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# **My water's fine, isn't it? An exploration of the gendered perception of water quality and security in Australia**

## **Abstract**

Drinking water is one of the most vital elements to the well-being of all species on earth, yet is something many humans in developed nations take for granted. Drawing from face-to-face interviews with 169 Australian residents in five capital cities (Brisbane, Hobart, Melbourne, Sydney) and rural locations (Wagga Wagga and other localities), we present findings on men and women's perceptions and concerns about their drinking water, including contamination by agriculture and terrorism. Findings show variation by gender, location, urbanisation, and the type and quantity of concerns, with the majority of the sample having limited concerns about their drinking water despite media and scientific evidence of contamination events in Australia. Restricted Australian federal and state legislation, and microbial and chemical contamination prevention measures being determined by population size, highlight the limited perception of the risks associated with drinking water and reveals need for further social and physical analysis.

**Key Words:** Drinking water, gender, women, Australia, rural, urban, water contamination, perceptions

## **Introduction**

It has long been documented that just 2.5% of global water supplies are freshwater and of this just 0.5% is accessible for human consumption (NHMRC, 2004). Human population growth and the impact of climate change have exacerbated the stress on the world's fresh water resources (Rose et al, 2001; Corvalan, 2007) so much that access to safe drinking water is included as one of the UN's millennial goals: "halve by 2015 the proportion of population without sustainable access to safe drinking water and basic sanitation" (United Nations, 2007a). Australia, in particular, is vulnerable to threats to both the quality and quantity of drinking water availability. This is because most of the little rain that falls evaporates, resulting in 1/5 of the population relying on ground water for drinking supplies which "is extremely difficult to clean up if it becomes polluted" (NHMRC, 2004, p.8).

Mounting scientific evidence on the implications of climate change for fresh water supplies makes it important and timely to question if the Australian public is aware of and/or concerned about the quality of their drinking water. Additionally, news coverage of water contamination events, frequently labelled “natural disasters,” tends to generate extensive media coverage (Ragusa & Crampton, 2007) and raising public consciousness of both scientific and popular understandings of water issues. Moreover, research has shown even when media publicity declines, due to decline in affected cases and/or identification of causes / solutions, water contamination events often create lasting public impressions (Ragusa & Crampton, 2007).

This research sets out to explore Australians’ knowledge and perceptions about water quality and contamination. It specifically questions if a gender difference exists among Australians’ perceptions of their drinking water and how perceptions do or do not differ by location (urban versus rural) and other demographic variables. To achieve this, qualitative face-to-face interviews and quantitative surveys were collected in five geographical locations detailed in the methods section. Findings are revealed in a socio-political climate where Australia's Minister for Climate Change and Water, Penny Wong states in relation to the Federal Budget, "the effects of climate change mean most of Australia's cities and towns have less water, and we can no longer [rely] on rainfall to supply all our drinking water" (Hannam, 2008).

Gender is a sociological construct whereby individuals learn, through the process of socialization, what it means to adopt norms, values and behaviours associated with being male or female. Although commonly associated with stereotypes relating to mannerisms and aesthetic displays of gender, such as clothing, hair styles, etc., gender norms also affect individuals’ agency/behaviour (Holmes, Hughes & Julian, 2007). For instance, research has shown that in most situations, men worry less and have less fear of risk than women (Kahan et al, 2005). However, research exploring gender differences and perceptions of risks associated with drinking water appear to consistently show women have less tolerance for risk than men. As Hamilton’s (1985) increasingly-dated study found, even in situations when an identified water contamination event occurred, men remained less concerned than women, particularly less concerned than women with small children (Hamilton, 1985). In the UK, women were found to be more concerned about the risk of coastal bathing water pollution

than men (Langford et al, 2000). While Australian women consistently showed heightened concern and perceived risk regarding water, men showed greater expectation that authorities and others should solve water issues, believed issues were not as bad as proposed, and in most cases, believed they should not be personally affected (ie, by increased water restrictions) (Ross, 2005; Roseth, 2006).

Additional gender-based research found significant relationships exist between gender and risk perceptions relating to water. In one of the earliest studies to consider potential water contamination events as a perceived health risk, Park, Scherer and Glynn (2001) found American women showed significantly higher levels of concern at both a personal and societal level than men. In Japan, perceptions of risk associated with drinking water were higher for women than men (Hirayama & Ito, 2005). In Australia, gender differences also existed relating to perceptions of risk and drinking water. For instance, Roseth (2006) demonstrated women were more concerned than men about water shortage issues and related actions at personal and community levels. Additionally, Ross' (2005) telephone survey of Perth residents' perceptions of water quality found women perceived a greater risk of something happening to their water quality than men.

While the studies above reported women held higher perceptions of risk than men, other research in Canada and Australia reveals, overall, individuals tended to devalue the potential risks water quality poses to individual well-being. For example, in a survey of Canadians' perceptions of health risks associated with drinking water, Canadians placed health risks from tap water well below many other life risks including stress, AIDS, sun tanning, ozone depletion, food poisoning, asbestos and nuclear waste (Jardine, Gibson & Hrudey, 1999). In a recent investigation of Australians' views on water shortages and conservation, Roseth (2006) noted concerns for water, specifically water shortages, ranked well below other social problems including crime, transport, education, unemployment and health. Although our research did not aim to contextualize drinking water among other social problems, we did question if the Australians interviewed could identify major drinking water concerns derived from a variety of social concerns (environmental, public health, social, etc.).

Globally contextualizing gender differences in perceptions of risk associated with drinking water amidst the management of quality, Australia is one of the only developed nations that does not protect the quality of its citizens' drinking water with federal legislation. With the

recent exception of Victoria, Australia's drinking water quality is dependent on providers voluntarily following the Australian Drinking Water Guidelines (NHMRC, 2004; Sinclair & Rizak, 2004). Since 2004, Victoria's water quality was governed by the 2003 Safe Drinking Water Act (Labza, 2004) and as of 2005, by the Safe Drinking Water Regulations (The State of Victoria, 2008). The Act and Regulations provide some security as they developed risk management and audit processes for suppliers and increased communication with consumers. However, as noted by the recent increase in the number of townships on regulated (non-drinking quality) water, these measures have not helped people in rural communities.

Although Australia is a developed country where one hundred percent of the population has access to improved drinking water sources<sup>1</sup> (United Nations, 2007b), it is not immune to issues of poor water quality. Research reveals variation in water quality depends largely upon geographic location: among metropolitan cities and between urban and rural locations. Examining reported instances of variation in drinking water quality over the past decade (restricted to the locations where primary data was collected) revealed differences in Tasmania, Sydney and Melbourne. Both Sydney and Tasmania recently experienced problems relating to the drinking water. For instance, a 2007 study found more than a third of residents in Tasmania lacked access to drinking water free of microbial and/or chemical contaminants (Whelan & Willis, 2007). In Sydney, a city with a history of a globally-publicised, contentious microbial water contamination event in 1998, and several minor ones since (Labza, 2004; Ragusa & Crampton, 2007), residents as recently as 2003 were warned "people with special health needs, such as those with a severe weakened immune system (including some people with HIV and AIDS transplant recipients dialysis patients and cancer patients), should talk with their doctor about taking special care and using only boiled, bottled or micro filtered water" (Sydney Water, 2003). In contrast, Melbourne's metropolitan water quality was 100% compliant with quality standards in 2005-2006 and the "vast majority of Victorian residents had access to safe drinking water" (The State of Victoria, 2007a, p. iv).

While the majority of Victorians enjoyed safe drinking water, a minority living in rural areas lacked access to safe drinking water. Disparity between rural and metropolitan water quality is evidenced by the Victorian state government's website statement, "Many towns in regional

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<sup>1</sup> Water that has been treated by filtration and/or chemical processes to remove hazardous chemicals or agents such as parasites or arsenic.

Victoria do not have a reliable and safe water supply” (The State of Victoria, 2007b). Moreover, in the 2006-2007 report on drinking water in Victoria, two Victorian townships had their water downgraded to regulated water (non-drinking water), bringing the total number of Victorian towns on regulated water to 46 (The State of Victoria, 2008).

Urban/rural disparity in drinking water quality is not limited to Victoria. The 1995 National Health and Medical Research Council & Agricultural and Resource Management Council of Australia and New Zealand’s audit of Australian water testing results found 98% of metropolitan samples complied with Australian criteria. However, only 85% of rural/regional samples and 44% of rural samples met the same criteria (Australian Institute of Health and Welfare, 1996).

In light of documented variation in drinking water quality we ask, is public concern, or lack thereof, about risk and contamination warranted? The answer depends largely upon geography. The impact of water-related diseases on the social and economic security of many third world countries is well documented (Watson, 2006). As the United Nations Human Development Report notes, “at any given time, half of the world’s hospital beds are occupied by patients suffering from a water-related disease” (United Nations, 2006). In developed countries, contamination events are considered relatively rare, often associated with extreme climatic conditions (i.e. flood) or environmental changes (i.e. landslides) and have significant cost to public health and socio-economic factors, especially for water providers (Rizak & Hrudey, 2007).

The size of water distribution systems, the number of agents involved and the many potential sources of contamination from a microbial perspective make it impossible to rule out water supply contamination from any system (Rizak & Hrudey 2007). Current monitoring efforts in Australia result in approximately 0.00002% of any monthly-monitored water supply being tested (Rizak & Hrudey 2007). Because several days may pass between when the water is sampled and when the results of the tests are completed/released, consumers may consume water before a contamination event is identified (Rizak and Hrudey 2007). The onus for monitoring, maintaining and reporting issues of water quality remains with the utilities contracted to supply water (NSW Health, 2005) guided by Australian Drinking Water Guidelines.

Australians living in rural locations have greater cause for concern about water contamination than urban residents. In 1995, lower rates of microbiological standard compliance were found for rural than urban samples (Australian Institute of Health and Welfare, 1996). Rural water supplies were also tested less frequently than urban supplies because testing frequency is based on population size (NSW Health, 2005). Examining New South Wales' (NSW) freely available public information, which is unavailable for other states and territories, a town with 500-5000 residents had microbial levels of drinking water tested weekly but chemical contamination, including hazardous by-products of anti-microbial treatments, was tested just twice a year (NSW Health, 2005). In comparison, water supplied to major cities was tested six times a week for microbial contamination and monthly for chemical contamination (NSW Health, 2005). For townships with less than 500 residents, microbial sampling frequency was even less: fortnightly for populations between 100-500 and monthly for populations under 100 (NSW Health 2005). Yet, despite water testing frequency, current monitoring practices are ineffective simply due to the amount of water sampled (NSW Health, 2005), causing urban and rural residents to face similar microbial contamination risks. Infrequent monitoring of chemical contamination in rural water supplies raises concern that chronic contamination of harmful agents may remain undetected, contributing to consumer health concerns (NSW Health, 2005). Hence, where public concern is manifested, it could be readily justified because of Australia's water contamination management systems.

This review of past research and available water quality data raises many concerns relating to policies, scientific monitoring, public health and consumer education relating to the delivery and consumption of drinking water in Australia, particularly rural Australia. Our research begins the process of examining these realities by offering an initial investigation into the Australian public's perception of the risks and quality of their drinking water. In light of the existing literature, we expect a) more rural Australians to perceive drinking water to be a risky activity than urban Australians and b) women to be more concerned about the quality of their drinking water than men.

## **Methodology**

To address our research questions, "How do Australians perceive the quality of their drinking water?" and "Do perceptions of water quality differ by gender and urban/rural location?", we used combined research methodology of a) quantitative and qualitative surveys and b)

face-to-face qualitative interviews. Quota sampling was used to obtain a demographically-disbursed (age, socio-economic status, occupation, ethnicity and location) sample from the Australian public, using purposive sampling to obtain more women than men consistent with the aims of feminist research methodology which "places emphasis on women and their position in society and contrasts it with the emphasis on men that prevails in the other methodologies" (Sarantakos, 2005, p.67). This research design permitted comparison with prior Australian and international studies that found women expressed the strongest opinions and concerns about water issues (Hamilton, 1985; Park et al., 2001; Roseth, 2006; Mummery, Duncan & Kift, 2007). Additionally, due to limited quantity of and access to comparable Australian rural cities, twice as many participants were collected from the Wagga Wagga sample as from the urban cities.

Our sampling frame, while limiting ability to make generalisations, also permitted diversity in demographic representation for each population. Samples were collected between December 2007 and February 2008 from five geographic locations: Brisbane, Hobart, Melbourne, Sydney and Wagga Wagga. These locations were chosen because of population size and designation as urban and rural cities in eastern Australia. Each sample was collected over one 2-3 day period except the Wagga Wagga sample which was collected on two separate occasions.

There were two parts to the data collection: face-to-face interviews and a survey. The interviews were conducted in public spaces (ie, airports, shopping centres, libraries and lobbies) and ranged from six-twenty five minutes. Digital recording permitted subsequent transcription and enabled a conversational interviewing style. Interviews took place after the collection of a 1-page written survey, completed by the interviewer. The survey contained a range of demographic variables and included six questions about participants' attitudes and behaviours towards the quality and security of their drinking water. This included questions about their perceptions and practices relating to drinking water, such as their source(s), quality, concerns, threats and any enhancements (ie, drinking bottled water, using filters, testing, etc.).

Data was entered into SPSS version 14 and analysed using exploratory statistics (descriptive, frequencies and correlations). The Shapiro-Wilk statistic was generated for each variable to identify those that satisfied the assumption of normalcy. However, because most variables



were measured at a nominal or ordinal level (with the exception of age and number of children measured at a ratio level), significant correlations used the Kruskal-Wallis test for independent-nonparametric variables.

## **Findings**

In the following section, descriptive statistics are presented first to detail the demographic profile for the entire sample. Next, empirical findings are presented to highlight our samples' practices and perceptions relating to drinking water. Finally, qualitatively-derived concerns are organized using thematic analysis to highlight emerging demographic and gender trends.

### *Demographic profile*

Demographically, our sample contained 169 respondents (101 women and 68 men) from 6 locations (Brisbane (N=26), Hobart (N=27), Melbourne (N= 27), Sydney (N=24) and Wagga Wagga (N=56) plus Other (N=9), people interviewed in one of the sampling locations yet who normally resided in a non sampled rural location). Respondents' age ranged from 18 to 93 with 27% of respondents under 30, 41% between 30 and 50, 24% between 51 and 70 and 8% over 70. Seventy-seven percent of respondents identified as Australian. The remaining 23% identified with 25 other ethnicities which included Aboriginal, Asian, Canadian, Chinese, English, European, Greek, Indian, Indonesian, Italian, Malaysian, Maori, Pacific Islander, Pakeha, Polish, Russian, Samoan, Saudi Arabian, Scottish, South American, South African, Spanish, Sri Lankan, and Thai. Seventy-three percent were employed (47.3% full-time), 6% were students and 12% were retired. Fifty-six percent of respondents were in a committed relationship, 30% single and 10% separated or divorced. Only 23% of respondents were currently financially responsible for any children and of those with children, 68% had two or less. Sixty-three percent had some form of tertiary education, including trade and TAFE qualifications, and 21% had University postgraduate degrees. Only 11% of respondents did not finish high school to Year 12.

### *Drinking water access & perceptions*

Although 63% of the sample drank bottled water either regularly or occasionally, the majority of respondents (91%) relied on centrally-supplied drinking water. While most (78%) had previously thought about its quality, only 24% had previously thought about the security of their drinking water supply. When asked specifically if they had considered the potential of

terrorism to affect the security of their drinking water, 57% said they had never considered this. Of the 43% who had previously thought terrorism could affect their drinking water, 65% (28% of total sample) thought terrorism could affect the security of Australia's drinking water. In contrast, 35% (15% of total sample) who had thought about terrorism did not think Australia's drinking water could be affected.

As a social group, women (38%) were slightly more likely than men (27%) to think agriculture could affect their drinking water.

#### **FIGURE 1 HERE**

The same is true for perceptions of terrorism; 32% of women thought terrorism could affect their drinking water in contrast with 23% of men. When asked about agriculture, 51% of women had previously considered how agriculture might impact the quality of their drinking water. Of this group, 38% thought agriculture could or does have an impact.

#### *Self-identified concerns about drinking water*

Regardless of gender, the majority (88%) of respondents articulated at least one concern about their drinking water. In most cases, respondents articulated two (21%) or three (47%) concerns. Table 1 depicts the number of concerns about drinking water by gender.

#### **TABLE 1 Here**

Although differences fail to reach statistical significance, it is interesting that as a group, men (52%) held the most ( $\geq 3$ ) concerns about their drinking water and women (13%) had the fewest (0). The ranking of top drinking water concerns also varied by gender: the top three concerns for men were 1. availability 2. taste and 3. biological contamination. The top three concerns for women were 1. processing 2. taste and 3. availability and non-specific/multiple contamination, which ranked equally as their third concern.

Collectively, the 169 respondents articulated 36<sup>2</sup> specific concerns about their drinking water. Categorize thematically permitted seven themes to be identified: 1. organoleptic attributes (ie.

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<sup>2</sup> Individuals' specific concerns were access, drought, wastage, social apathy, source, cleanliness, clarity, colour, smell, contamination by animals, effluent, heavy metals, pipes, biological, chemical contaminants, waterborne diseases, overall safety, cost, impact of plastic

sensory perceptions such as taste, smell, clarity etc.) 2. contamination 3. processing/added chemicals 4. health and safety 5. source/catchment/environment 6. availability/cost/wastage and 7. recycled water. Figure 2 compares the frequency of these themes.

### **FIGURE 2 HERE**

As Figure 2 reveals, while frequency of concern varied by gender, overall men and women exhibited very similar patterns of concerns.

#### ***In Focus: Women's perceptions of drinking water***

Previous research shows women demonstrated greater concern (Hamilton, 1985; Park et al., 2001; Roseth, 2006; Mummery et al., 2007) and heightened awareness of terrorism's potential to their drinking water than men (Lemyre, Turner, Lee & Krewski, 2006). To prioritise focus on women's perceptions of their drinking water, the remainder of this analysis is focused on women and provides data on rural Australian women to address an existing gap in the research literature.

#### ***Demographic Profile: Women***

A total of 101 women were surveyed and interviewed in relatively equal proportions by location (Brisbane N=16, Hobart N=17, Melbourne N=14, Sydney N=15), again with Wagga Wagga being over-sampled (N=32). All the "Other" (N=7) respondents were from rural areas outside of Wagga Wagga making the sample 39% rural and 61% urban women. The majority of women were employed (41% full-time and 29% part-time) with others retired (14%), not employed (11%) or students (6%). The mean age was 42. Most women were married (55%), yet only 20% were currently financially responsible for children. Of those with children, 60 had two or less. Sixty percent were tertiary educated and 18% had postgraduate degrees.

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bottles, catchment quality, sabotage / terrorism, media reports' reality versus "beat ups", nutrition, quality, taste, presence and absence of fluoride, calcium levels, degree of processing, presence and lack of nutrients and minerals, hygiene, pros and cons of recycled water, and temperature.

### *Women's consideration of the quality of their drinking water*

When asked “Have you ever thought about the quality of your drinking water before?”, 78% of women answered, “yes”. Statistical analysis using the Kruskal-Wallis test for independent nonparametric variables revealed significant relationships between women’s consideration of water quality and eight other variables: ethnicity ( $p=.00$ ), marital status ( $p=.04$ ), years lived in current town ( $p=.02$ ), age ( $p=.02$ ), number of concerns about drinking water ( $p=.00$ ), concerns ( $p=.02$ ), the potential impact of agriculture on drinking water quality ( $p=.01$ ) and the potential impact of terrorism on their water quality ( $p=.03$ ). Women who considered water quality to be a concern were more likely to be in a committed relationship (61%) than single (22%). Conversely, women who had not previously considered drinking water quality were more likely to be single (41%) than in a committed relationship (23%). Finally, women under 40 were less likely to have considered the quality of their drinking water (see Table 2).

#### **TABLE 2 HERE**

A significant relationship ( $p= .02$ ) was found between whether a woman had thought about the quality of her water and how long she had lived in her current town. As displayed in Figure 3, women who resided in their current town for less than five years were less likely to have thought about the quality of their drinking water.

#### **FIGURE 3 HERE**

When asked for the top three concerns about drinking water, 40% of women who had not thought about the quality of their water could identify more than two possible concerns. Yet, only 27% articulated three concerns. In contrast, 73% of women who had thought about the quality of their water nominated two or more concerns and 46% identified three concerns. Interestingly, the two groups did not differ in the type of concerns they reported most frequently, with organoleptic attributes (smell, taste, clarity) cited most often. Women who had thought about the quality of their drinking water (57%) were also more likely to have considered the potential impact of agriculture on their drinking water (31%) and/or terrorism (45% of women who had considered drinking water quality verses 18% of women who had not considered drinking water quality).

### *Farm proximity and women's perceptions of drinking water*

Twenty percent of the women interviewed indicated some type of farming activity occurred near their home and at least three of the women were farmers. Statistical analysis using the Kruskal-Wallis test for independent nonparametric variables identified significant relationships between proximity (respondents' definition) to farming activity and six water variables: use of tank water ( $p=.00$ ), use of town water ( $p=.00$ ), number of drinking water concerns ( $p=.00$ ), three concerns ( $p=.03$ ,  $p=.01$ ,  $p=.01$ ) and potential for agriculture to impact their drinking water quality ( $p=.03$ ). Twenty-five percent of respondents who lived near farms relied on tank water as their main source of drinking water. Only 3% of respondents not near farms used tank water as their main drinking water source. Table 3 demonstrates the relationship between proximity to a farming area and number of drinking water concerns.

### **TABLE 3 HERE**

All women in farming regions had at least one, usually three, concerns, about their drinking water. In contrast, 17% of women from non-farming areas had no concerns about their drinking water. Urban women (46%) were less likely to have thought about the impact of agriculture on their drinking water than rural women from farming areas (70%). Of those who had considered the impact of agriculture, 86% of rural women and 72% of urban women felt agriculture could affect their drinking water. The key difference between farming versus non-farming regions was consideration of health and safety issues related to drinking water. Urban women consistently ranked health and safety a top concern whereas women from farming regions ranked health and safety amongst their bottom three concerns (along with source/catchment/ environment and recycled water), if they included concerns at all.

#### *Community differences and similarities among women's perceptions of drinking water*

Significant relationships were also found between location and farming ( $p=.00$ ), type of concerns ( $p=.04$ ), use of town water ( $p=.01$ ) and bottled water ( $p=.02$ ). Women who lived near or on farms were found in all locations except Sydney. The location "Other" contained the highest percentage of respondents near farms (86%), followed by Wagga Wagga (31%), Hobart (18%), Melbourne (14%) and Brisbane (6%). The two locations with the highest percentage of women near farms (Other & Wagga Wagga) showed similar concerns about their drinking water; health/safety was not identified as a major concern although

health/safety was the second greatest concern, after contamination, for Sydney women (see Figure 4).

#### **FIGURE 4 HERE**

As shown in Figure 4, contamination was the top concern for all locations except Brisbane, where availability/cost/wastage was the main concern, and organoleptic attributes and contamination ranking second. Brisbane was the only location concerned about recycled water. Wagga Wagga, Melbourne, Hobart and Other shared the same second most common concern, processing/added chemicals. Finally, of all the locations, Sydney women reported the least concerns overall since 50% had no concerns.

#### **Discussion**

Our research presents the most regionally-diverse survey of the Australian public's perceptions about drinking water quality and security to date. While a number of surveys exist regarding different aspects of water, this is the first study to include a rural sample, to have conducted face-to-face interviews with every participant and to be truly independent of any water industry stakeholders. Our failure to find significant gender differences regarding the number (Table 1) or pattern of concerns (Figure 2) the Australians sampled had about their drinking water may reflect the typically homogenous use of water. In Australia, both women and men cook, clean, garden, etc. putting both in intimate contact with water. In contrast, many developing nations gender norms more readily affect how men and women come into contact with water and for what purpose (WHO & UNICEF, 2000). For example, in developing nations women tend to manage the household usage of water and are likely to have responsibility for fetching, cooking and washing while men control and administer water usage at a macro, supra-household level, such as for an entire village (Lahiri-Dutt, 2003). Traditionally, rural women and girls, in countries such as Yemen, have different types of knowledge and responsibilities related to the access and management of water, for drinking and other purposes (Pelat, 2006).

International reports by agencies such as WHO and UNICEF show how gender norms and socialisation lead to gender inequality relating to risks and experiences with water. Case

examples, such as Pelat's (2006, p. 11) discussion of the invisibility of women informing water management projects, demonstrate this clearly:

The main reason is of course linked to the traditional socio-cultural contexts where low social status, poor education, weak decision-making power, poverty and non access to income-generating activities are intimately connected [with gender]...most of rural women are not aware of their rights....And most of rural women would be dependent on men for many aspects of life.

Although developed countries such as Australia, Canada and America have long and statistically documented experiences of gender inequality, in contrast with developing countries, the issues frequently differ in relation to water.

While water quality may be a life or death issue for millions of people in developing nations, only 78% of our Australian sample had ever thought about the quality of their water. When asked, "What, if any, are your top three concerns about drinking water?" respondents most frequently answered, "None!". One explanation for why Australians failed to show much concern for drinking water, one of the few vital elements required to sustain life, may relate to public perceptions of risk. In our post-industrial, Information Age (Giddens, 2007; Castells, 2000), social action is increasingly organised and shaped by perceptions of risk facilitated by the bombardment of information from a plurality of sources including media, digital technologies, global industries, multinational corporations, etc. In relation to other risks Australians encounter on a personal and societal level, issues about the quality of their drinking water simply do not rank highly. This builds upon similar findings from both international (Jardine et al., 1999) and national studies (Roseth, 2006) and offers greater insight into urban and rural Australians' drinking water concerns. Our findings support Roseth's (2006) survey research, as water shortages failed to rank highly among Australians' social concerns more broadly and among their drinking water concerns more specifically. In other words, the majority of Australians we interviewed doubted neither the existence nor quality of their current and future drinking water supply.

For both men and women, the most commonly stated concern was contamination. Respondents identified several potential sources of contamination, including chemical (i.e. industry related), microbiological sources (eg. Giardia, bacteria and algae), human effluent and general animal-related sources (i.e. dead animals in catchment areas and animal effluent

from farms). Contamination was also identified as the most likely issue individuals could be affected by in a Perth study on trust and satisfaction with drinking water quality (Ross, 2005). On a much larger scale, in the United States the 2004 and 2006 Gallup environment surveys found water pollution topped the list of concerns, ahead of air pollution, global warming, animal and plant extinction, loss of rainforests, damage to the ozone layer, pollution of rivers, maintenance of fresh water supplies and toxic waste contamination of soil and water (Carroll, 2006). Prioritisation of contamination is perhaps to be expected as there have been several major, highly publicised, and in some cases lethal, water contamination events in both Australia and the US. For example, the *Cryptosporidium* outbreak in Milwaukee in 1993, leaving fifty dead and thousands ill, the *Salmonella typhimurium* contamination of Gideon, Missouri's water in 1993, leaving seven dead and ~600 ill (Rizak and Hrudey, 2007) and the 1998 Sydney outbreak of *Giardia* and *Cryptosporidium* resulting in thousands of residents boiling their water for several months although no deaths and no reported increase in associated illnesses were identified (Ragusa & Crampton, 2007). Thus, because of media coverage and personal experiences with boiling water, it is unsurprising contamination is the water issue with which individuals most often relate. However, in light of the microbial discussion presented in the introduction, it is perhaps problematic that less than 30% of the Australians sampled consider water contamination to be a risk to the safety of their drinking water.

Looking at women's water concerns by location, Brisbane women were the only group to not rank contamination as their most frequent concern; availability/cost/wastage was ranked above contamination. This location-specific trend may be due to Brisbane's higher water restrictions (Stage 6) than other areas sampled. Therefore, water availability in general appears more pertinent than risk of water contamination. Although Sydney women articulated the least discernable concerns (>50% were "None"), of all locations sampled, Sydney had the most widely-known water contamination issues (Ragusa & Crampton, 2007) as well as the Sydney Olympics and APEC summit events where security issues and heightened concerns about terrorist actions were in both the media and public conscience. Perhaps the reality of the 1998 "Water Crisis" where, despite all the alerts to boil water and dire predictions, no one got sick (Ragusa & Crampton, 2007), contributed towards Sydney's women feeling as if there is little cause for concern.



Our research offers preliminary support for a gender difference in how Australian women and men perceive the impact of agriculture or terrorism on drinking water. In our sample, women were more likely than men to consider agriculture or terrorism does and/or could affect their drinking water. This finding was anticipated due to past water issue surveys highlighting gender differences in perceived risks. Women living in farming areas were more likely to articulate several concerns about drinking water in comparison with their urban counterparts. Such results are unsurprising given we interviewed during a major drought where some Australian townships were running dry, salinity problems were rising and management of the country's largest river system, the Murray-Darling, which runs through three of the four states sampled, was enduring controversy regarding irrigation, water ownership and use-rights. These major issues are likely to have been prominent realities for the rural women and, except for the drought, distant concerns for the urban women.

A final contributing factor to our findings may have been the prevalence of tanks as a major source of drinking water for the rural population. Twenty-five percent of the women in farming areas relied on tank water as their main drinking source and therefore played a more direct role in maintaining their water quality. This may explain why they were subsequently more aware of water issues compared to women without tanks. The admission by women in farming areas that agriculture could impact their drinking water demonstrates an opposite trend to that found in a study of perceived agricultural chemical risks in three water sheds in the United States, where respondents from farms were less likely to perceive agricultural chemicals as a risk than those not on farms (Tucker and Napier, 2001). However, since their study failed to note respondents' gender, we are unable to make further comparisons.

### **Conclusion/ Future Directions**

This research found although gender differences in perceptions about drinking water do exist, as a variable, gender is subservient to location in significantly impacting the type or degree of concerns respondents had about their drinking water. For the entire sample, contamination was qualitatively identified by participants as their key concern about drinking water. This was consistent with Australian and international studies, although less than 30% of our sample voiced such a concern. Our research also revealed that amongst women, those in farming regions were more aware of possible water-related issues and the impact of

agriculture as a source of contamination for drinking water. As a social issue, terrorism received minimal commentary. However, when terrorism was noted, women were more likely than men to have considered it as a source of drinking water contamination. Critical issues this paper did not address, yet which remain worthy of further investigation include: Are the views represented by these respondents due to a lack of knowledge or education about water quality issues facing Australia? And, do perceptions of low/no risk relating to the quality and security of Australians drinking water accurately reflect reality?

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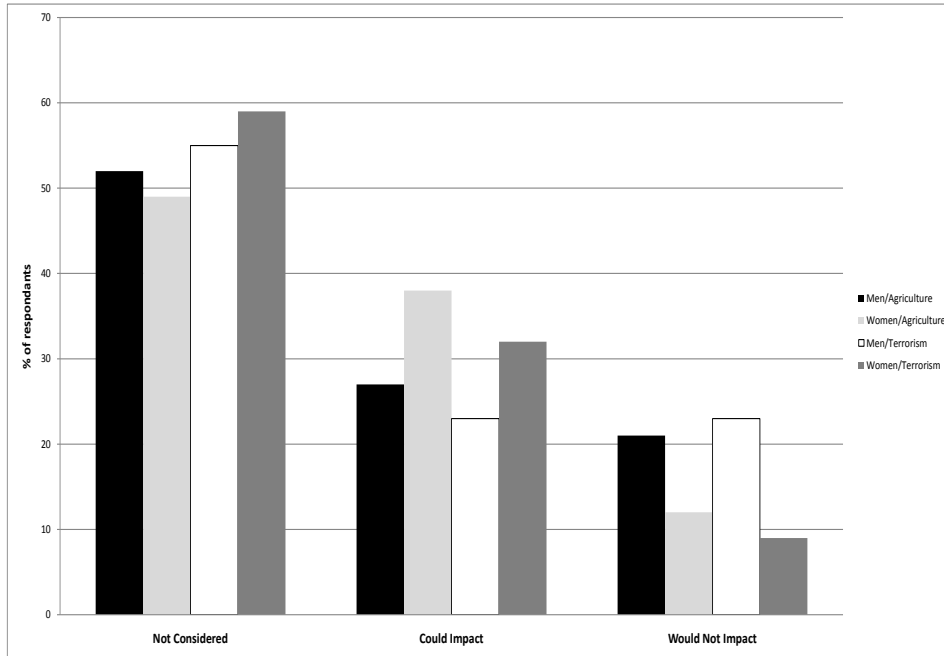
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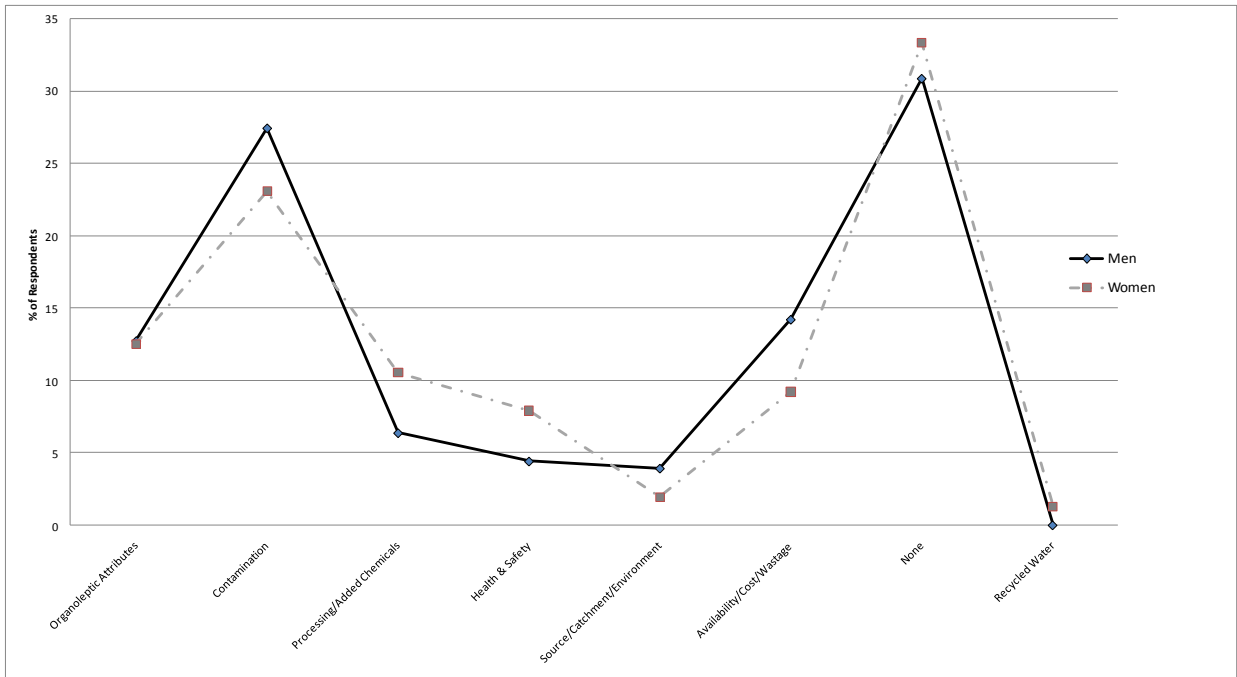
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## Figures

**Figure 1: Perceived impact of terrorism or agriculture to impact drinking water, by gender**



**Figure 2:** Frequencies of self-identified drinking water concerns by gender.



**Figure 3:** Percentage of women who had considered (CQ) or not considered (NCQ) the quality of water relative to how long they lived in their current location.

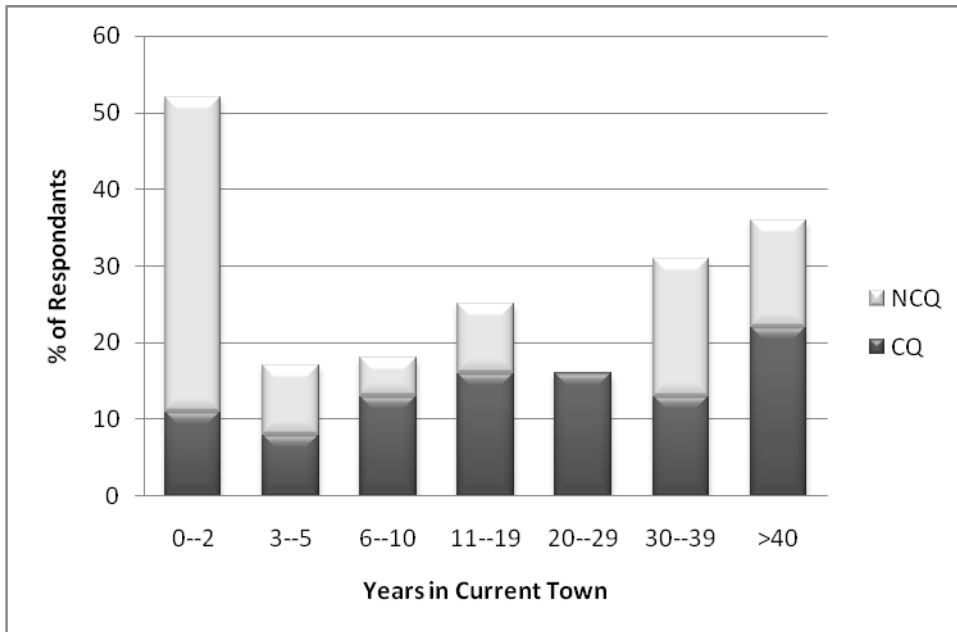
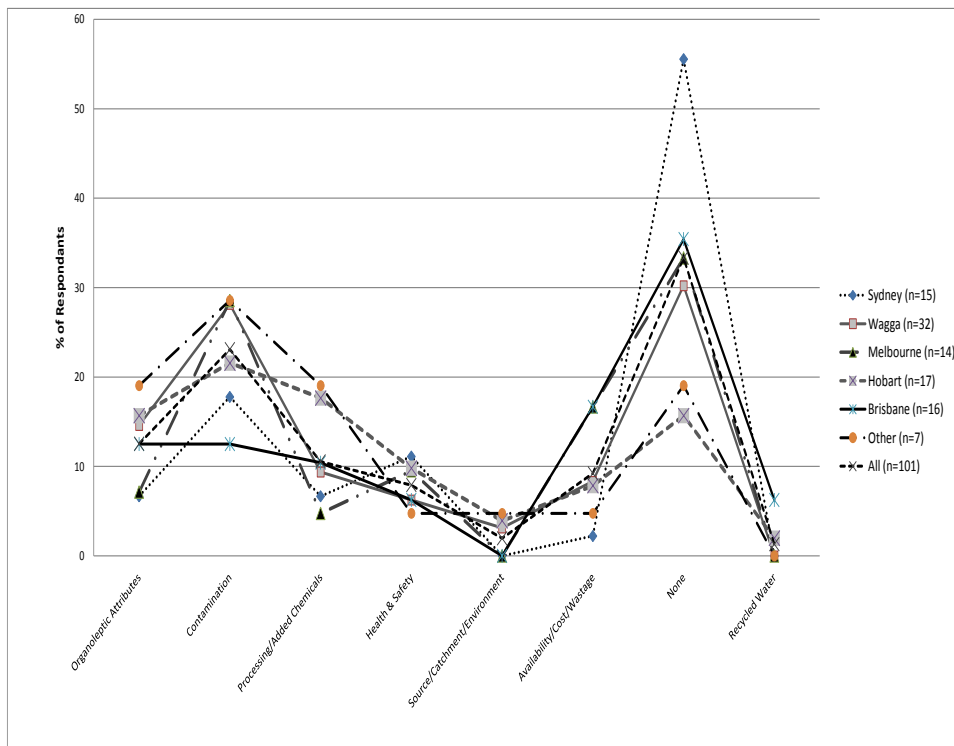


Figure 4: Self-Identified concerns about drinking water.





## Tables

**Table 1: Number of concerns about drinking water by gender.**

Number Concerns	Men	Women
0	10%	13%
1	22%	20%
2	16%	24%
3	52%	44%

**Table 2: Women's Age and consideration of drinking water quality**

Women's Age (n)	% Have considered quality	% Have Not considered quality
18-29 (25)	20	46
30-39 (17)	17	18
40-49 (25)	29	14
50-59 (12)	13	9
60-69 (10)	11	9
>70 (9)	11	5

**Table 3: Women's proximity to farms and number of drinking water concerns.**

Number of Concerns	Farming Present	No farming
0	0%	17%
1	10%	23%
2	20%	26%
3	70%	35%