Perceptions of bottled water consumers in three Brazilian municipalities

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ABSTRACT

This study presents perceptions of consumers of bottled water in their households in three Brazilian municipalities. Data from interviews were analyzed using the Discourse Collective Subject method. Interviewees spent, on average, the equivalent of 40% of their water bill for the public water supply on the purchase of bottled water. The decision about water consumption in the household was predominantly made by women. Interviewees were particularly concerned with health risks and expressed a strong preference for the safety and organoleptic qualities of bottled water, particularly in cases where the tap water supply did not fully meet the regulated water quality standards. Interviewees were largely unaware of the origin, type, storage, and social and environmental impacts of bottled water. Results highlight the importance of water education efforts among the general population and the key role of women in the processes related to drinking water. The need for gender-specific interventions and the empowerment of women on water issues is noted. Results also strongly support the relevance of ensuring the provision of safe drinking water, from the source to the consumption point, with the trust of consumers.

Key words | bottled water, drinking water consumption, tap water, water perceptions

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INTRODUCTION

Bottled water consumption has consistently risen worldwide over the last decade. The factors that drive this phenomenon have been the target of several studies in North America and European countries, where they are relatively well understood. However, academic research on this topic is extremely scarce in other regions, including in emerging economies or developing countries, particularly when existing tap water systems are not fully reliable. As cultural and economic factors play a role in water source preferences, Doria (2006) hypothesized that the factors that drive bottled water sales in Asia and South America may be somewhat different from those in effect in North America and Europe. This study addresses this hypothesis by contributing to the understanding of the preferences and perceptions of consumers of bottled water in three Brazilian municipalities.

In Brazil, the growth in consumption of bottled water has created space to expand the number and variety of products. In the past, customers only had the option of purchasing still or sparkling mineral water, but now bottled water on the market includes water reprocessed from the public supply and 'flavored waters'. The increase in consumption has also led to a debate on the role of bottled water on the provision of safe water, drinking water as a human right, its social and environmental impacts, the need to improve the public water supply, and water as a market commodity (Ferrier 2001; Barlow & Clarke 2003; Irigaray 2003; Caubet 2005; Gleick 2007; Ribeiro 2008; Brei & Bohm 2011). Several studies

suggest that bottled water may have the same or worse bacteriological and chemical quality as tap water, concluding that bottled water is not better than tap water with regards to health benefits (Fraij *et al.* 1999; Lalumandier & Ayers 2000; Van Der Aa 2003; Ahmad & Bajahlan 2009). However, generalizations are hard to make at a global level, as the quality of bottled water is not intrinsically better or worse than tap water. Indeed, most of the comparisons available in the academic literature, including the ones noted above, were conducted in developed countries or in locations where recent high-quality water supply treatment and distribution systems are available. A different conclusion may arise in other locations, as millions of people still lack access to a safe supply of drinking water. Even when adequate water treatments are in place, distribution systems may be unsatisfactory.

Several authors have researched the factors associated with bottled water preferences and consumption. Doria (2006) points out that the two main factors indicated by consumers to explain their use of bottled water are often organoleptic (e.g., odor and color) and concerns about the health risks of tap water. This finding is ironic, as blind tests often reveal a preference for the sensory properties of tap water and in the countries studied the quality of tap water is generally more rigorously monitored. Moraes (2007) asserts that there is the tendency to consume bottled water instead of tap water and presents factors to explain this trend, including discredit of the public service, inadequate public information by water suppliers and regulators, cultural aspects, organoleptic preferences, fashion, and an aggressive marketing by bottling companies. Studies by Jardine *et al.* (1999) and Jones *et al.* (2006) indicate that contamination of microbiological and chemical sources and its negative health effects are the main causes for the search for alternatives to the use of tap water. Doria (2010) presents a comprehensive review of consumers' behavior in relation to tap water, including health aspects and chemical and microbiological water parameters. Actions to disseminate information on the quality of the public water supply and to disseminate information for the public were noted by Silva (2007), Coelho & Cardoso (2010), and Queiroz (2011). Others have highlighted the role of marketing campaigns and business strategies in promoting bottled water (Petrella 2002, 2003; Caubet 2005).

Within this context, the main goal of this study is to advance the current knowledge of the factors that underlie bottled water consumption in Brazil, including the preference for specific bottled water characteristics and perceptions of tap water.

RESEARCH APPROACH

To better capture all factors potentially involved in consumers' option for bottled water, the data collected for this study are based on interviews and the Discourse Collective Subject method. The term 'mineral water' ('água mineral') was used in the research, as during the pre-test it was clear that this term was used by interviewees as their preferred term to designate 'bottled water' ('água envasada' or 'água engarrafada'). Interviewees were asked the amount and value of their water consumption and their views about the following questions:

1. What is bottled water?
2. Why do you consume bottled water?
3. How do you choose your bottled water?
4. What do you think about the bottled water you use?
5. What do you know about the extraction of bottled water? What do you think of the commercialization of bottled water?
6. What do you think about the public water supply?

Specific municipalities were selected to represent a combination of different management models of the public water supply. Detailed information about the research approach used in this study can be found in Queiroz (2011).

Sample

Data were collected in three predominantly urban municipalities in Brazil, identified in this paper by capital letters (A, B, and C), located in the same State and the same watershed, with similar population sizes but different water supply services management providers (Table 1). Municipality C has the lowest Human Development Index (HDI) score, income per capita the highest value for the indicator of infant mortality (Heller 2007).

Data collection was based on a sample of households in various districts or administrative regions in each

Table 1 | Management models prevailing in 2007 for services of water supply, population, and average income in the municipalities studied

Municipality	Service provider	Tariff	Population	Average income[c] (US$/hab/year)	HDI
A	Municipal autarchy[a]	System with its own tariff	34,725	12,346	0.786
B	Municipal government[b]	No tariff	38,301	18,481	0.787
C	Concession state service with a mixed share of public and private capital	Tariff standard for the whole State	75,213	4,979	0.747

[a]'Purely administrative units in nature, created by special law, for the conduct of activities, works or services decentralized state entity that created them (…), but with no hierarchical subordination, subject only to the control of its administration and conduct of their leaders' (Meirelles 1995).

[b]Water is supplied directly by the municipality through a secretariat, department or the allocation of direct administration. The municipal autarchy service of this municipality changed after this study.

[c]The gross domestic product of municipalities is based on data from the Regional Accounts of Brazil.

municipality, using a 'snowball' technique (i.e., one interviewee identified other potential interviewees, and the second round of interviewees identified the third round of interviewees, etc.). Interviews were conducted in the case the interviewees used only bottled water for drinking purposes. Ten interviews were conducted in each municipality, taking into account the principles of repetition and saturation (Lefévre & Lefévre 2003) and the normal sample size for this kind of research (Mason 2010). The sample was not controlled for socio-demographic factors.

The interviews were transcribed and treatment results were analyzed using the Discourse Collective Subject (DCS) method. DCS consists of a discourse production modality obtained from oral testimony, through individual interviews or groups with a particular focus or in any discursive manifestation that can be found in texts and written documents (Lefévre & Lefévre 2003). Structurally, DCS is organized by designating text as a central idea (CI). CI is the linguistic expression that reveals and describes in a succinct, accurate and as reliable as possible way, each one of the answers investigated. There is not an interpretation, but a description of the meaning of a statement or set of statements, which will later give birth to the DCS.

For the development of DCSs, the starting point is the discourses in their raw state, through the transcription of the answers given in the interviews. The responses are subjected to an initial decomposition, which consists in using the methodological figures of the technique, seeking reconstitution of discursive social representation.

Another pathway for the study was contact by letter with the concessionaires responsible for public water supplies of the selected municipalities. Information was requested on the general system of the water supply, sampling for water quality control and management characteristics. However, the requested data were not provided. Thus, data from Heller's study (2007) are used for discussion of the results.

RESULTS

Demographic profile of interviewees

Of the 30 interviewees, 40% reported to be between 18 and 30 years old and 60% reported to be between 30 and 79 years old. Ninety percent of the interviewees were female. The interviews were done at different times and days of the week, and when the first contact was with a man, they said the woman was responsible for the purchase of bottled water and invited her to reply. Of the three male interviewees, one lived alone and other reportedly responded on the behalf of his wife who was not at home at the time.

Price and quantity of bottled water consumed

In municipality A, it was found that individual consumers spent up to 120% more on bottled water than on tap water with respect to spending money, i.e., consumers spend more money on purchasing bottled water than the water bill of the public water supply. A consumer could buy over 53,000 L of treated water with the amount spent on the purchase of 200 L of bottled water (Table 2). The average price for water charged by the autarchy is US$0.56 per m^3 and the average price of bottled water is US$3.00 per 20 L pack,

Table 2 | Comparative buy bottled water x water supply public

Municipality[a] (statistics)	Expenses with bottled water (US$/month)	Expenses with bottled water (% of average income)	Expenses with tap water (US$/month)	Expenses with tap water (% of average income)	Proportion value buying bottled water over water bill (%)	Purchased bottled water (L /month)	Amount of tap water that could be purchased with the amount spent on bottled water (L/month)
A (range)	6–30	0.6–3.0	10–40	1.0–3.9	39–120	40–200	10,714–53,571
A (average)	13	1.3	21	2.0	67	89	23,724
B (range)			–		–		–
B (average)			–		–		–
C (range)	6–24	1.5–5.8	15–85	3.6–20.5	11–52	40–160	7,500–30,000
C (average)	12	2.9	41	9.9	31	73	14,583

[a]Three respondents in municipality A and one in C did not know the cost of their water bill.

i.e., the price of 1 L of bottled water can purchase 300 L of water from the public water supply.

In municipality B, tap water from the public water supply was not directly charged to consumers at the time of the interviews.

In municipality C, it is verified that consumers spend up to 52% of their water bill in buying bottled water and some interviewees could have bought 30,000 L of water from the public water supply as opposed to the 160 L of bottled water (Table 2). The average rate charged by the concessionary service for water is US$0.8 per m^3 and the average price of bottled water is US$3.00 per 20 L pack, i.e., the price of 1 L of bottled water can purchase 187.5 L of water from the public water supply.

All respondents used bottled water for at least two years before the data were collected. It was found that the use of bottled water had become commonplace in the household, mainly for drinking, presenting a burden on the family budget.

Perceptions about bottled water

Interviewees were first asked what they understood by bottled water. Four central ideas and related discourses were identified, as presented in Table 3. The idea of purity emerged in 93% of the interviews. Respondents were largely unaware of the chemical components that exist in bottled water. Four of the interviewees believed that bottled water received some treatment. Respondents also believed that the water from the tap does not come directly from nature, because it undergoes treatment processes to ensure safety and is distributed through pipes. In contrast, they described

bottled water as something that comes home in sealed packages, directly from nature. The idea of health was present in all interviews. Most respondents do not seem to have any knowledge about bottled water composition or that it contains various minerals, even if the mainstream term translates directly into English as 'mineral water' and the chemical composition of the water is generally present on the bottle labeling. Many respondents seemed to reject tap water because they believe it can negatively affect their health, in some cases also noting the chlorine odor. The convenience of bottled water was highlighted by five interviewees in the three municipalities.

In relation to question 2 on the reasons why the interviewees consumed bottled water, specific discourses were identified in municipalities A and C (cf. Table 3). In municipality A, two interviewees indicated that they drink bottled water because of medical recommendations. These respondents were aware that microorganisms harmful to health can exist in tap water and being afraid of the risk of contracting diseases or worsening an already existing condition, they resort to the use of bottled water. The idea of using bottled water at home as a fashion statement was shared by two people in municipality C, the municipality with the lowest income per capita and HDI of the municipalities studied.

Question 3 focused on how interviewees selected their bottled waters, including if they were aware of aspects such as quality, packing conditions, water source, storage location and practices, price, delivery conditions, difference in taste and which reasons lead them to choose a particular brand of bottled water. The responses were similar in the three municipalities (cf. Table 3). According to Brazilian

Table 3 | Central idea (CI) and Discourse Collective Subjects (DCS) on bottled water questions, with the indication of the number of respondents per municipality (N)

Question	CI	DCS	N
1. What is bottled water?	Bottled water is healthier than tap water.	It presents health, I trust, you understand? You don't need to worry that it has those bugs that keep moving, it is natural water, right? It is healthier, it is not contaminated, it has quality, you can take it peacefully because it is water withdrawn directly from nature.	A: 10; B: 10; C: 10
	Bottled water is pure.	It is pure water that I take without fear, [it is] more natural without chemical components. I think my tap water is not pure. It is a water with quality, without preservatives. It is clean, ready to take, right? It has no contamination. I like it a lot, it is clean.	A: 10; B: 10; C: 8
	Bottled water is practical.	It is much more practical because it already has the packaging, home delivery, it is very practical, it is there you can take it. No need to be cleaning filters, boiling water, that was before.	A: 3; B: 1; C: 1
	Bottled water is better treated.	I'm sure it is well treated, special, it has a more refined treatment, without chlorine, no bad stuff in it; it can be consumed without any problem.	A: 1; B: 1; C: 2
2. Why do you consume bottled water?	Medical recommendation.	It's perfect water, put in the cup and it comes out clear, and it was a medical recommendation for kidney stones. I have person with immunodeficiency at home and I cannot have viruses or bacteria, so I buy bottled water.	A: 2;
	Bottled water is tastier and stylish.	Because it's tastier and I also think it's more chic than the filter clay, [I prefer] to have that mineral water bowl in my room, because it does not fit in the kitchen. I use it to drink, the other things I use street [public] water because I could not keep buying bottled water for everything, it would be good, but it's really just to drink it.	C: 2
3. How do you choose your bottled water?	Consumers trust the water sellers and consider cheapest brands.	Look, I call the tele-water and whatever comes is good, the water he sells I buy, if it is bottled water it is fine for me, I don't really choose it. Sometimes I look at the price and buy the cheapest.	A: 10; B: 10; C: 10
4. What do you think about the bottled water you use?	The consumer who buys water usually likes it regardless of its quality.	I think it is tastier, I do not feel any difference from one to another. It is a good alternative, I have no brand loyalty.	A: 10; B: 10; C: 10
5. What do you know about the extraction of bottled water? What do you think of the commercialization of bottled water?	The consumer has no idea about the source and impacts of bottled water.	That's right I cannot opine not, nor imagine, never curious, but if you have mineral water because it's good, right? I know it comes from the ground, take the stone? I do not know, comes from the source? But I know nothing, nothing at all. I think this is all good, too good for me because then we have good water to drink.	A: 10; B: 10; C: 10

law, storage, transport, and distribution are governed by specific legislation (Resolução Diretoria Colegiada – RDC n. 173/2006) (Brasil 2006). This law states that bottled water should only be for sale in commercial food or beverage outlets; should be protected from direct incidence of sunlight and kept on pallets or shelves, in a clean, dry, airy space reserved for this purpose; and empty returnable containers should not be stored next to sanitized products, liquefied petroleum gas and other potential pollutants in order to prevent toxic contamination or impregnation of odors (Brasil 2006). However, while there are cases of practices contrary to this legal framework, the interviewees had no idea whether they were buying bottled water from authorized retailers or from irregular (in some cases even illegal) establishments, had no idea of the hygiene and sanitary conditions of these retailers and had no knowledge whether the storage and the transportation of containers were suitable.

When interviewees were asked their opinion about the bottled water they consumed (question 4), the answers were similar in the three municipalities (Table 3). Interviewees seemed accustomed to different bottled waters and could not see any significant difference between the different brands and kinds of bottled water (apart from the more obvious sparkling/still). The difference between mineral and other bottled waters was not at all evident to respondents.

The interviewees' knowledge about the extraction and commercialization of bottled water (question 5) emerged as a single discourse from the three municipalities (Table 3). The interviewees had no information about the social and environmental impacts of the chain of production, storage, transportation, and consumption of bottled water.

Perceptions about tap water supply

Interviewees were asked about their views on the public water supply and its frequency. Results are presented by municipality in Table 4. In municipality A, the central idea is that the public water supply is good overall, but not for drinking purposes due to a lack of familiarity and trust. It seems to be the case that investments in infrastructure and upgrades in the treatment and supply system were not combined with an efficient public information approach. In

Table 4 | Central idea (CI) and Discourse Collective Subjects (DCS) about the public water supply and its frequency for each municipality

CI	DCS	Municipality
The public water supply is good, but not for drinking.	The water from the [public supply company name] is not bad, it is treated, right? Apparently it's good, right? But I have no way to confirm this, right? Even recently they inaugurated a network of these water things, I don't drink it for a long time, I use it for everything but to drink, to take it is mineral water, for the other things it serves, if we have another more trustable option, right?	A
The public water supply is not treated.	I don't like tap water, from the street, because here it is not treated. Everybody says the water is dirty, I've heard that whoever takes it from filter gets diarrhea. My consumption of bottled water is high, especially during the rainy season. The water here is sometimes impossible to use, then mineral water is an alternative. I don't know, do you know that a tadpole came up from my tap, then when it rains it comes full of stuff, even dirty, dark, and this is why? Then it is even unless for laundering, right?	B
The public water supply has a bad taste, color and we do not have a regular supply.	The water here is full of calcium, it is brackish water, here in the neighborhood you cannot drink it, it comes whitish and tasting chlorine, when it comes, right? Ah! You cannot consume the natural way, it is unreliable without passing by a filter or boil, this water is not transparent, is a turbid water when you put it in the glass. I think the treatment does not leave it 100% trustworthy. The water from the street gives you worms, they purify the water from the dam and this water that comes for us to drink, there is everything is open as you can see on the street.	C

municipality B, the central idea is that the public water supply is not treated and not suitable for human consumption, with evident health risks and organoleptic problems. In municipality C, the central idea includes organoleptic problems, particularly taste and color, an intermittent supply, pathogenic contamination, and problems with the treatment and supply systems. It must be noted, however, that these results do not necessarily reflect the perspectives of the populations of these municipalities, as this research has focused only on bottled water consumers, who by definition decided to partially or completely reject tap water.

DISCUSSION

The current research advances a series of points that merit detailed discussion. As noted in the Introduction, Doria (2006) raised the hypothesis that the factors that drive bottled water sales in South America may be somewhat different from those identified in North America and Europe. This research suggests that, while the factors are largely the same, their strength and role in the process of option for bottled water may be somewhat different. While in those regions organoleptic considerations were the main factor involved, in the municipalities studied health and risk concerns were more evident. In fact, health issues were the first to be raised during the interviews and were consensual to all interviewees. Even when such issues were not presented in question 2 ('Why do you consume bottled water?'), this can be explained by the fact that the respondent had just mentioned them in the previous question ('What is bottled water?'). These results suggest a kind of Maslowian level of factors, so that some factors become more relevant when other factors are controlled. In the case of drinking water, if health risks are present or perceived, health reasons will be the main factor influencing the decision for bottled water; in the absence of health concerns, organoleptic considerations become the main factor. In addition, due to economic growth and as available income rises, households start consuming more bottled water as an alternative to water from sources that they consider inadequate or untrustworthy.

This study found that the water budget for bottled water can be significant. This is particularly evident in municipality C, where income is lower. While somewhat striking, this finding is consistent with previous research. For instance, Coelho & Cardoso (2010) found that over 80% of households of a low-income neighborhood in the State of Espírito Santo (Brazil) spent more money on bottled water than on tap water. Similar findings are reported in Doria (2006) and also emerged during the focus groups conducted for the study presented in Doria *et al.* (2009), in a case of a relatively poor respondent from a deprived neighborhood. According to Heller (2007), there were problems with the quality and regularity of the water from the public supply of municipality C and this may play a significant role in the interviewees' option for bottled water. The implications are, however, ambiguous: on the one hand, bottled water is depicted as a means to provide safer drinking water to those that currently lack access to an adequate public supply, which may be viable at the level of some individuals but is hardly sustainable at the wider societal level; on the other hand, bottled water is presented as an additional economic burden on the poorer and more vulnerable segments of society.

In addition to health and organoleptic considerations, convenience also emerged as an important factor in the option for bottled water consumption. This finding is also consistent with the research of Coelho & Cardoso (2010) and Ward *et al.* (2009), which noted that bottled water is regarded as a largely convenient source. Pitaluga (2006) points out that the convenience, ease, and practicality of so-called 'tele-waters' (ordered over the telephone from a grocery store or bottled water company) as a factor influencing water packaged in 20 L containers.

Another aspect that was evident from the data collected for this research is the basic level of knowledge of related water among the interviewees. This was clear from the start of the research, on the lexical preference for the term 'mineral water' to refer to all bottled waters. The term 'mineral water' was originally reserved for water from mineral springs associated with medicinal properties. The ratings of Brazilian mineral waters take into account a predominant chemical element, may receive a rank as a mixed water which has more of a noteworthy element, or elements that are rare. Fluoride is not mentioned in the Code of Mineral Waters, in effect, as a criterion for classification. However, the National Department of Mineral Production (DNPM) began to consider fluoride as a 'rare element and noteworthy' from the

end of the 1980s, which allowed the classification of various waters as 'mineral fluoride'. Since then, water previously classified as 'drinkable table water' (which does not have the qualities of mineral water) gained the status of mineral water, due to detection of minute concentrations of fluoride (Caetano 2005). Rebouças (2004) and Borges *et al.* (2006) reported on the banality of the term 'mineral water'. According to them, the bottled waters that are sold as mineral water cause confusion about the features that make mineral waters different and confuse consumers about the characteristics of 'natural water' or 'table water' – a classification that depends only on the specification of drinkability. Therefore, bottled waters marketed primarily in 20 L bottles are often not mineral waters but come from potable water sources which do not need treatment.

Several other examples of the basic level of knowledge of related water were evident. Ironically, in spite of the preferred terminology, respondents were largely unaware of the presence of mineral and other chemical components in bottled water, corroborating studies such as Stangler (2005) and Mourão (2007). This may be related to the concept of water as 'pure'. In this regard, the findings of this study are consistent with those of Pitaluga (2006), where over 80% of survey respondents believed it is important to note the purity of bottled water and combined the ideas of color and transparency with that of purity. As Douglas (1976) argues, the meanings of purity are variously constructed by different social groups and civilizations. In the context of this study, the meanings of purity and cleanliness are also associated with modern plastic packaging. In Giddens (1991) analysis of modernity, he argues that one of the key features is the process of disengagement, which coupled with industrialization, means that people have less knowledge and control over the origin of the products they consume, such as drinking water. In addition, some interviewees believed that bottled water was subject to a treatment, which was implicit as being better than the one used for tap water. It can be noted that the only treatment allowed by the Brazilian legislation for mineral waters is the physical process of filtration, the results of which are typically sold in large 20 L containers.

Interviewees also lacked information about the environmental consequences related to the chain of production, storage, transportation, and consumption of bottled water, as discussed in the study by Queiroz & Heller (2009). This contrasts with studies by Nessi *et al.* (2012), Saylor & Prokopy (2011), and Ward *et al.* (2009), where participants demonstrated some knowledge and concern about the possible negative consequences that consumption of bottled water can cause to the environment. As for the origin of water, in the research by Silva *et al.* (2010), those living in Vitória (Brazil) responded that water comes from rivers that are not within the State and from the sea, corroborating the fact that most people do not know the source of their bottled water.

Another relevant finding, due to its potentially noxious consequences, has to do with recommendations from medical staff. A small proportion of interviewees (7%; $n = 2$) noted that their consumption of bottled water was related to medical recommendations, in one case due to kidney stones and in the other case related to immunodeficiency. No additional information was collected during the interviews on this issue and the exact recommendation is unknown (e.g., for a specific brand of bottled water). Both interviewees reside in the municipality with a better water supply, which may be indirectly related to better access to health services. It can be noted that a similar proportion of respondents (5.6%; $n = 28$) was identified during the research summarized in Doria *et al.* (2005). In that research, such respondents were advised by doctors to avoid drinking tap water and such advice was related to higher perceived risks and greater use of filtering devices, but unrelated to bottled water consumption. This CI is also present in the study by Coelho & Cardoso (2010), supporting the fact that some bottled water consumption is sometimes based on medical recommendations. In the present research, the importance of the provision of accurate and unambiguous information can be highlighted due to the potentially noxious consequences of incorrect or ambiguous information. For instance, in the cases identified, if the respondent with renal calcium stones consumes a random kind of bottled water, he risks having his condition significantly aggravated depending on the calcium concentration (Bellizzi *et al.* 1999). In the case of the respondent with immunodeficiency, it should be noted that the bacteriological quality of bottled water varies (e.g., Zeenat *et al.* 2009) and the use of cooled boiled tap water can ensure more adequate results (Hayes *et al.* 2003; Hall *et al.* 2004). Both cases highlight the importance of identifying suitable water sources, including specific

brands of bottled water wherever appropriate. In addition, as noted by Fortes Jr. (2009), the long-term consumption of highly mineralized water can be harmful. The author further adds that the French Senate advised citizens to vary often the brand of bottled water they consume. Napier & Kodner (2008) recommend that physicians counsel their patients about the health effects of bottled or tap water; and must take into account factors such as region of residence, possible risks that may be caused by the water used, personal beliefs, costs and convenience, and should seek clinical and scientific data about the benefits and real risks. The authors also recommend that other data, such as source water, container types, and regulations be considered by physicians when assessing the risks and benefits that the choice of water allows the patient. Thus, medical practitioners should also be provided with learning opportunities about the different possible sources of drinking water, their implications, and the relevance of clear communication with their patients.

One critical aspect identified during this study has to do with the role of women as the main actors in the identification and selection of drinking water sources for the household. This finding is consistent with other studies (e.g., Melo 2010) and merits further research as it has several implications. Women generally perceive higher water-related risks than men, in particular those associated with tap water chemicals and pollution, perhaps due to differences in perceived vulnerability, gender structures, socio-political factors, and differences in world views and trust (see Doria 2010). In contrast, those in charge of water supply infrastructure and management, including water-related information campaigns and bottled water distribution, are often men. The integration of gender equality issues on the decision-making process and water management is then central to ensure efficient processes.

With regards to the question on tap water supply, it is interesting to compare results with Heller's (2007) study, which provides details of the public utilities of the municipalities in this research, including water quality data. In municipality A, Heller concluded that the water quality met the parameters of the current law. Heller noted that consumers have a reasonable understanding of the tap water supplied, but they do not rely on it for their consumption. Consumers are uncertain about the health risks of tap water because water quality information is not always accessible in a comprehensive fashion from the supplier. In this case, lack of consumers' trust of the public supply system seems to be promoted by the absence of channels of communication and information to the population about the quality and origin of tap water. This compares with the findings of Strang (2004), who reported that respondents of his survey had little notion about aspects of the tap water they received, and the processes of capture and treatment required expertise not accessible to a large proportion of the population. The users of the public supply are in doubt about the quality of the water distributed, and are being driven to consume costly bottled water. This trend occurs mainly because of the lack of adequate disclosure of data and quality assurance about the public water system, lack of action aimed at improving its continued supply, combined with aggressive marketing by the bottling companies in favor of bottled water (Pitaluga 2006; Moraes 2007; Silva et al. 2008; Queiroz & Heller 2009).

In municipality B, Heller (2007) identified several problems related to the water supply system. Therefore, respondents from this municipality could have real reasons to suspect the quality of tap water at the time of the interviews. The system has been improved since the data were collected and the new municipal system may have changed consumption patterns. It should be noted, however, that improvements in tap water quality per se may not influence consumers' trust and behavior if no reliable information is provided about such changes. From a study by Celik & Muhammetoglu (2008), data were used to improve public acceptance of tap water as a low cost source of drinking water and led to campaigns to inform the public about improvements in the public water supply, monitoring, maintenance techniques, and replacement of the public distribution network.

In municipality C, the interviewees perceived color and taste of chlorine in the water and concluded that the treatment performed by the supplier was not efficient. When analyzing water samples from this municipality, Heller (2007) found physicochemical and microbiological parameters that did not conform to the regulated values set as safe for drinking water. Heller also detected the irregularity of the supply, with stoppages of a mean duration of 12 hours, and daily interruptions of 6 hours on average in

CONCLUSIONS

One of the main conclusions of this research is the need to further promote the development of accurate and relevant information about drinking water and/or ensure its dissemination among the population through suitable channels, such as radio and printed media. Moreover, the need for adequate learning opportunities related to drinking water must be highlighted. This need has implications for all levels of education and is closely linked to the processes and goals of education for sustainable development (Van Der Schaaf *et al.* 2009). Education is one of the best instruments consumers have to ensure their understanding about the implications of their choices and the development of skills to translate such choices into behaviors. Thus, findings support the importance of reinforcing water education efforts among the general population.

Another conclusion is the key role of women in the processes related to drinking water. In particular, the need for further research on water and gender issues and for gender-oriented interventions is highlighted. The promotion of gender equality and the empowerment of women is much in line with wider development objectives, and this study substantiates these efforts in the context researched.

Overall, results strongly support the relevance of ensuring the provision of drinking water, from the source to the consumption point, with the trust of consumers. This understanding has already been presented in some strategic documents (e.g., The IWA Bonn Charter for Safe Drinking Water) and is fundamental to ensure the success of water supply policies.

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DISCLAIMER

The statements presented in this paper are not necessarily those of UNESCO and do no commit the Organization in any way.

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