit of rivalry over the issue shining through: “It’s well known that Melbourne has the best drinking water in Australia” (Melbourne 107); “I think it’s fantastic...the water is as good as it gets anywhere in the world.” (Sydney 55).

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Table 1: Drinking Water Perceptions versus reality: Melbourne and Sydney's sampled perceptions and compliance with Australian Drinking Water Guidelines.

Drinking Water Concerns	% Sydney Respondents Citing Concern	% Compliance of Sydney Water to ADWG 2006-2007*	% Melbourne Respondents Citing Concern	% Compliance of Melbourne Water to ADWG 2006-2007*
Organoleptic attributes¹	10%	100%	7%	100%
Processing/added chemicals²	6%	100%	4%	100%
Contamination³	18%	100%	31%	88 of 89 zones were 100% compliant for microbial contamination. All zones 100% for non-microbial contamination

1. Of all possible organoleptic issues only colour is routinely tested by authorities. However, issues of smell and taste are noted by the providers as a result of customer complaints.

2. This includes chlorine, fluoride and disinfectant products

3. This includes both microbial (i.e. *E. coli*, *Giardia*, *Cryptosporidium*) and chemical sources of contamination

*Compliance with Australian Drinking Water Guidelines gathered from the most recent data available from the Australian Government National Water Commission, unless otherwise specified. Compliance levels indicated are for all zones tested (33 zones in Sydney and 89 zones in Melbourne).

Table 2: Information sources: Melbourne and Sydney residents sampled, 2007-2008

News source	Melbourne	Sydney
Television	56%	75%
Print Media:	55%	78%
<i>Local paper</i>	(7%)	(33%)
<i>State paper</i>	(41%)	(37%)
<i>Magazines</i>	(7%)	(8%)
Internet	30%	17%
Radio	0%	8%
Conversations	7%	4%