Journal of Water & Health

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Journal of Water and Health Vol 21 No 1, 81 doi: 10.2166/wh.2022.319

Status, social norms, or safety? understanding intended and reported bottled water use in Urban Mashhad, Iran

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ABSTRACT

Personal plastic-bottled water use is highly commodified, raising an array of cost and environmental concerns, and continues to grow globally. Studies in lower-income nations suggest safety as a primary motivation for such water purchases, but studies in high-income nations with greater relative affordability suggest it is more tied to socially situated consumer decisions like status and aesthetics. Here, we consider what motivates bottled water use in an urban city (Mashhad) in a middle-income predominantly Muslim country (Iran), where there is a likely intersection of safety (due to contamination), social norms, and status concerns. Surveys were collected with a random population-representative sample of resident adults from discrete households ($n = 970$). Structured equation modeling testing the relative effects on reported bottled water intentions and use shows that all these factors are shaping people's decisions. Both higher- and lower-income residents' responses suggest that status and social norms considerably influence intentions to use. Overall, even despite real safety issues with tap water, social norms and status concerns seem to weigh more heavily on residents' decisions to drink bottled water.

Key words: bottled water use, safety benefits, social norms, status

HIGHLIGHTS

- Many residents use tap water despite contamination of ground water, especially lower income.
- Bottled water is used more by women than men.
- Bottled water use increased with perceived safety benefits, education, self-efficacy, income, and household size.
- Status awareness and social norms notably affected bottled water use and intentions, even once safety/health concerns and income were taken into account.

INTRODUCTION

From being virtually non-existent in the early 1990s, personal use of plastic-bottled water is now the second biggest market in the beverage industry after carbonated drinks (Beverage Marketing Corporation Report 2020). Use of bottled or other commercially packaged water continues to rise globally, including with rapid uptake in middle-income countries (e.g., Stoler 2017). Understanding why bottled water use continues to expand in such contexts is anything but straightforward (Hawkins 2017) and requires hybrid theoretical approaches that can link such concerns as safety, status, or cost constraints to wider ecological or political contexts (Kooy & Furlong 2020). Here, we advance the evidence base through a population-representative study of bottled water intentions in a large arid city in Iran, Mashhad. More generally our study is responding to a recent call for water insecurity research to consider contexts like Mashhad in which it is water quality, rather than water access, that is compromised (Wutich *et al.* 2021).

Background

Based on many studies in higher-income countries, the question of what motivates people to choose bottled versus tap water for drinking has emerged as an important but complexly entwined public health, social status, and economic issue. These

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studies from higher-income countries begin with a landscape of secure water supplies. In contexts where tap water is expected to be safe, cheap, and easily accessed, a basic assumption is that widespread use of commercially mass-produced bottled water is both more costly, not safer, and probably more environmentally harmful than tap water. In some cases (such as non-fluoridation or toxic effects of plastic), it may even have important attendant health costs especially for children (e.g., Andra *et al*. 2012; Lin *et al*. 2021). Findings from such studies tend to emphasize bottled water use as a socially situated consumer decision, with attention to such issues as taste, luxury branding, convenience, health consciousness (rather than simple safety issues), and other status, aesthetic, and lifestyle factors (Miller 2006; Wilk 2006; Biro 2017; Ballantine *et al*. 2019; Brewis *et al*. 2021). That is, the choice to buy portable bottled water is clearly situated as a status marker and aligned with an array of social norms.

In lower-income countries, the available studies by contrast suggest the adoption of bottled water is related to water insecurity, including concerns about unsafe water from available piped or collection sources like mains or wells (e.g., Prasetiawan *et al*. 2017). Cost is also a major barrier issue that can constrain decisions to use bottled water in low-income communities, and is likely a major daily stressor for millions (Stoler *et al*. 2020). Of course, these same dynamics also appear to exist within higher-income countries in lower-income or otherwise marginalized communities where public systems do not deliver safe water consistently. On the US–Mexico border, for example, known safety issues are cited as the primary reason that bottled water is preferred by residents (Beamer *et al*. 2022), while other minoritized communities' lack of trust in public utilities is cited as a motivator for avoiding tap water entirely (Pierce & Gonzalez 2016; Rosinger *et al*. 2018). And there are some documented higher-income country cases, like New Zealand, where social status seems relatively irrelevant as part of consumer decisions of bottled water users (Ragusa & Crampton 2016).

Middle-income countries – theoretically – likely contain sites where safety and status concerns increasingly intersect. That is, there are rapidly expanding markets for bottled water for several relevant and related reasons: incomes are typically rising, urban populations are expanding, and consumer markets growing. Yet water supplies may also not be consistently stable and/or safe. In a recent overview, Kooy & Furlong (2020) identify that such 'how' and 'why' of this wider global trend toward more bottled water in middle- and lower-income countries, where market penetration is expanding greatly now, requires much better consideration and explanation. What is needed, they suggest, are studies that both can add to a needed diversity of cases where incomes are rising to allow brand water to be able to penetrate markets successfully. We ask: How are safety concerns versus status or social norms of expected behavior weighted in such cases? Do status awareness or social norms matter as much or more than health concerns, or does perceived safety typically trump (as it seems to in lower-income marginalized communities in higher-income countries like the United States)?

This study – examining bottled water use intentions in Iran – is an effort to address these questions. Our focus on the specific case of the Persian-Iranian city of Mashhad using population-representative interviewing allows us also to consider how concerns about water safety interact with potentially interactive-vailing social concerns related to both status and norms around bottled water use.

Mashhad is a large arid (cold and dry) industrialized city in a middle-income county with predictable and adequate tap water access, but in a place particularly affected by low water quality. Residents of Mashhad are potentially balancing possibly substantial issues of poor water quality directly related to health threats against social status concerns and drinking norms in how they are deciding about the use of bottled instead of tap water. Tap water in Mashhad is drawn from rivers, wells, and groundwater based in rock that can act as a heavy metal source and then transported in old and inadequate pipes that can as well. Environmental pollutants from industrial and agricultural activity release additional heavy metals and other toxins into water sources (Yasoori 2004, 2008; Entezari *et al*. 2014; Blake 2016). Contamination levels in treated drinking water in Mashhad are borderline harmful for adults but more certainly harmful for children (Alidadi *et al*. 2019). In addition, Entezari *et al*. (2014) indicated that there is probably an important association between deaths due to cardiovascular disease and the chlorine parameter in drinking water in the Mashhad Plain.

As Kooy & Furlong (2020) also note, studies that can help better explain the continued global trend toward bottled water adoption must adequately link individual-level explanations of bottled water decisions to wider social contexts, especially given a divide in the current literature between social psychological and structural/social analyses. An analytic focus that connects social norms around water to status and health/safety concerns is one way to begin to better bridge this and is one we adopted for this study. For example, one recent analysis of the history of bottled water adoption in Indonesia suggested that we focus on use decisions. A small online survey of convenience sample residents of one city analyzed using qualitative content analysis suggested safety and trust as major factors in growing bottled water use, but they did not explicitly consider the

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status of water (Prasetiawan *et al*. 2017). While theoretically, these relationships are both complex and important, more data-based studies – including population-representative studies – that better reveal the dynamics are greatly needed.

In the case of Mashhad, we could predict social norms will particularly focus on the protection of water resources. According to national surveys (Khodayri 2009; Ebrahimi 2011), Mashhad is one of the most religious cities in Iran and this is relevant because the Quran emphasizes the importance of protecting humans and the environment, and the responsibility to refrain from behavior that would disrupt healthy human and natural resources. Majdi (2020), for example, has shown how social norms tied to religion can have a positive and significant effect on soil and water conservation intentions and behaviors in Mashhad farmers. Other studies suggest this pro-environment orientation is a wider phenomenon in Mashhad (Salari *et al*. 2022).

Study approach and research propositions

In devising the structure of the analysis of intentions for and reported use of bottled water in Mashhad, we were guided by two very different theories of decision-making that assume different levels of influence related to social and health/safety concerns. Social psychological theories of planned behavior are concerned with the preferences and intentions of individuals as a key factor in behavior; it begins with the individual assuming that people as cognitive agents generally have control (self-efficacy) of their decisions (Nisbet & Gick 2008). While widely applied in consumer research, one common criticism of the approach (sometimes called the 'health belief' model in health research) is that the phenomenon often fails to capture subjective norms – or if doing so then does so in ways that inadequately explain actual behavior (Armitage & Conner 2001). Cultural approaches drawn from anthropology emphasize the role of both status meanings and related social norms as the contexts in which people make decisions between bottled versus tap water in their daily lives. Relative socioeconomics also interacts with these. For example, in a recent study of values placed on tap water in a large urban US city, higher-income residents were more likely to devalue not only tap water but people who drink it (Brewis *et al*. 2021). That is, the non-use of tap water was identifiable as an elite social marker, at least for elites.

In our approach, we use these two theory sets to identify key domains of interest associated with the reported use of bottled water in Mashhad, and test proposed relationships using structural equation modeling. Structural equation modeling is useful here as it also allows us to take into account likely covarying relationships between predictor variables (such as between bottled water status awareness and drinking norms). We began with two key propositions related to this middle-income case where tap water is accessible yet also potentially unsafe: Proposition 1: Greater health and water safety concerns will have a significant effect on bottled water use, and taking this into account will minimize the role of status concerns in predicting bottled water use.

Proposition 2: Social norms around bottled water drinking will maintain a significant association with bottled water use, even once other likely factors like safety/health concerns, status awareness, ability to pay (income), and environmental concerns are taken into account.

METHODS

Sample

The population of interest was all residents above 15 years of age in Mashhad city in 2020. According to Statistical-Center-Iran (2020), there are 13 districts in Mashhad city and 3,001,184 residents above 15 years of age live in these districts. The adequate representative sample size was determined using the following Cochran's (1977) formula, but the final target increased to 970 samples for better allocation of samples to the subgroups of the statistical population (13 urban districts). The data were gathered in the summer of 2020. Using stratified random sampling, primary and secondary sampling units were selected with 26 neighborhoods selected from all 13 urban districts of Mashhad (primary sampling unit), and, then, from the selected neighborhoods, households, and respondents (secondary sampling unit) chosen randomly. The method of selecting households was such that after the random selection of several alleys in the districts, some houses with a systematic order (third, sixth, ninth houses, etc.) were selected along alleyways. All people over 15 years old in the households had an equal chance to be selected as respondents. After assigning a number to each, the one selected randomly was asked to complete the questionnaire. The gender ratio of the resulting sample is 51% female and 49% male. The response rate was 94.4%.

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Study tool

Each study respondent completed the same quantitative data collection survey undertaken using questionnaire-based interviews. The language of the questionnaire was Persian, the formal language of Iran. To finalize the instrument, pilot data were collected with 50 respondents to confirm the validity and reliability of items pertaining to key study variables.

Independent variables

Perceived health and water safety benefits

The perceived water safety and health benefits variable was measured using three items (see Table 1). All of these items were measured through a Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree).

Status awareness

This variable was measured using three items (see Table 1). All of these three items were measured through a Likert scale (from strongly disagree = 1 to strongly agree = 5).

Table 1 | Item mean values and standard deviations, scale reliability, and factor loadings from CFA

Variables	Questionnaire items	Mean	SD	λ	AVE	CR	α
Perceived health and safety benefits	Bottled water contains vitamins and minerals that are good for my health.	2.94	1.01	0.87	0.73	0.75	0.89
	Drinking bottled water is part of a healthy lifestyle.	3.14	1.03	0.92			
	Bottled water is safer for children, the elderly, and those with compromised immune systems.	3.28	1.01	0.78			
Status awareness	Advertisements have influence over the amount and types of bottled water I drink.	2.63	1.06	0.89	0.66	0.74	0.85
	I am aware of advertisements for bottled water.	2.58	1.02	0.85			
	I tend to purchase and consume more famous brands of bottled water.	2.72	1.07	0.68			
Social norms	My family think that I should consume bottled water rather than tap water.	2.66	1.02	0.90	0.84	0.75	0.94
	My close friends think that I should purchase and consume bottled water rather than consume tap water.	2.62	1.09	0.92			
	Most people who are important to me think I should consume bottled water rather than tap water.	2.61	1.1	0.93			
Attitudes to bottled water	I am more likely to drink bottled water when I'm not at home.	2.96	1.04	0.83	0.55	0.80	0.82
	I am more likely to drink tap water at home.	3.82	1.06	0.67			
	I use tap water when it is hard to buy bottled water	3.05	0.95	0.66			
	More time and money should be spent on making tap water taste better.	3.2	1.08	0.80			
Self-efficacy	If I want, I can have behavior consistent with environmental protection.	3.33	0.88	0.84	0.71	0.80	0.91
	I'm sure I can do some activities to conserve the environment.	3.22	0.90	0.85			
	I feel I can have complete control over what protects the environment.	3.3	0.95	0.86			
	Usually, I'm in a position to be pro-environmental.	3.28	0.88	0.83			
Intention to bottled water use	I intend to purchase and consume bottled water next time because of its positive environmental contribution.	2.59	1.05	0.92	0.75	0.80	0.94
	I plan to purchase and consume more bottled water rather than tap water.	2.56	1.1	0.90			
	I will consider switching from tap water to bottled water for ecological reasons.	2.64	1.06	0.91			
Reported bottled water use	Individual consumption of bottled water	2.04	1.36	0.96	0.60	0.88	0.87
	Household consumption of bottled water	2.08	1.35	0.88			
	Frequency of drinking bottled water	2.36	1.08	0.82			
	Bottles of water drunk in the past day	0.56	0.87	0.51			
	Bottles of water drunk in the past week	1.52	1.4	0.63			

Note: SD, standard deviation; AVE, average variance extracted; CR, composite reliability; λ, factor loading.

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Social norms

The social norms variable was measured using three items (see Table 1). All of these items were measured through a Likert scale that ranged from 1 (strongly disagree) to 5 (strongly agree).

Attitudes to bottled water use

This variable was measured using four items (see Table 1). All of these four items were measured through a Likert scale (from strongly disagree = 1 to strongly agree = 5).

Self-efficacy

The self-efficacy variable was measured using the four items (see Table 1). This variable used Likert type items ranging from 1 (strongly disagree) to 5 (strongly agree).

Intention to bottled water use

The intention to bottled water use variable was measured using three items (see Table 1). All of these items were measured through a Likert scale that ranged from 1 (very low) to 5 (very high).

Dependent variable

Reported bottled water use

The reported bottled water use was measured using the following five items (see Table 1). Items of *Individual and household consumption of bottled water* were measured through a Likert scale (from not at all = 0 to always = 4). Items of *how often do you drink bottled water* used Likert type items ranging from 0 (never) to 4 (daily). Items of *bottles of water drunk in the past day and the past week* were measured through a Likert scale (from no consumption = 0 to more than 4 l = 4).

To test the dimensionality of reported bottled water use, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were applied. The results indicated that these bottled water consumption behavior items have one factor. In particular, the EFA through Varimax rotation with Kaiser normalization obtained a one-factor solution which accounted for 67.6% of the explained variance (Kaiser–Meyer–Olkin [KMO] = 0.778, df = 10, Sig. = 0.000), larger than the 60% threshold recommended by Finch (2019). Also, all of the five items had factor loadings greater than 0.50 (0.51–0.96), as recommended by Kaiser (1996). CFA was applied to the one factor identified through EFA. The one-factor 6-item CFA model was estimated using AMOS 22. The results showed that all items load highly on their corresponding factors, and the CFA results revealed that the factor loadings of all constructs were significant (sig. = 0.000) and above 0.50, the minimum threshold value. The five items showed an adequate overall model fit to the data (CMIN/df = 2.8, goodness of fit index [GFI] = 0.94, comparative fit index [CFI] = 0.93, normed fit index [NFI] = 0.92, root mean square error of approximation [RMSEA] = 0.070).

Control variables

Gender, age, number of family members, income, and education were used as control variables. Gender was specified as (1) standing male and (2) female. Education was measured by the number of years of formal education. Monthly total family income and number of family members were actual counts. All the control variables were measured at the interval level of measurement.

Validity and reliability of measurement instrument

All the variables described above were created as additive scales. All scales were found to have high internal consistency ($\alpha >$ 0.70; CR > 0.70) as recommended by Esposito Vinzi *et al*. (2010; see Table 1). We also tested their discriminant validity by exploring the average variance extracted (AVE) shared between a construct and its measures. AVE indices were found to be higher than 0.50 as recommended by Rodgers & Pavlou (2003). Finally, we conducted a first-order CFA for these scales; factor loadings for all the items were significant (factor loadings > 0.50). Moreover, the CFA revealed good fit indices for all scales (Byrne 2016).

Plan for analysis

Statements from open-ended questions were coded and analyzed using the basic Statistical Package for the Social Sciences (SPSS, version 22). The independent and dependent variables were described and presented by mean, and standard error. To achieve the main goals of the study, the researchers used visually based structural equation models (SEM) via AMOS software (SPSS, version 22) as shown in Figure 1. This approach yielded estimates of the degree of impact of the control variables (age,

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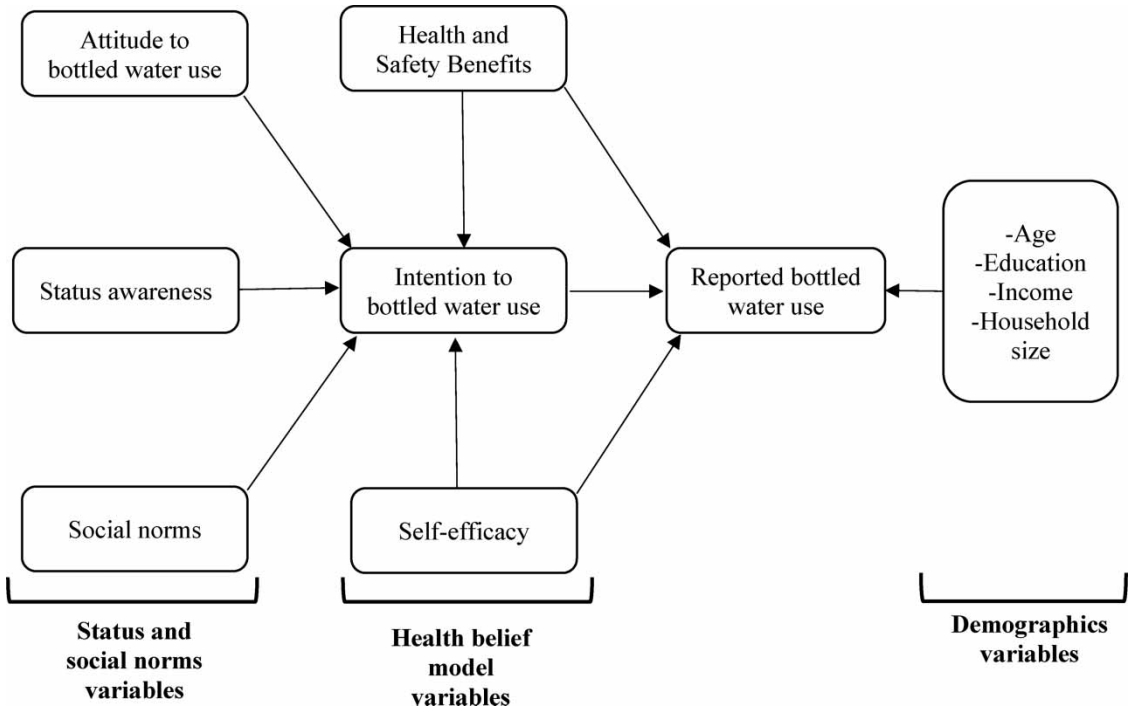

Figure 1 | A research model.

household size, income, and education) and independent variables (status awareness, social norms, perceived health and safety benefits, attitudes to bottled water, self-efficacy, and intention to bottled water use) on reported bottled water use; SEM was selected because it allowed simultaneous testing of both the direct and indirect effects of independent variables on the outcome variable of reported bottled water use. The results from the model were reported as standardized coefficients (beta coefficients).

RESULTS

Descriptive statistics

Demographic responses revealed that the mean age of respondents was 37 years (standard deviation [SD] = 13.55) and the mean education of the respondents was 12 years (SD = 1.83). With regards to gender, 49% of respondents were male and 51% were female. On average, the income of the respondents was $150.2 per month (SD = 48.10). The mean number of family members was 3.5 (SD = 1.16).

As indicated in Table 2, proportions of attitudes to bottled water were 12.2, 68.5, and 19.3% at low, moderate, and high levels, respectively. Around 17.9, 62.8, and 19.3% of the respondents have low, moderate and high levels of status awareness, respectively. In our sample, nearly 39.7% of respondents had low level social norm, 44.4% had moderate level social norms and around 15.9% had high levels of social norms. Around 20.3, 56, and 23.7% of the respondents have low, moderate, and high levels of perceived health and safety benefits, respectively. Proportions of self-efficacy were 9.5, 64.2, and 26.2% at low, moderate, and high levels, respectively. Nearly 45.8% of respondents had low level of intention to bottled water use, 38.3% had a moderate level of intention to bottled water use and around 15.9% had high levels of intention to bottled water use.

According to Table 3, about 25% of the sample had no use of bottled water, nearly 34.7% use a low level of bottled water, 23.5% use a moderate level of bottled water and 16% use high level of bottled water. A total of 74.2% use bottled water in our sample, of which 72.7% are male and 75.7% are female. Among the age groups, the highest use of bottled water belongs to the age group of 25–34 years with 80.5%. The lowest use belongs to the age group of 55 years and older with 61.2%. The highest use of bottled water in terms of education is related to people with higher diploma with 81.5%. The highest use of bottled water in terms of household sizes belongs to households with four people with 76.8%. Among the income levels, the highest use of bottled water belongs to the income level of $200–250 with 79.8%. The lowest use belongs to the income level of more

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Table 2 | Description of the independent variables

Independent variables		Proportion (%) or mean
Attitudes to bottled water	Low level (4–8)	12.2%
	Moderate level (9–15)	68.5%
	High level (16–20)	19.3%
	Mean (SD)	12.25 (3.35)
Status awareness	Low level (3–6)	17.9%
	Moderate level (7–11)	62.8%
	High level (12–15)	19.3%
	Mean (SD)	8.95 (2.58)
Social norms	Low level (3–6)	39.7%
	Moderate level (7–11)	44.4%
	High level (12–15)	15.9%
	Mean (SD)	7.88 (3.05)
Perceived health and safety benefits	Low level (3–6)	20.3%
	Moderate level (7–11)	56%
	High level (12–15)	23.7%
	Mean (SD)	9.35 (2.77)
Self-efficacy	Low level (4–8)	9.5%
	Moderate level (9–15)	64.2%
	High level (16–20)	26.2%
	Mean (SD)	13.12 (3.22)
Intention to bottled water use	Low level (3–6)	45.8%
	Moderate level (7–11)	38.3%
	High level (12–15)	15.9%
	Mean (SD)	7.78 (3.02)

Note: SD, standard deviation.

than $250 with 68.5%. Reported bottled water use had a significant and positive relationship to education, household size, and income. The reported bottled water use had a significant and negative relationship to age.

As indicated in Table 4, reported bottled water use had a significant and positive relationship to the attitudes to bottled water, status awareness, social norm, perceived health and safety benefits, and self-efficacy, and intention to use bottled water variables.

Modeled relationships

Based on the structural equation model of intention to use and reported bottled water use, health and water safety benefits (beta = 0.34, sig = 0.000), education (beta = 0.25, sig = 0.000), self-efficacy (beta = 0.16, sig = 0.000), the intention to bottled water use (beta = 0.11, sig = 0.000), income (beta = 0.11, sig = 0.000), and household size (beta = 0.06, sig = 0.040), have the largest influence on reported bottled water use, respectively (Figure 2). These variables explained approximately 23% of the variance in reported bottled water use. The status awareness (beta = 0.64, sig = 0.000), social norms (beta = 0.51, sig = 0.000), attitudes to bottled water (beta = 0.19, sig = 0.000), and self-efficacy (beta = 0.06, sig = 0.007), indirectly affects reported bottled water use through its positive effect on the intention to bottled water use. The value of status awareness, social norms, the attitudes to bottled water, and self-efficacy's indirect effect are nearly 0.07, 0.05, 0.03, and 0.01, respectively (see Table 5). These variables explained approximately 71% of the variance in intention to bottled water use, showing a large influence. The resulting structural models showed an acceptable fit to the data (CMIN/df = 2.1, GFI = 0.96, CFI = 0.95, NFI = 0.93, RMSEA = 0.060).

DISCUSSION

As noted, Mashhad is an interesting case from a middle-income country to test basic propositions around bottled water use, given that public tap water supply is ample but potentially borderline harmful, especially due to groundwater contamination.

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Table 3 | Description of the dependent variable

Dependent variable		Proportion (%) or mean
Reported bottled water use	Not use (0)	25.8%
	Low level use (1–6)	34.7%
	Moderate level use (7–13)	23.5%
	High level use (14–20)	16%
	Mean (SD)	8.57 (5.03)
Reported bottled water use and gender	Male	72.7%
	Female	75.7%
Reported bottled water use and age		
Bivariate correlations = −0.28**	15–24 years	77.1%
	25–34 years	80.5%
	35–44 years	75.3%
	45–54 years	70%
	55 years and more	61.2%
Reported bottled water use and education		
Bivariate correlations = 0.41**	Under diploma	69.5%
	Diploma	74.3%
	Higher than diploma	81.5%
Reported bottled water use and household size		
Bivariate correlations = 0.08*	1 or 2 people	71.1%
	3 people	74.8%
	4 people	76.8%
	5 people or more	72.6%
Reported bottled water use and income		
Bivariate correlations = 0.31**	Less than $100	73.8%
	$100–150	79.5%
	$150–200	75.2%
	$200–250	79.8%
	More than $250	68.5%

Note: SD, standard deviation.
*$p < 0.05$, **$p < 0.01$.

Table 4 | Bivariate correlations between independent and dependent variables

Variables	1	2	3	4	5	6	7
1 – Attitudes to bottled water	1						
2 – Status awareness	0.81**	1					
3 – Social norms	0.75**	0.76**	1				
4 – Perceived health and safety benefits	0.79**	0.78**	0.73**	1			
5 – Self-efficacy	0.51**	0.49**	0.56**	0.57**	1		
6 – Intention to bottled water use	0.74**	0.70**	0.71**	0.68**	0.52**	1	
7 – Reported bottled water use	0.62**	0.52**	0.49**	0.53**	0.44**	0.44**	1

Note: **$p < 0.01$.

Descriptive findings

Based on our analysis of cross-sectional, population-representative data we find that people report a moderate level of using bottled water, and also intending to do so. Results show that women reported more bottled water use than men. This higher bottled water use by women has been found in previous work such as Vieux *et al*. (2020) and Hu *et al*. (2011). Bottled water

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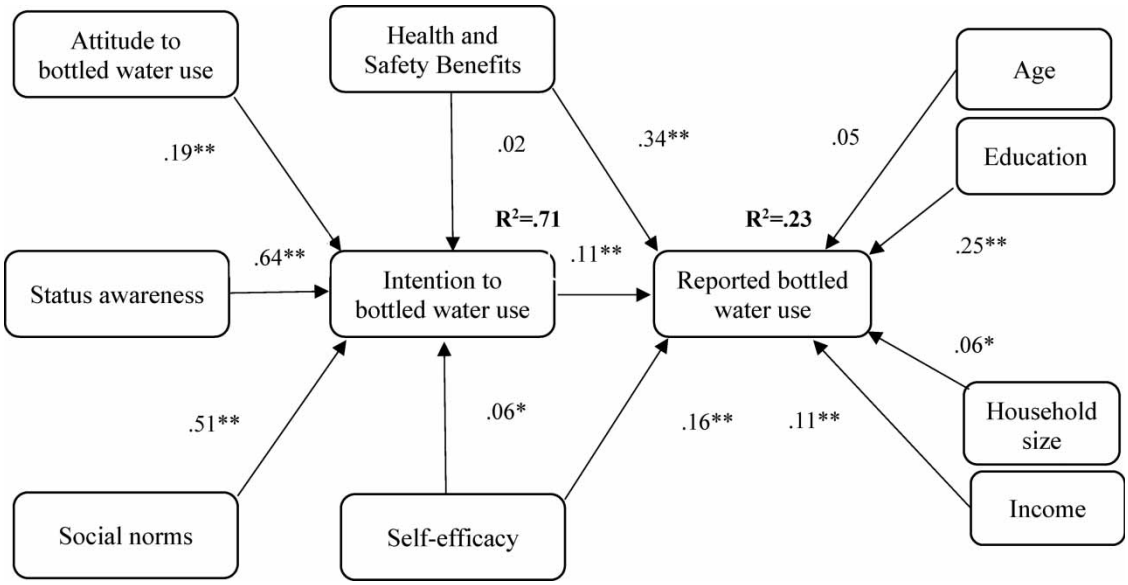

Figure 2 | The SEM model of independent variable effects on reported bottled water use.

Table 5 | Direct and indirect effects of the independent variables on reported bottled water use ($n = 970$)

Indirect effects (Beta)	Dependent variables	Direct effects (Beta)	Independent variables
Perceived health and safety benefits	Reported bottled water use	0.34**	0.001
Self-efficacy		0.16**	0.01*
Intention to bottled water use		0.11**	–
Age		0.05	–
Education		0.25**	–
Household size		0.06*	–
Income		0.11**	–
Attitudes to bottled water		–	0.03*
Status awareness		–	0.07*
Social norms		–	0.05*
	$R^2 = 0.23$		
Attitudes to bottled water	Intention to bottled water use	0.19**	–
Status awareness		0.64**	–
Social norms		0.51**	–
Perceived health and safety benefits		0.02	–
Self-efficacy		0.06*	–
	$R^2 = 0.71$		

Note: *$p < 0.05$, **$p < 0.01$.

is reportedly used more by younger residents, with the highest bottled water use in the age group of 25–34 years and 15–24 years. Other studies have also observed that bottled water use decreased with age (Doria 2009; Drewnowski *et al.* 2013). Also, as the level of education of individuals increases, their bottled water uses increases as well. These results are similar to the results of some studies about bottled water use in low- and middle-income countries (Qian 2018; Aslani *et al.* 2021) but opposite to the typical results of studies on bottled water use in higher-income countries (Onufrak *et al.* 2014; van Erp *et al.* 2014; Colburn & Kavouras 2021). In low- and middle-income countries, people with an academic education report

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less trust in tap water quality and try to use alternative methods such as bottled water to drink safer water. While in high-income countries, people with higher education levels are aware that there is not much difference between the quality of tap and bottled water because of the proper tap water supply infrastructure.

Bottled water use in Mashhad also increases with household size and income. People with higher incomes reported the use of bottled water for health, convenience, and taste. Residents with relatively lower incomes place more emphasis on cost as a factor. The positive relationship between income and bottled water use is perhaps expected and also observed in previous studies such as Family *et al*. (2019) and Doria (2006). Larger households use more bottled water than smaller households, also an expected finding (Johnstone & Serret 2011).

Hypothesis test results

In terms of our hypothesis testing, first, we were considering if greater water safety concern was significantly associated with bottled water use, and then if taking this into account would minimize the role of status concerns in predicting bottled water use. We were also testing if social norms around bottled water drinking will maintain a significant association with bottled water use, even once other likely factors like health concerns, status awareness, ability to pay (income), and environmental concerns are taken into account.

Through modeling, we have identified the relative contributions of social status and social norms, and health/water safety concerns (our main explanations of interest) to intentions to use and reported use of bottled water while taking into account other likely covariates including the ability to pay (income). Our analysis shows that perceived health/safety benefits had a significant and independent effect on more reported use of bottled water. The positive effect of perceived health benefits on bottled water use has been found in previous work, such as Ward *et al.* (2009) in the United Kingdom and Petrie & Wessely (2004).

However, taking these perceived health/safety benefits into account, both status awareness and social norms still had a significant impact on the intention to use bottled water, suggesting this weighed more heavily than health/safety concerns for respondents. Social norms and status awareness each contribute to intentions to use bottled water, similar to previous studies (Jorgensen *et al*. 2009; Saylor *et al*. 2011). Status, based on how we measured it here, is respondents' awareness of and desirability of status branding. That is, those with more awareness are more likely to intend to and report using bottled water. This is not a surprising finding, given that bottled water is an expanding and competitive market with significant multinational investments in advertising. About half of the bottled water in Mashhad is from foreign companies Nestle, Dasani, and Aquafina, and the other half belongs to Iranian companies such as Damavand, Zamzam, and Vata. In this regard, Doria (2009) claims that interpersonal information (e.g., from friends and peers) along with impersonal information (i.e., information-based media and advertising) has a strong effect on bottled water use.

Social norms, in contrast, focus in our analysis on perceptions of what friends and family are thought to do or believe is desirable or acceptable. Also, in this case, we see they have a significant and independent association with bottled water intentions and use, once other factors like status awareness, health concerns, income, and so on are taken into account. So, in summary, we observe in this middle-income case that health concerns matter to residents, but status and social norms matter more. Compared to the results of Etale *et al.* (2018), there is a greater impact of status and social norms than health concerns on bottled water use in some high-income countries such as Switzerland and Germany, and seemingly in New Zealand too (Ragusa & Crampton 2016).

While not our core hypothesis, our study also found a positive effect of self-efficacy on bottled water use and its intentions. Respondents in this study moderately evaluated their ability to consume bottled water and environmentally related products and this assessment was predicted to affect their bottled water use. In other words, the more a person is convinced that bottled water use is only up to them, the more likely they will be to intend to use bottled water. These effects were also shown by Xu & Lin (2018) in the United States.

Our empirical results also show that attitudes to bottled water are positively related to the intention to bottled water use. In our measurement, more emphasis is placed on the convenience and taste of bottled water. Ward *et al*. (2009) stated that convenience and taste are of universal importance and are the main reasons for using bottled water, based on a sample of students in the United Kingdom. Respondents in this study had a moderate attitude toward the convenience and taste of bottled water, affecting their intention to bottled water use. There is a significant and positive relationship between attitudes to bottled water and intention to bottled water use has been found in previous work such as Díez *et al*. (2018) in Spain and by Parag & Roberts (2009) in the United States, and suggests Iran's general patterns are similar to what has been observed in countries with advanced economies.

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CONCLUSIONS

This study has several limitations that could be addressed in future research. Numerous aspects relevant to health belief models (such as perceived susceptibility, perceived severity, perceived barriers, and cues to action) were not measured. In addition, the study featured a convenience sample and cross-sectional data. In this study, there is no direct data regarding respondent consumption of tap and filtered water. Future research in middle-income settings could usefully compare the amount of bottled, tap, and filtered water consumption empirically rather than rely solely on self-reports.

Despite these limitations, this study makes contributions to the literature on the use of bottled water, as an empirical test of these two theoretical frameworks in a large sample. A core finding was that various aspects of health belief and planned behavior are significantly correlated with bottled water use in predominantly Muslim Mashhad. The predicted independent variables explained a very large part of the variance of the intention to bottled water use and the bottled water use.

Based on the literature discussed in the introduction, we can say that this pattern – of socio-economic status sensitivities and social norms both mattering greatly in explaining bottled water use and intentions – is more reflective of what has been generally observed in higher-income countries overall, even in the social-political contexts of a predominantly Muslim city in a Muslim nation. This case study is illustrative, then, of possible contexts of widening bottled water use in middle-income countries, where status and social norms concerns seem to be weighted with and even perhaps above health concerns in intentions to purchase and consume plastic-bottled water.

This has both public health and environmental implications for Mashhad and other similar cities. Bottled water is an expensive commodity for many households, one that cannot be consumed exclusively, even as they seek to, and even – we expect – if tap water was to be fully safe. In all, our study shows that the situation around plastic-bottled personal use water in middle-income is perhaps more complex and nuanced than that observed in prior studies in higher- and lower-income nations. More detailed studies in middle-income countries of how tap versus purchased drinking water exists at the intersection of rising incomes, water commodification, economic inequality, status concerns, and social norms are needed to unravel not just motivations, but also the implications (health, environmental, infrastructural, etc.) of these complex decision-making heuristics around use that are suggested by the survey findings in this Mashhad case.

FUNDING

This study was not funded by any organization.

INFORMED CONSENT

Free and verbal informed consent was obtained from all individual participants included in the study.

DATA AVAILABILITY STATEMENT

Data cannot be made publicly available; readers should contact the corresponding author for details.

CONFLICT OF INTEREST

The authors declare there is no conflict.

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First received 2 August 2022; accepted in revised form 7 December 2022. Available online 19 December 2022

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