South Africans' perception of their DRINKING WATER QUALITY

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South Africans' perception of their drinking water quality

Report to the
Water Research Commission

by

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Executive Summary

South African water institutions are regarded as producing and providing some of the highest qualities of drinking or potable water in the world. The SANS 241 drinking water standard compares well with the best in the world.

The launch of the Blue Drop Report in 2010 by DWA has highlighted some new concerns regarding the compliance of drinking water in South Africa. It reported that in urban centres we continue to produce high quality drinking water, but this is not the case in rural areas and small towns. The status quo has contributed to some serious negativity and concerns amongst the public. However, despite the negative publicity around water quality issues in South Africa, we are still producing high quality water in urban centres.

Between March 2011 and May 2011, the Water Research Commission commissioned a dipstick survey which investigated, with a national syndicated survey, urban South Africans' current perceptions of their water quality and the variables that influence perceptions.

Five questions were included on one of the existing syndicated studies, conducted by the major market research houses. The OMNIBUS survey of Nielsen South Africa was used because the time frame and sample suited the research best.

The OMNIBUS survey covered adults, aged 16 years and over, from all race groups. An area-stratified, probability sample of 2437 urban households was drawn.

The main findings of the study confirm the results found in similar studies done in other countries.

81% of urban South Africans perceive their tap water to be safe to drink. This concurs with international studies, which found that most people in countries with a reliable water supply perceive tap water as having a low safety risk.

More specifically the study also found that:

- Women are less confident about the safety of tap water than men. The difference is statistically significant. This supports the findings of the international studies.
- Women are also more likely than men to boil or filter drinking water and women are more inclined than men to drink only bottled water.
- The younger age categories (16-34) were found to be more positive about the safety of drinking water than the older age categories (35+).
- Consumers in the Metro Municipalities perceive their tap water to be significantly safer to drink than consumers in the other urban municipalities.
- For Metro Municipalities, the study found a large gap between the highest consumer confidence in the safety of tap water (eThekwini Metro) and the least confidence (Mangaung Metro).

- Consumers of non-metro municipalities in the Northern Cape, the Eastern Cape, Free State and Mpumalanga have the lowest confidence in the safety of their tap water.

- A wide range of factors influence the individual's perception of the safety of drinking water. The **top six** reasons why people think tap water is **safe to drink** are:

    a. The water looks clean.

    b. Nobody gets sick.

    c. The water tastes good.

    d. The water smells good.

    e. The water is not polluted.

    f. The water is purified.

  The **top six** reasons why people think tap water is **unsafe to drink** were: "the water looks dirty"; "the water tastes bad"; 'the water is not purified";" the water smells bad"; "some people got sick from the water" and "there are chemicals in the water".

- International studies found that media reporting has very little impact on the individual's risk perception of drinking water safety. In this study as well, a very small percentage of the population base their perception that tap water is safe or unsafe to drink on what they have heard or read in the media.

- The Blue Drop status of Metros is very low on the list of drivers of perceptions. Although the study did not test it, the results seem to indicate that the general awareness of Metros' Blue Drop status is very low.

- A perception that tap water is clean and safe to drink and regularly tested is a major indicator of good municipal service. On the other hand, factors other than water safety, such as a perception that the municipality does not care about consumers, refuse removal is inadequate and that roads are bad, are the main drivers of perceptions of bad and very bad municipal service.

Although the scope of this study was small, it provides a baseline with which to compare future studies. It also gives the water sector and its stakeholders an understanding of how South Africans perceive the quality of drinking water.

The findings show that multiple factors determine consumers' perceptions about the safety of drinking water. The findings also confirmed international research and add insight into the drivers of risk perception.

The findings also have several implications for policy, management and further research:

- Sensory aspects such as appearance, taste and odour have the strongest influence on South Africans' perceptions of the safety of tap water. Therefore, the Blue Drop criteria should take consumers' perceptions into consideration, as recommended by the World Health Organisation (2004).

- Municipalities' Water Safety Plans should take the drivers of risk perceptions into consideration when emergency plans are developed.

- The findings point out several areas of drinking water quality which are insufficiently communicated to the general public:

    - Blue Drop status as an indicator of safe drinking water: Currently this factor is a very weak driver of consumer perceptions. Consumers in the Metros seem unaware of the Blue Drop status of their municipalities and the implication that the status has for the safety of drinking water.

    - Clean and safe water is an important driver of positive perceptions about municipal services. Municipalities with high quality water should use this finding to improve their image and to build consumers' trust in their services.

    - The impact of chlorine on water safety: Consumers seem confused about whether the addition of chlorine makes water safe or unsafe to drink. They also have ambivalent perceptions about the impact of "chemicals in water" for water safety.

    - Water treatment processes: The general public, especially lower LSM groups seem to lack knowledge of water treatment processes. This could be addressed with educational programmes and visits to municipal water and wastewater treatment plants.

- First-hand experience will, however, remain the strongest factor and consumers will use past experience as a reference point. Because consumers use their own experience as the point of reference, any change in the organoleptic qualities of tap water, for example as a result of maintenance work, will probably be negatively perceived by consumers. Municipalities should therefore educate and warn consumers if any change in the organoleptic qualities is expected.

A multiple strategy, including school and above the line and below the line media campaigns, is recommended for communicating information about water safety. Because family and friends have a strong influence on perceptions, social networks and the relationship between adults and children in a community should be harnessed in communication campaigns.

Table of contents

Tables

Table of Figures

1 Introduction

South Africa has very high standards for water quality. The SANS 241 drinking water standard compares well with the best in the world.

In 2008, the Department of Water Affairs (DWA 2008) introduced the Blue Drop certification programme to "allow for ordinary citizens to be more informed on the drinking water quality management of a specific town. Through this initiative the Department is taking up the challenge to ensure that South Africans develop a higher level of confidence in our tap water."

The compliance levels of those municipalities which monitor their drinking water quality according to the Blue Drop criteria is high. For December 2010, Blue Drop compliance figures were as follows: 97.5% for microbiological compliance, 99.6% for chemical compliance and 99.7% for physical and organoleptic compliance (DWA, 2010). Unfortunately, monitoring compliance is relatively low. In December 2010 the average monitoring compliance for each standard was 50%. The low number of municipalities with Blue Drop status (only 26 municipalities out of 238) probably reflects the low monitoring compliance. Six Metros have Blue Drop status.

In March 2010, Water and Environmental Affairs Minister, Buyelwa Sonjica, said the world can rest assured that the tap water in all host cities for the 2010 FIFA World Cup™ is safe to drink (Bua 2010).

Despite this excellent performance, the Nielsen Global Online consumer survey found in 2009, in preparation for the FIFA World Cup 2010, that: "unsafe water and sanitation in South Africa" was amongst one of the five major factors that respondents believed could affect a successful World Cup.

Our perceptions do not only control our actions, they are also expressed to others in conversation, locally and internationally. Thus, the perception of the individual has a direct impact on the reputation, not only of the water situation in South Africa, but also of the country itself.

Sheat (1992: 3), as quoted in Doria (2010), says that perception may become more important than reality. Whereas quality standards in South Africa are based on measurable qualities, recent literature (WHO, 2004; IWA, 2004) notes an increasing awareness that drinking water quality standards should include consumers' "judgement of safety".

A better understanding of the underlying drivers of consumers' perceptions about the safety of drinking water will assist the regulator and municipalities to improve water management, consumer services and risk communication.

2 Objectives of this study

With this background and motivation, the WRC commissioned this study into consumers' perceptions of safety of their drinking water and the factors that drive these perceptions.

The study aimed to establish:

- How South Africans perceive the quality of their drinking water;
- The drivers of perception, for instance
    - the anticipated quality of the drinking water,
    - health experience,
    - Blue Drop status of the municipality,
    - service delivery,
    - information and
    - the experience or perception of the quality of service delivery; and
- The influence of demographic and geographic variables on perceptions of drinking water quality.

3 Literature review

3.1 Local studies

Local studies about perceptions of drinking water quality are rare.

In 1998, Rand Water undertook a survey of 597 respondents across all LSM[1] levels in Gauteng to identify individual characteristics and environmental influences underlying water purchase and consumption needs. These included the importance and evaluation of water quality. The Rand Water study found that:

- 90% of households get their water from municipalities by pipe;
- All segments consider water quality important – taste, smell and water clarity were the most important aspects of water quality, with mineral content the least important; and
- All segments report that their water tastes and smells good, has good clarity and comes out of the tap with good pressure. However, the higher LSM groups tended to believe, more than the other groups, that the water quality had deteriorated over the past few years.

Kolanisi (2005) did a Masters Degree on the topic: *A South African study of consumers' perception and household utilization of a rural water service*. The study found that consumers rely on the physical qualities and availability of water when evaluating a water service.

3.2 International studies

Most first world studies on drinking water perceptions are undertaken by water utilities and explore reasons why consumers prefer bottled water to tap water.

Few studies explore the psychological drivers of perception, safety risk assessment and customer satisfaction with reference to drinking water quality.

Doria (2010) gives an overview of these studies.

Strang (2001: 98) relates consumers' perceptions of water quality to three factors:

a) the sensory qualities of water: flavour, appearance and odour;

b) impressions and interpretations of information from various sources; and

c) the trust relationship with the service provider and regulator.

An earlier study by Doria et al. (2005) put forward taste, perceptions of risk, context, colour, odour, familiarity and trust as the drivers of perceptions of water quality.

Other studies (referred to in Doria 2010) investigated specific factors that influence perceptions. For example, Auslander & Langlois (1993) and AWWA (1993) discuss organoleptics, C.I. Eau (2000) explores the impact of chemicals, such as chlorine, nitrates and sediments, Parkin et al. (2001) explores personal vulnerability and AWWA (1993) explores satisfaction with water utilities and information from the mass

[1] The Living Standards Measure (LSM) has been developed by the South African Advertising Research Foundation. It is built around a set of 29 household variables, e.g. sewing machine, flush toilet in/outside house, traditional hut, electric stove. There are 10 LSM groups.

media. Auslander & Langlois (1993) looks at the availability of water and Grondin et al. (1996) at the source of the raw water and demographics.

In 2004, Scottish Water commissioned independent research to explore attitudes and perceptions of Scottish Water among consumers.

"Perceived water quality was the key factor that determined whether respondents drank tap water or bottled water. Perceptions of the quality of tap water were seen to vary between location, with some respondents reporting that they were deterred from drinking tap water because of taste, odour or cloudiness. A number of respondents believed that the quality of tap water had deteriorated over time. This belief was underpinned by a perception that more chemicals are added to tap water today and consequently water was not as 'pure' as it used to be".

Researchers found that the relative importance of these factors can vary and change over time (C.I. Eau, 2000). C.I. Eau (2000) reports a 14% variance over a four year period. According to Doria (2010), **direct experience is the strongest factor in determining perceptions of drinking water.**

We will use Doria's (2010) framework for the analysis of the findings of this study. Below, the literature relating to each factor is discussed separately.

3.2.1 General perception of the safety of drinking water

Doria (2010) notes that surveys undertaken by Grondin et al. (1996), AWWA (1993), C.I. Eau (2000) and CP-LM (2001), generally indicate that most people in countries with a reliable water supply perceive tap water as having a low safety risk.

"Approximately 60-80% of respondents classify it on the top of the rating scales. Even in places with persistent water-treatment deficiencies and microbiological contamination, when consumer notifications are released, the magnitude of perceived risks of tap water is close to the average point of the measurement scale used in the questionnaire (Anadu & Harding, 2000). Perceptions of drinking water safety and risk seem to be consistent and tap water is generally regarded as safe (e.g. AWWA, 1993; DWI, 1998; C.I. Eau, 2000; MORI, 2002).

A recent survey of target markets across the US, as well as a national survey, explores the impact of taste and odour on drinking water perceptions (Mackey, 2010). "Most respondents reported that they felt their tap water was 'safe' (80-87% across the eight populations surveyed) and 'healthy' (63-79%) and were satisfied with its overall quality (66-84%)."

3.3 The impact of demographic variables

Doria (2010) quotes several international studies which found gender differences in the perception of risks associated with tap water, for instance AWWA (1993); Anadu & Harding (2000) and Griffin & Dunwoody (2000). However, other studies did not find gender differences, such as Griffin et al. (1998) and Johnson (2003).

Aini et al. (2008) evaluated the level of concern, perceived quality, perceived risk, evaluation criteria and preference with respect to tap alternatives in a survey of 500 respondents in Kuala Lumpur, Malaysia. Females rate importance of water quality higher than males, but males perceived, more than females, that heavy metals and pesticide waste held higher risks for the quality of water.

Women generally perceive a higher safety risk than men. Several hypotheses have been put forward to explain this, for example the vulnerability of women, their concern for the health of children, etc.

In another international study, Canter et al. (1993/94) suggested that "culture might influence water perceptions by interfering with several factors, particularly trust in institutions, the way risks are individualised or extrapolated in the community, beliefs in personal immunity, preferences for personal optimism and reactive behaviour". Although "culture" is not unpacked, it could relate to the demographic variables of race, language and religion.

Studies which either found (Grondin et al., 1996), or did not find (Park et al., 2001; Johnson, 2003), that education and income were significant demographic variables for risk perception usually relate their explanations to "better informed" respondents.

According to Doria (2010), the role of age is ambiguous in the broader risk perception literature. Some studies (AWWA, 1993; Park et al., 2001) found that younger respondents are more concerned about the safety of tap water, whereas other studies such as Syme & Williams (1993) found the opposite.

3.4 Drivers of perceptions about the safety of drinking water

A wide range of factors influence the individual's perception of the safety of drinking water. Although the general perception may be stable over time, the relative impact of the factors which drive perceptions may change. Doria (2010) reports a study by CI Eau (2002), which found that the relative impact of a factor may vary by as much as 15% over a four year period.

3.4.1 Organoleptics (sensory qualities, for instance appearance, taste and odour)

Doria (2010:2), Warren (1996) and MORI (2002) note that the relative importance attributed to each of the senses varies according to time and culture. In western countries, water taste is usually identified as more important than odour or appearance.

Taste was cited most frequently in Mackey (2010) as the primary reason when consumers reported dissatisfaction with their tap water quality. Taste was also the main reason why people would switch from tap water to bottled water.

Chemicals which have a distinct taste such as chlorine can affect risk perception either way. Doria (2010) says: "Chlorine is sometimes mentioned as a cause of objectionable tastes, but there are also suggestions that subtle tastes may be interpreted as a sign of water safety (Kelly & Pomfret, 1997) ".

Awareness of microbiological contamination is low in the international studies. C.I. Eau (2000) reports a French study in which only 7% of respondents believe that their tap water has microbes and viruses. Doria (2010) also refers to a survey (Mahler et al. 1999) in the United States (Idaho) where less than 5% of respondents considered bacteria as a risk factor in drinking water.

3.4.2 Contextual factors

Doria (2010) notes that the public generally has a low awareness of contextual factors, such as environmental factors or the pollution of a water resource. He refers to surveys (Grondin et al., 1996; Oliver, 1999) which found that only half of the respondents could correctly identify their tap water source.

On the other hand, familiarity with contextual factors does influence risk perceptions (Theodori et al., 2009). A study conducted in Texas investigated the treatment and reuse of oil and gas field brine aka ’produced water‘ (water present in an underground hydrocarbon-bearing formation that is brought to the surface with the crude oil or natural gas) and the general public's knowledge and perception about this possibility. The study found that respondents who are more familiar with desalination technology are more

likely than those who are less familiar, to believe that desalinated oil and gas field water could be safely used for selected purposes.

A disturbing finding was recorded by Dogaru et al. (2009) in their study on community perceptions of water quality in a mining-affected area in the Apuseni Mountains in Romania. Dogaru et al.'s (2009) study compares the community's perception of the safety of their drinking water with their knowledge that the water resource, the river, is heavily polluted by a nearby mine. Even though the water is heavily polluted by acid mine drainage and water pollution is clearly visible, only about half of the respondents perceived the water as highly polluted. The study did not clearly show that people perceived their drinking water as polluted due to mining.

Most of the respondents consider mining activity as a constant and secure source of revenue although they are aware that it pollutes the main river. The results suggest that under difficult economic situations, individuals and the community favour the availability of jobs over environmental safety. This means that a poor community might accept some level of pollution or even the risk to water safety for a better household income.

3.4.3 Personal experience

Doria (2010:13) notes that of all the factors which drive perceptions about the safety of drinking water, "the influence of direct experience is the strongest".

Strang (2001), notes that prior experience sets a standard for drinking water quality. Qualitative research on water organoleptics suggests that people prefer what they are used to. Therefore, people in areas where the drinking water is naturally brown or yellow or has a distinct taste, might regard the water as safe to drink, whereas newcomers to an area, such as student populations, might have negative perceptions about the safety of the drinking water.

3.4.4 Impersonal and interpersonal information

The impersonal impact hypothesis (Tyler 1980) suggests that information from the mass media influences perceptions at the societal level, but not at the personal level. On the other hand, interpersonal information mostly affects perceptions at the personal level, but not at the societal level.

Water safety issues attract wide media coverage, but international studies have found a weak correlation between publicised drinking water risks in the media and other information campaigns and the individual's personal risk perception (Wahlberg & Sioberg, 2000; Griffin & Dunwoody, 2000 and Park et al., 2001).

On the other hand, interpersonal sources, such as friends and family members have a stronger influence on perceptions about drinking water safety (Park et al., 2001; Doria et al., 2005).

3.4.5 Perceptions about the service provider

Doria (2010:10) notes that "trust in companies and institutions is often linked to the perception of quality and risk, but the causal order of this relationship is not entirely clear and may vary according to the case". Doria et al. (2005), Mori (2002) and Johnson (2003) found a very weak or no correlation between trust in water suppliers and consumers' risk perception.

Aini et al. (2008) indicated the contrary: Even though water authorities' figures indicate that municipal water is drinkable without treatment, most respondents boil tap water, filter tap water or drink bottled water, which indicates that they do not trust official figures.

4 Methodology

Five questions were attached onto one of the existing syndicated studies that are conducted by the major market research houses. The OMNIBUS survey of Nielsen South Africa was used.

The OMNIBUS survey covers adults, aged 16 years and over, from all race groups. An area-stratified, probability sample of 2437 urban households was drawn from The Nielsen Company's Customized Research computerised dwelling unit census. The sample was 1219 females and 1218 males. In each household the male or female to be interviewed was chosen using a random selection grid. Three calls were made before substituting in an adjacent household with a person of the same sex.

The total coverage represents 92% of the urban adult population of South Africa and 56% of the total adult population. "Urban" is defined as areas of a community size of 8000 and above. This includes cities, large towns and small towns.

A copy of the questionnaire appears in the next section. The questionnaire was translated into Afrikaans, Zulu, Xhosa, Tswana, Southern Sotho and Northern Sotho. The questionnaire was piloted and subsequently adjusted and improved.

Personal at-home interviews were conducted in the home language, or preferred language of the respondent. The interviews were conducted using a structured questionnaire on a CAPI (Computer Assisted Personal Interview) machine as well as show cards.

A 20% validation check was done personally or telephonically on the work of each interviewer.

The results have been post weighted to estimated population proportions.

The analysis was done by specified demographic breakdowns:

- Race
- Monthly household income
- Home language
- Gender
- Provinces
- Living Standards Measure (LSM)[2]
- Municipalities where 50 or more interviews were conducted.

[2] The Living Standards Measure (LSM) has been developed by the South African Advertising Research Foundation. It is built around a set of 29 household variables, e.g. sewing machine, flush toilet in/outside house, traditional hut, electric stove. There are 10 LSM groups.

5 Findings

5.1 General perception of the safety of drinking water

81% of urban South Africans perceive their tap water as safe to drink, as the figure below indicates.

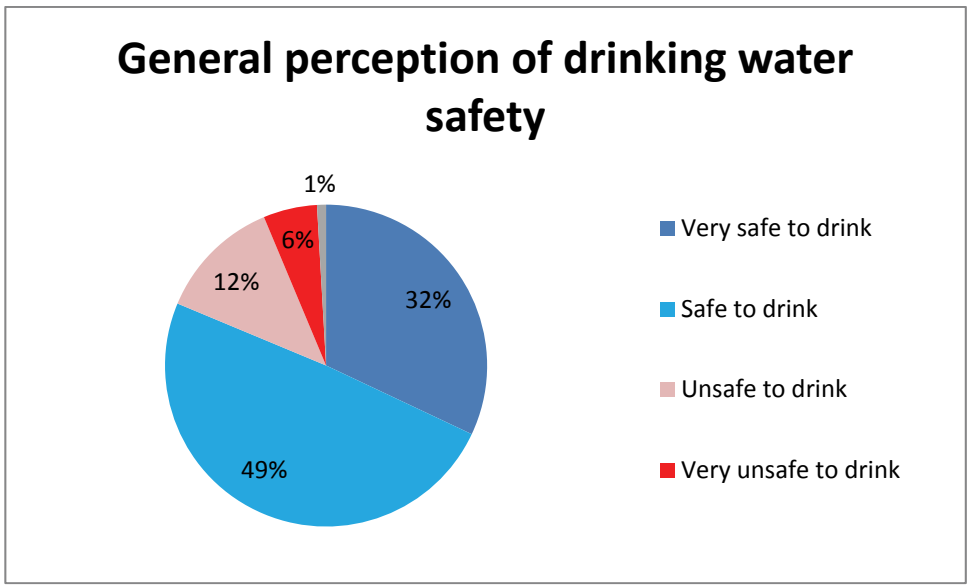


Figure 1: General perception of drinking water safety

5.2 The impact of demographic variables

5.2.1 Gender

In this study, gender differences were significant in the categories "very safe to drink" and "very unsafe to drink" as the table below illustrates:

Table 1: The impact of gender on perceptions about drinking water quality

Gender	Very safe to drink	Very unsafe to drink
Males	34.1%	4.1%
Females	29.7%	6.6%

The differences suggest that women are less confident about the safety of tap water than men, which supports the findings of the international studies summarised in Doria (2010).

This difference was confirmed in the significant gender differences which were found in reported drinking water behaviour. Women are more likely than men to boil or filter drinking water and women are also more inclined than men to drink only bottled water.

The pilot and the feedback of the field workers provided qualitative information that women tend to boil or filter water specifically for children. This will have to be explored further.

The figure below illustrates these differences.

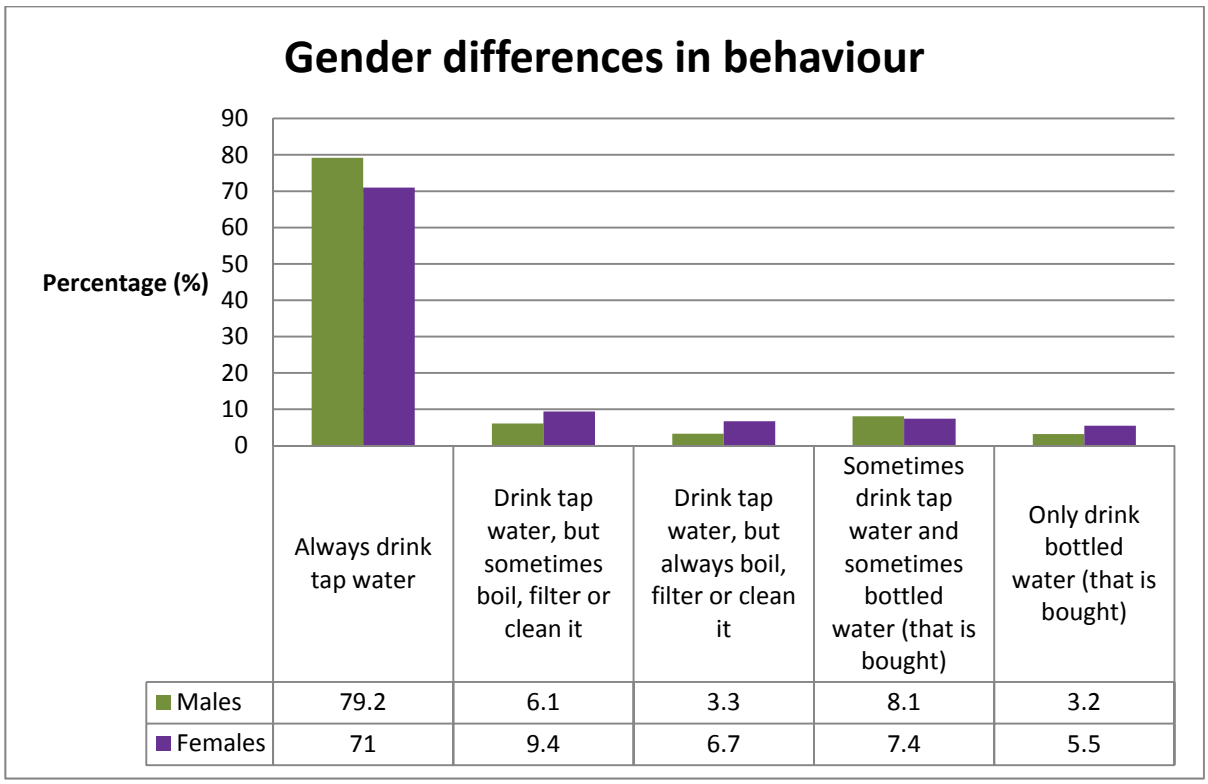


Figure 2: Gender differences in drinking water behaviour

No significant gender differences were found in the reasons for the perception that the tap water is either safe or unsafe to drink.

5.2.2 Race and language

Race and language are standard demographic variables included in national syndicated studies.

This study found that whites are significantly less confident than the other races about the safety of their drinking water as the figure below illustrates. It will be shown further on that there was a very weak positive correlation between the perception of drinking water safety and the perception of the quality of municipal services. The reasons for this difference will therefore have to be explored further.

According to Nasreen Khan of Nielsen (personal communication), other studies have indicated that whites are more inclined to offer a negative perception than other race groups.

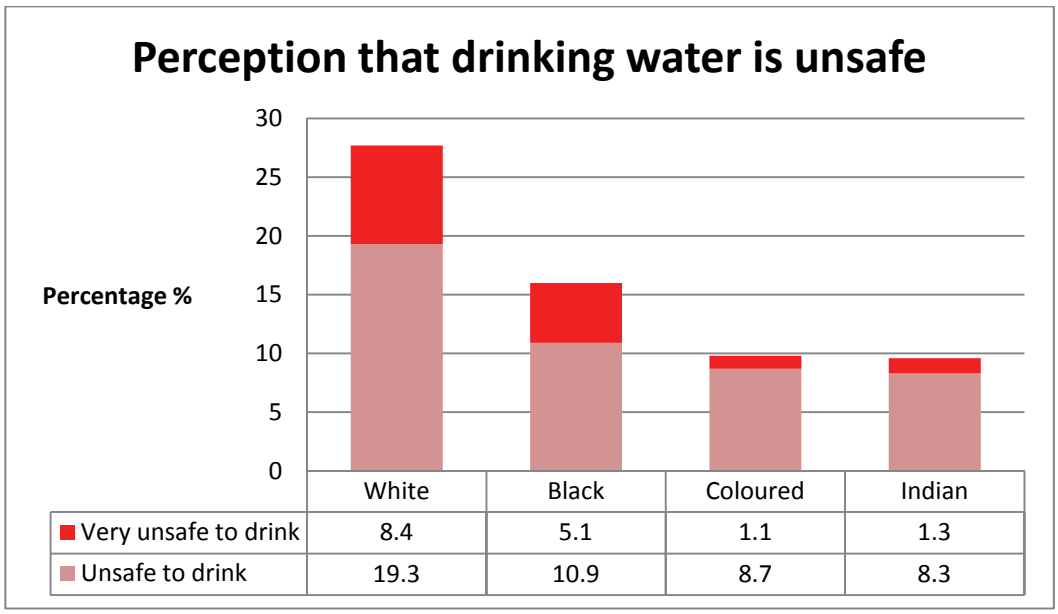


Figure 3: The impact of race on perceptions that tap water is unsafe to drink

5.2.3 Income and Living Standard Measure (LSM)

The study however did not find any significant differences for income and LSM groups. Income or living standard therefore also does not offer an explanation for the racial difference found above.

5.2.4 Age

The younger age categories were found to be more positive about the safety of drinking water than the older age categories. The differences were significant for "very safe to drink" and "unsafe to drink". The reasons for these differences will have to be explored further.

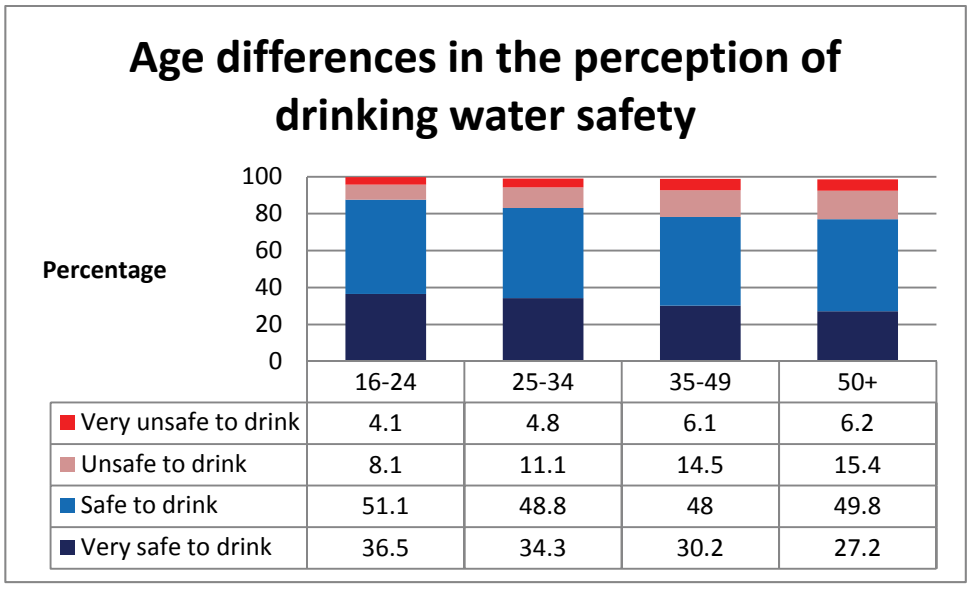


Figure 4: Age differences in the perception of drinking water safety

5.2.5 Municipality

Type of municipality was a significant demographic variable. Consumers from Metropolitan municipalities perceive their tap water to be significantly safer to drink than consumers in the other urban municipalities as the figure below illustrates.

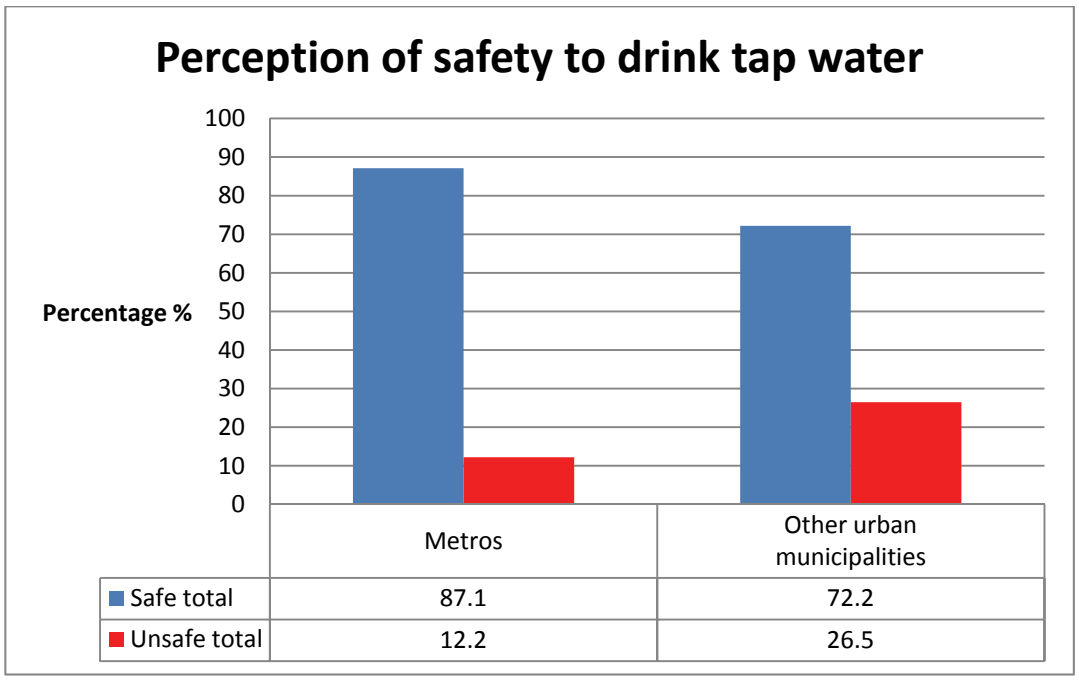


Figure 5: Metros versus other urban municipalities

The figure below ranks the composite scores of "safe to drink" versus "unsafe to drink" for six Metros showing a gap of nearly 25% between the best perceived performance (eThekwini) and the weakest (Mangaung).

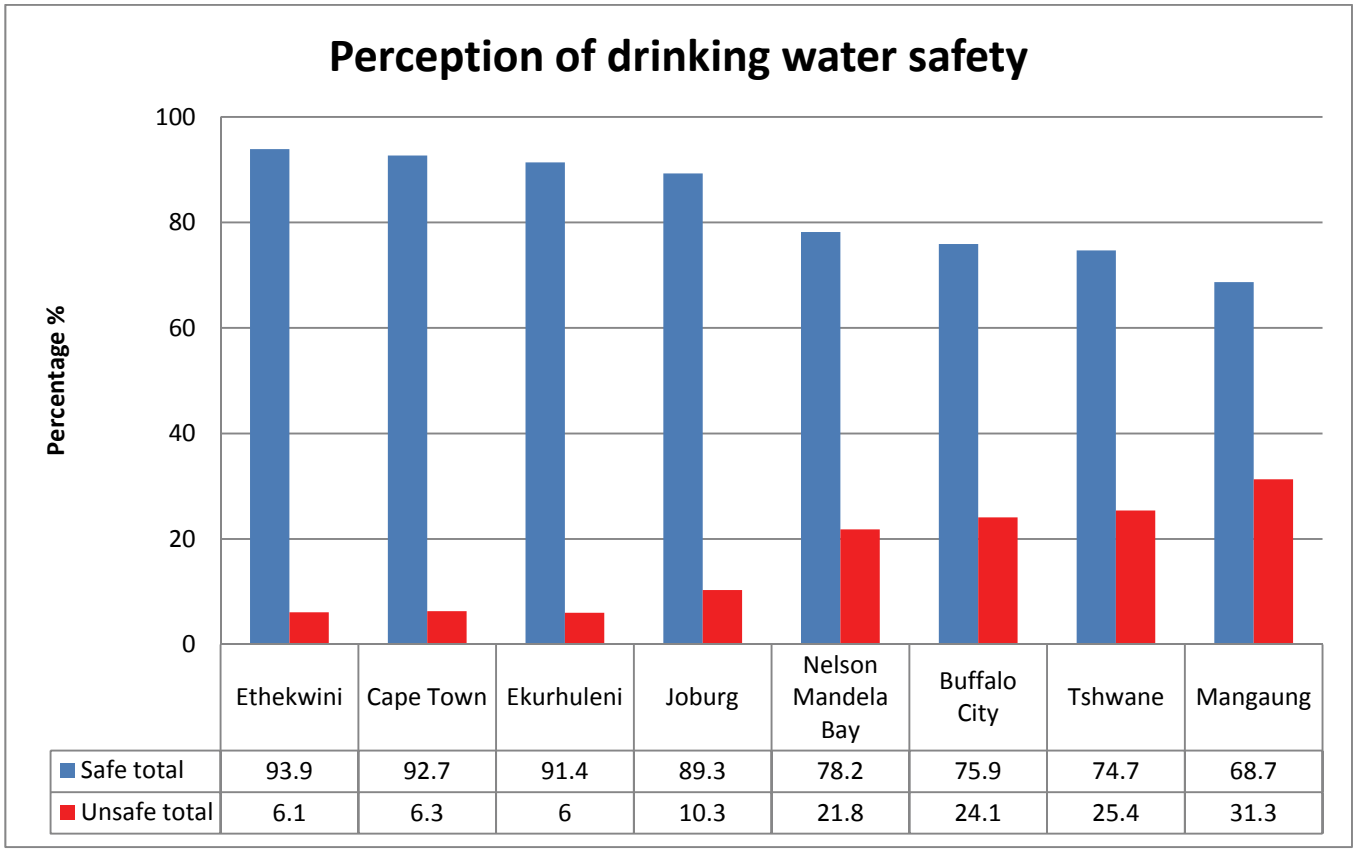
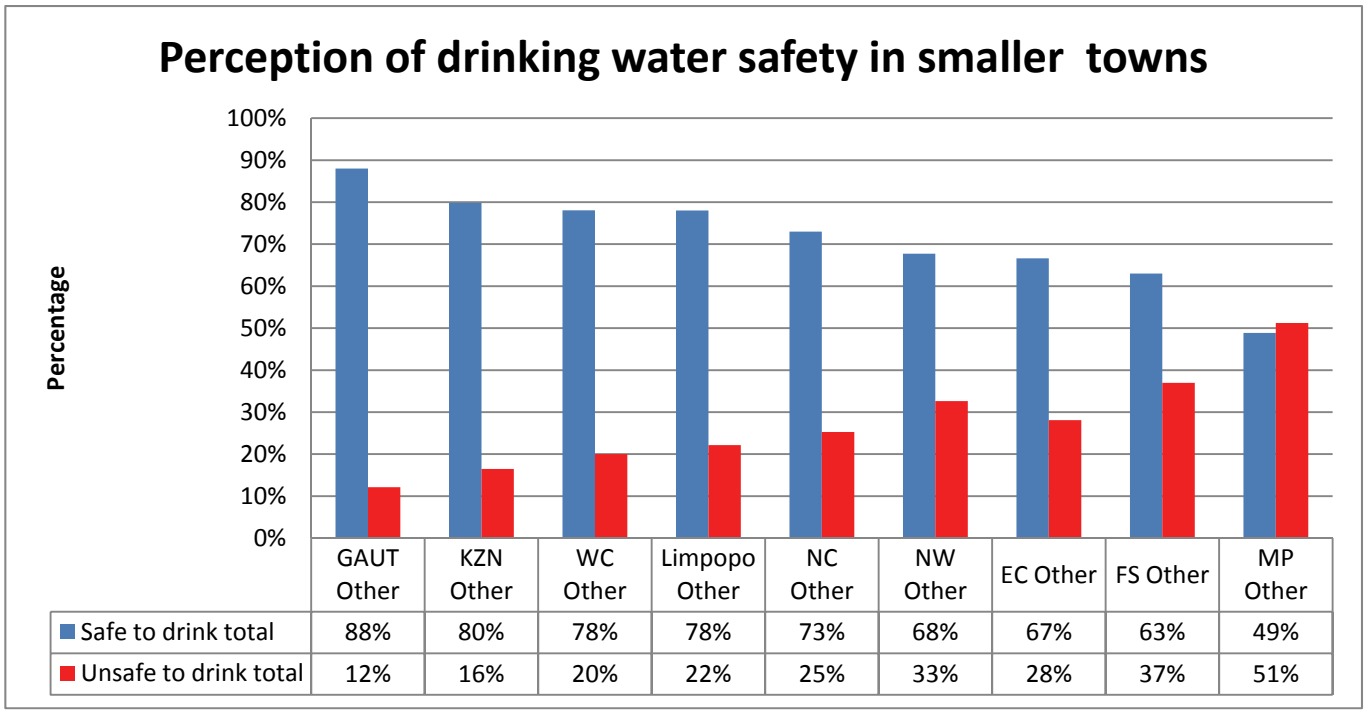


Figure 6: A comparison of the Metro municipalities

Mangaung and Buffalo City, the two new Metros, scored relatively low on perception of water safety. It should be noted though that the sample sizes for these two municipalities were small (33 and 40 respectively). Further research would be needed to confirm the validity of the result.

The figure below gives the perception of the safety of drinking water in smaller municipalities or non-metros. Please note that the sample only covered the urban areas or towns of these municipalities. The Western Cape sample was small and further research would be needed to confirm the result for this province.



	GAUT Other	KZN Other	WC Other	Limpopo Other	NC Other	NW Other	EC Other	FS Other	MP Other
Safe to drink total	88%	80%	78%	78%	73%	68%	67%	63%	49%
Unsafe to drink total	12%	16%	20%	22%	25%	33%	28%	37%	51%

Figure 7: Perception of drinking water safety in smaller municipalities per province – urban areas only

In the Eastern Cape and KwaZulu-Natal, 5.3% and 5.4% respectively, do not get water from a tap. This explains why the percentages for these two provinces do not add up to 100%.

Although the sample sizes are relatively small in comparison with the Metros, the result confirms that consumers in smaller municipalities are less confident about the safety of their drinking water than consumers in the Metro municipalities.

5.3 Drivers of safety risk perceptions

Respondents' perception of the safety of tap water was further explored with a follow up question about the reasons for their perception. No show card was used; answers were coded and respondents could give multiple answers.

The table below compares the main drivers of the perception that tap water is safe to drink with the main drivers of the perception that tap water is unsafe to drink.

The results confirm international findings as cited in Doria (2010:14) that the public's perception of drinking water quality is "based on a combination of multiple factors".

Table 2: The main drivers of perceptions

Drivers of perception that water is safe to drink	Percentage	Perceptions that tap water is unsafe to drink	Percentage
The water looks clean	78	The water looks dirty	60.5
Nobody gets sick	58.1	The water tastes bad	49.7
The water tastes good	47.7	The water is not purified	35.5
The water is purified	36.7	The water smells bad	31
The water smells good	22.5	Some people got sick from the water	29
The water is not polluted	16.7	There are chemicals in the water	21.6
The water is tested for harmful bacteria	12.4	The water smells of chlorine	16.8
There are chemicals in the water	10.6	People told me the water is unsafe to drink	14.6
The municipality told us that the water is safe	9.9	The water is not tested for harmful bacteria	11
People told me the water is safe to drink	8.9	The water is polluted by mines or factories	9.4
The water smells of chlorine	6	I heard in the media (radio, TV, newspaper) that the water is unsafe to drink	2.7
I heard in the media (radio, TV, newspaper) that the water is safe to drink.	3.4	Our municipality does not have a Blue Drop.	2.2
Our municipality has a Blue Drop.	0.8	Other	1.4
Other	0.6	The municipality told us that the water is unsafe to drink.	1.3
Use filter system	0.2	Has find worms in the water	0.4
Water comes from the tap	0.1	Water is brown	0.3
I know the water is safe to drink	0.1	Pipes are not clean regularly / old pipes	0.2

The figures below compare the relative impact of these factors.

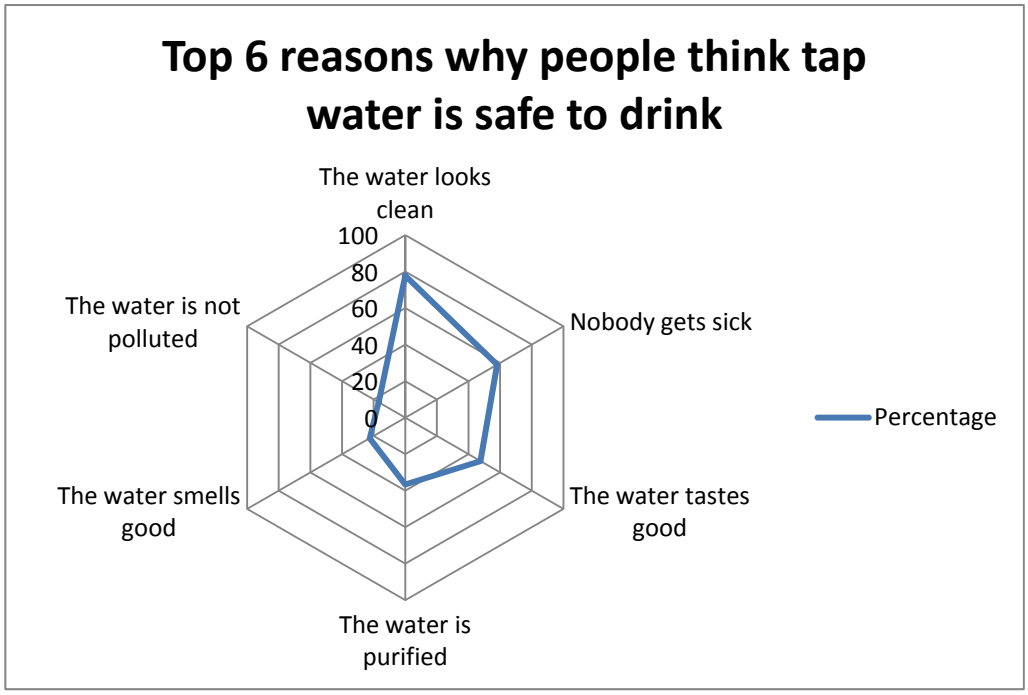


Figure 8: The relative impact of different factors on the perception that tap water is safe to drink

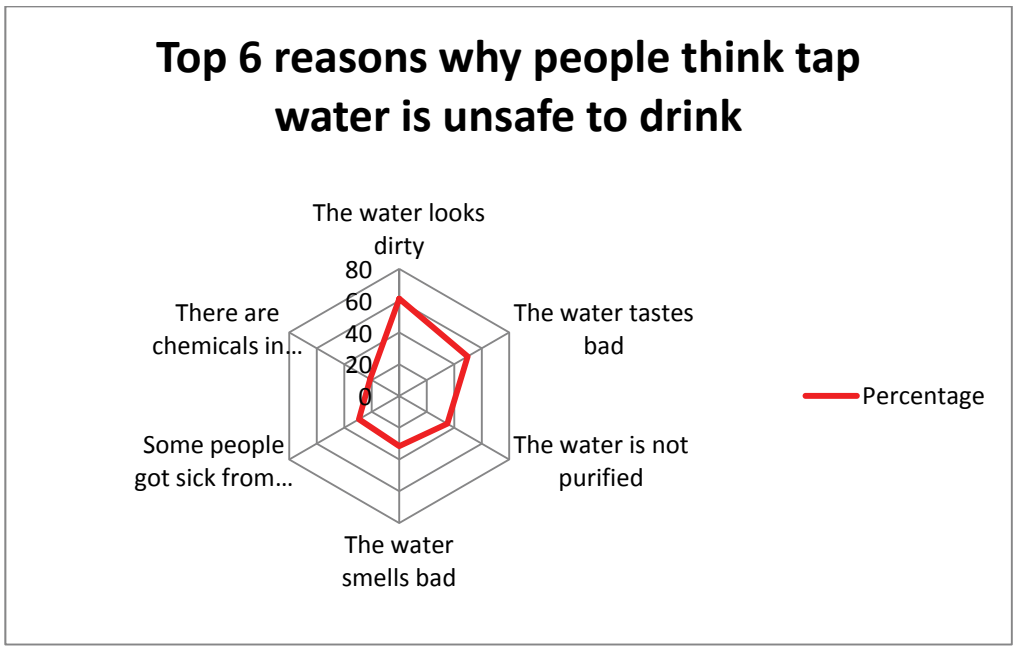


Figure 9: The relative impact of different factors on the perception that tap water is unsafe to drink

We will now compare each group of factors with the findings of international studies discussed above.

5.3.1 Organoleptics (the sensory experience of water)

South Africans' risk perception of the safety of tap water is mainly guided by the appearance of the water. Taste is in the second place and odour in the third place as sensory drivers of perceptions about the safety of tap water.

This differs from the international results discussed above.

No significant race, gender or age differences were found for the contribution of organoleptics to the perception of safety.

However, the reasons provided by consumers of the six metros for their perception that tap water is safe or unsafe to drink differed significantly in a number of respects, as the table below illustrates. Outliers are marked red.

The major drivers (in Bold) are however the same. Further research is needed in order to explain the reasons for these profile differences. The variability of the relative impact of the major factors found in international studies could have attributed to this result.

Table 3: The relative weight of different drivers of perceptions about safe drinking water – per Metro

Drivers of perception that water is safe to drink	Percentage per Metro						
	National urban	City of Cape Town	City of Johannesburg	City of Tshwane	Ekurhuleni	eThekwini	Nelson Mandela Bay
The water looks clean	78	**72.1**	**77.1**	**83.8**	**81.5**	**82.1**	**81.1**
The water smells good	22.5	20.3	19.9	**34.7**	20.5	22.7	16.2
The water tastes good	47.7	**49.7**	**38.9**	**65.7**	**41.8**	**48.7**	**61.3**
The water is purified	36.8	26.3	31.4	**55.4**	46.1	**51.5**	**6.8**
The water is tested for harmful bacteria	12.4	18.9	9.2	15.3	11.1	10.6	**1.6**
The water is not polluted	16.7	25.1	12.3	26.7	18.8	17.6	**0**
Nobody gets sick	58.1	**57.6**	**65.2**	**54.2**	**54.4**	**64.5**	**30.3**
People told me the water is safe to drink	8.9	13.3	10.5	8	9.5	7.7	1.7
There are chemicals in the water	10.6	10.5	15.1	13.8	16	5.8	1.1
The water smells of chlorine	6	7.4	11.4	7.1	8.4	0.7	1.3
The municipality told us that the water is safe	9.9	18.4	10.7	17.1	6.1	5.7	6.9
I heard in the media (radio, TV, newspaper) that the water is safe to drink.	3.4	8.7	9	3.8	0.3	2	0
Our municipality has a Blue Drop.	0.8	4.4	0.6	1.8	0.2	0	0

5.3.2 Water chemicals and microbiological factors

Interestingly, the smell of chlorine in tap water could either induce a positive perception that the water is safe to drink (6%) or a negative perception that it is unsafe to drink (17%). However, water which smells of chlorine is more likely to be perceived as rendering water unsafe to drink. The demographic profiles of the two different perceptions will have to be further investigated.

The same trend was found for chemicals in the water: 11% regarded "chemicals in the water" as an indicator of safe drinking water; 22% regarded it negatively as an indicator of unsafe drinking water.

"Tested for harmful bacteria" was furthermore an indicator of drinking water safety for just over 10% of the population.

5.3.3 Contextual factors

Pollution as a contextual factor did influence consumer perceptions about water safety, both positively and negatively. However, the details of this driver and the link to media reports on water pollution by the mines, for instance, will still have to be explored further.

5.3.4 Prior experience

The study confirmed that personal experience of people getting ill is a major driver of perceptions of water safety.

5.3.5 Impersonal and interpersonal information

Table 4: Impersonal versus interpersonal information as drivers of perceptions

Drivers of perception that water is safe to drink	Percentage	Perceptions that tap water is unsafe to drink	Percentage
The impact of information from a source which is impersonal			
The municipality told us that the water is safe	9.9%	The municipality told us that the water is unsafe to drink.	1.3%
I heard in the media (radio, TV, newspaper) that the water is safe to drink.	3.4%	I heard in the media (radio, TV, newspaper) that the water is unsafe to drink	2.7%
The impact of information from family or friends			
People told me the water is safe to drink	8.9%	People told me the water is unsafe to drink	14.6%
The impact of scientific or technical information from an unknown source			
The water is not polluted	16.7%	The water is polluted by mines or factories	9.4%
The water is tested for harmful bacteria	12.4%	The water is not tested for harmful bacteria	11%
There are chemicals in the water	10.6%	There are chemicals in the water	21.6%

In this study interpersonal information had a stronger influence on negative perceptions than impersonal information (14.6% versus 4%), but positive perceptions were influenced more by impersonal information than interpersonal information (13.3% versus 8.9%).

The higher LSM groups tend to rely more than lower LSM groups on scientific or technical information from an unknown source for perceptions as to whether their tap water is safe to drink or not.

Although the impact is subject to the sensory experience of the water, communication from the municipality still has a major impact on positive perceptions as the figures above illustrate.

The Blue Drop status of Metros is very low on the list of drivers of perceptions. Only 1.2% of consumers from Metros gave "Our municipality has a Blue Drop" as a reason for their perception that tap water is safe to drink. This finding has major implications for municipal communication.

International studies found that media reporting has very little impact on the individual's risk perception of drinking water safety. In this study as well, a very small percentage (3.4% and 2.7% respectively) said that their perception that tap water is safe or unsafe to drink is determined by what they have heard in the media. Doria (2010:14) points out that, although the influence of media reports on perception might be statistically weak, a negative media report on water quality in a large Metro impacting on 2.7% of a population of 1 million adults, could flood the municipality's call centre with calls by concerned consumers.

5.3.6 Perceptions about the service provider

In view of recent unrest about municipal service delivery, the study also asked a general question about consumers' perception of their municipality's service delivery.

The distribution of the perception of service delivery across the survey population was as follows:

Table 5: Service delivery perceptions

Perception of service	Percentage
Very good service [5]	12%
Good service [4]	31.5%
Good and bad service [3]	23.3%
Bad service [2]	24.6%
Very bad service [1]	8.5%
Mean	**3.14**
Standard deviation	**1.17**

No significant gender differences were found for these perceptions.

Significant provincial differences were found in the perception of the quality of municipal services as the Figure below illustrates. The results depicted in Figure 10 links back to that of Figure 7. Consumers in the Free State and Mpumalanga have the least positive perceptions about the safety of drinking water; they also rate the quality of municipal services the lowest.

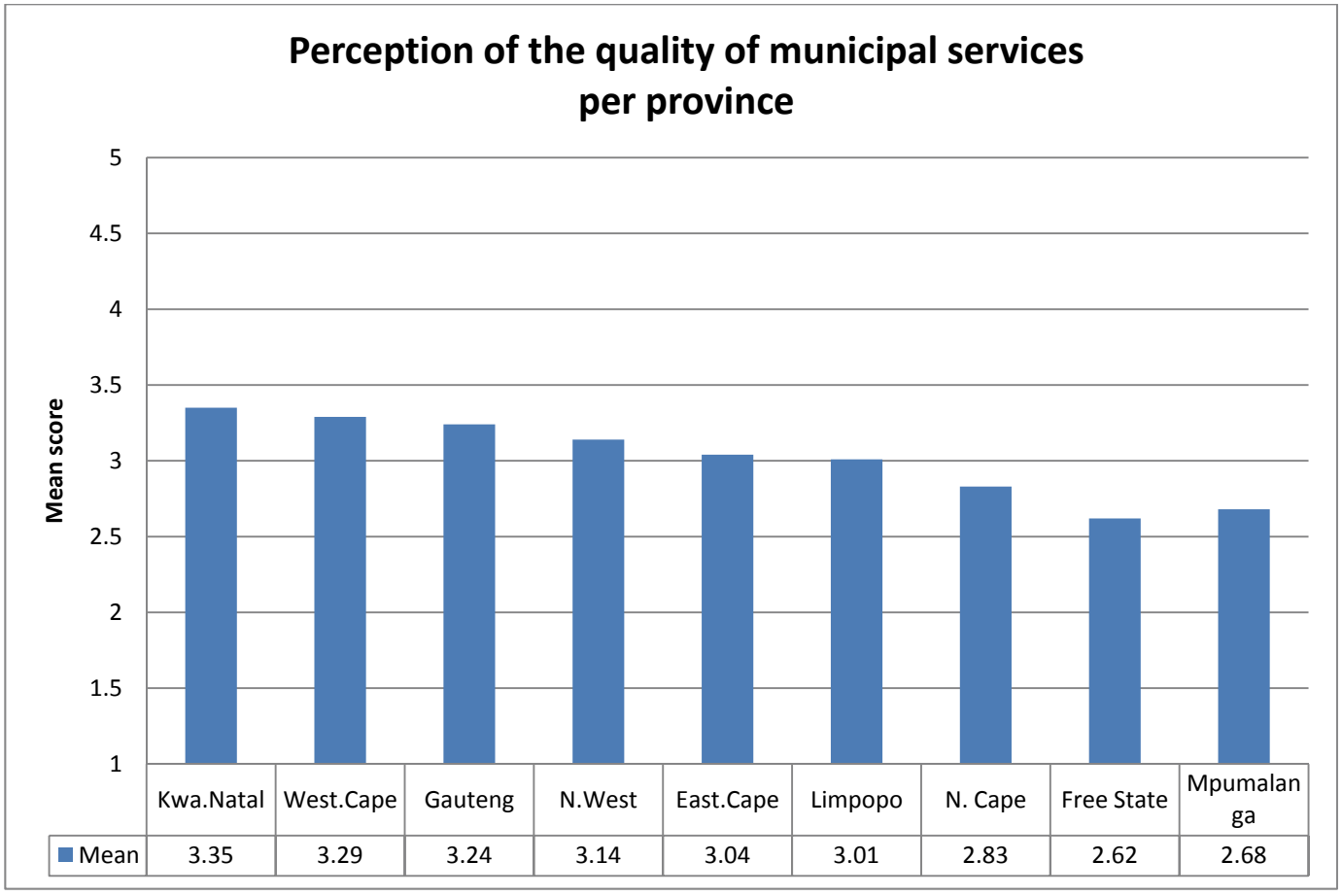


Figure 10: Perception of the quality of municipal services per province

Amongst other factors, a perception that drinking water is clean and regularly tested has a major impact on perceptions of very good service. On the other hand, factors other than water safety, such as a perception that municipalities do not care about consumers, refuse removal is inadequate and roads are bad, mainly determine perceptions of bad and very bad service.

Table 6: Main reasons for perceptions of good service

Main reasons for perception of good (very good and good) service	Percentage (multiple mention)
Never experienced any problems/good service	81.7%
Collect rubbish bins all the time/On time; Maintain the area well/Neat all the time/ Clean streets	78.8%
Clean water/Purified water/water gets tested	31.9%
Complaints are attended to quickly/as soon as possible	28.7%
Enough water/availability of water/taps in the yard	18.3%

Table 7: Main reasons for perceptions of bad service

Main reasons for perception of bad (very bad and bad) service	Percentage (multiple mention)
Municipality does not care about us/community is not taken seriously/bad service from municipality	56.6%
Streets are not kept clean/Rubbish is just dumped in street/Dirt is all over the place; Don't pick up bins on a weekly basis/on time	85.6%
Roads are very bad/roads are not maintained/No street names/potholes	62.6%
Take too long to attend to any problem	27%
Have empty promises	18%
Still waiting for an RDP house	17.4%
No water/shortage of water/run out of water for weeks/no taps in the yard	13.5%
Not clean drinking water/not enough clean drinking water/Water is not safe to drink	15.2%

Doria (2010:11) cites several studies, for instance Jordan & Elnagheeb (1993) and Contu et al. (2004) which found that the perceived control influenced perception. For example, consumers are more likely to perceive tap water from a public supplier as unsafe than their own borehole water. Doria (2010:11) concludes that "there are some suggestions that good communication with water companies is interpreted by consumers as a form of control".

It is therefore interesting that response time, which reflects the quality of communication between the consumer and the municipality, is an important indicator of the quality of service.

5.4 Correlation between perceptions of the safety of drinking water and service delivery

Although clean and safe water featured in the reasons for a perception of good service, the correlation between perceptions of the safety of tap water and perceptions of municipal service was positive, but very weak (0.222) as the correlation table below illustrates.

		[Q1] Tap water in household	[Q5] Perception of municipality service
[Q1] Tap water in household	Pearson Correlation	1	.222
	Significance. (2-tailed)		.000
	N	2418	2418
[Q5] Perception of municipality service	Pearson Correlation	.222	1
	Significance. (2-tailed)	.000	
	N	2418	2437

This confirms the result of some of the international studies cited in 3.4.5.

6 Conclusions

Although the scope of this study was small, it provides a baseline with which to compare future studies. It also gives the WRC and its stakeholders an understanding of how South Africans perceive the quality of drinking water.

The findings discussed in this paper show that multiple factors determine consumers' perceptions about the safety of drinking water. The findings also confirm international research and add insight into the drivers of risk perception.

The findings have several implications for policy, management and further research:

- Sensory aspects such as appearance, taste and odour have the strongest influence on South Africans' perceptions of the safety of tap water. Therefore standards for organoleptical criteria should take consumers' perceptions into consideration, as recommended by the World Health Organisation (2004).
    - Doria (2010) mentions that this practice, “already mainstreamed in several countries, of using both consumer and trained panels to assess drinking water flavour and odour should be maintained or reinforced if appropriate".
- Because perceptions about the safety of tap water are influenced by multiple factors, communication strategies should address several factors at the same time (Doria 2010:14).
- The findings point out several areas of drinking water quality which are insufficiently communicated to the general public:
    - Blue Drop status as an indicator of safe drinking water: Currently this factor is a very weak driver of consumer perceptions. Consumers in the Metros seem unaware of the Blue Drop status of their municipalities and the implication that the status has for the safety of drinking water.
    - Clean and safe water is an important driver of positive perceptions about municipal services. Municipalities with high quality water should use this finding to improve their image and to build consumers' trust in their services.
    - The impact of chlorine on water safety: Consumers seem confused about whether the addition of chlorine makes water safe or unsafe to drink. They also have ambivalent perceptions about the impact of "chemicals in water" on water safety.
    - Water treatment processes: The general public, especially lower LSM groups seem to lack knowledge of water treatment processes. This could be addressed in educational programmes and visits to the municipal water and wastewater treatment plants.
- A multiple strategy, including school and above the line and below the line media campaigns, is recommended for communicating information about water safety. Because family and friends have a strong influence on perceptions, social networks and the relationship between adults and children in a community should be harnessed in communication campaigns.
- First-hand experience will however remain the strongest factor and consumers will use past experience as a reference point.

- ❖ Because consumers use their own experience as point of reference (Doria 2010), any change in the organoleptic qualities of tap water, for example as a result of maintenance work, will probably be negatively perceived by consumers. Municipalities should therefore educate and warn consumers if any change in the organoleptic qualities is expected.

- ➢ Municipalities' Water Safety Plans should take the drivers of risk perceptions into consideration when emergency plans are developed (Doria 2010).

Finally, the study pointed out several knowledge gaps and areas for further research:

- How the various factors interact to form general perceptions;
- The perceptions of women with children in their care versus women without children in their care regarding safe water and methods to make water safe to drink;
- Perceptions about the safety of municipal water versus bottled water;
- The reasons for the perceptions of young people: Are they less knowledgeable about safe water and water treatment processes? Are they more prepared to take a safety risk with drinking water? What is the role of other demographic variables in this?;
- What do people understand when they talk about "chemicals in water"?;
- Are poor people in South Africa also willing to accept the pollution of a water resource in order to keep their jobs?

The general public has an important role to play in the self-regulation of drinking water safety. An understanding of the psychology of drinking water quality is necessary to educate and inform consumers so that they can play this role in the best interests of our society.

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8 Appendix: Questionnaire

SECTION C – CLEAN (ALL URBAN)

ASK ALL

Q1	READ OUT. SHOW CARD	Code	Route
	Is the tap water in your household:…… [SA]	( )	
	Very safe to drink	1	Q2
	Safe to drink	2	Q2
	Unsafe to drink	3	Q3
	Very unsafe to drink	4	Q3
	Unsure or don't know (NOT ON SHOW CARD)	5	*
	I don't get water from a tap (NOT ON SHOW CARD)	6	**NEXT SECTION**

***IF RESPONDENT IS UNSURE, PROBE: "BASED ON YOUR EXPERIENCE, WOULD YOU SAY THE WATER IS …."**

ASK IF CODES 1,2 in Q1

Q2	READ OUT.	Code	Route
	What makes you say …..? REPEAT ANSWER FROM Q1.	( )	
	MULTIPLE ANSWERS		
	The water looks clean	1	
	The water smells good	2	
	The water tastes good	3	
	The water is purified	4	
	The water is tested for harmful bacteria	5	

The water is not polluted	6	
Nobody gets sick	7	
People told me the water is safe to drink	8	
There are chemicals in the water	9	
The water smells of chlorine	10	
The municipality told us that the water is safe	11	
I heard in the media (radio, TV, newspaper) that the water is safe to drink.	12	
Our municipality has a Blue Drop.	13	
Other (SPECIFY)……		

ASK IF CODES 3,4 in Q1

Q3 READ OUT.	Code	Route
What makes you say …..? REPEAT ANSWER FROM Q1.	( )	
MULTIPLE ANSWERS		
The water looks dirty	1	
The water smells bad	2	
The water tastes bad	3	
The water is not purified	4	
The water is not tested for harmful bacteria	5	
The water is polluted by mines or factories	6	
Some people got sick from the water.	7	
People told me the water is unsafe to drink	8	
There are chemicals in the water	9	
The water smells of chlorine	10	
The municipality told us that the water is unsafe to drink.	11	
I heard in the media (radio, TV, newspaper) that the water is unsafe to drink	12	
Our municipality does not have a Blue Drop.	13	
Other (SPECIFY)……		

ASK IF CODES 1,2,3,4,5 in Q1

Q4 READ OUT. SHOW CARD	Code	Route
When at home, do you:…… [SA]	( )	
Always drink tap water.	1	
Drink tap water, but <u>sometimes</u> boil, filter or clean it. .	2	

Drink tap water, but <u>always</u> boil, filter or clean it.	3	
Sometimes drink tap water and sometimes bottled water (that is bought).	4	
Only drink bottled water (that is bought).	5	

ASK ALL

Q5 READ OUT. SHOW CARD	Code	Route
In the area where you live, the municipality gives:…… [SA]	( )	
Very good service	1	Q6
Good service	2	Q6
Good and bad service	3	Q6
Bad service	4	Q6
Very bad service	5	Q6

ASK ALL

FOR EACH ANSWER IN Q5, ASK Q6

Q6 Why do you say that the municipality gives ….. (ANSWER IN Q5)?

PROBE FULLY