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Article

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Abstract: The production and consumption of plastic bottled water have several negative environmental impacts worldwide. The EU countries have adopted strategies and programs to reduce single-use plastics, including PET bottles. A key aspect of designing effective policies is understanding consumer behaviour. To identify barriers and motivations for drinking tap and bottled water, we conducted a nationally representative questionnaire survey among 3,411 respondents in the Czech Republic in 2022. The results reveal that people aged 18-34 appear to be moderate consumers of bottled water and very frequent consumers of tap water. Bottled water consumption tends to be less frequent among people with higher education, while tap water consumption is less frequent among people with lower incomes. The most important factors that explain the frequency of drinking bottled and tap water are taste perception, health concerns and habit. Health concerns about tap water and the unpleasant taste of tap water influence higher consumption of bottled water and vice versa. People with a strong habit of drinking tap water are less likely to consume bottled water. The constructs from the Theory of Planned Behaviour were statistically significant. The results can guide decision-makers in promoting tap water to consumers. To encourage tap water drinking, we suggest measures to increase the availability of tap water in public places in conjunction with campaigns targeting taste and health perception and the habit of drinking tap water.

Keywords: tap water; bottled water; consumer behaviour; Theory of Planned Behaviour; questionnaire survey

1. Introduction

The production and consumption of plastic bottled water has a number of negative environmental impacts. The environmental impact of drinking bottled water is estimated to be 1400 times higher in terms of species loss and 3500 times higher for resource use than tap water (comparing a scenario where the entire population consumed tap water versus a scenario where the entire population drank bottled water [1]). Production is energy intensive [2]) and improper disposal leads to plastic waste pollution [3].

To address environmental problems, the EU countries have been adopting a number of strategies and programs. The most important are the European Green Deal, the 17 Sustainable Development Goals [4], and the revised EU Drinking Water Directive 2020/2184. The directive, among others, reinforces water quality standards and recommends promoting tap water to consumers in public areas and restaurants [5]. In the Czech Republic, there is an action plan „Circular Czechia 2040"with the aim of a successful transition to a circular economy [6]. Among the many objectives of this plan is also the reduction of single-use plastics (e.g. PET bottles). To reduce the negative environmental impacts of bottled water production and consumption, effective measures should be designed and adopted.

A key aspect of designing effective policies is understanding consumer behaviour. A number of international studies have therefore analysed consumption of tap and bottled water. The most important factors that explain tap and bottled water consumption are organoleptic properties [7–12],

health reasons [13–15], convenience [16–20], environmental aspects [21], socio-demographic characteristics [22,23] and constructs from the theory of planned behaviour [24].

The organoleptic properties of water, such as taste, odour, colour or appearance, affect consumer perceptions, preferences, and water choices [9,10,19]. The most influential of these is probably taste. A representative survey of the Flemish population in Belgium concluded that bottled water consumption is widespread because consumers negatively evaluate the safety and taste of tap water [23]. According to the findings of an US study, higher ratings of tap water quality in terms of taste, odour, and appearance were associated with an individual's decision to drink tap water, particularly when comparing a group that drinks only tap water with a group that drinks only bottled water [8]. German consumers of bottled water rated bottled water as significantly preferable in terms of taste, odour and colour, while consumers of tap water demonstrated the opposite by rating it as significantly less preferable across all factors compared to tap water [7]. In a Canadian survey [10], perceptions of overall tap water quality emerged as a key determinant of consumption choice. As satisfaction with overall quality declined, the proportion of bottled water consumption increased.

Health reasons are linked to safety and concerns about the potential health risks of drinking water, with a number of studies showing that tap water tends to be considered riskier and less safe [10,13–15,17,20,23]. For example, 74% of research participants in an Iranian study believed that tap water can often be contaminated (especially with toxic chemicals, microbial agents, or nitrate compounds) and thus cannot be a reliable source in terms of quality [13]. A representative survey in the USA found that respondents who had negative experiences with tap water or come from states with more dominant violations of EPA water quality standards consume more bottled water [19].

Convenience refers to the ease and accessibility of using a product. Bottled water has been shown to be preferable to tap water in terms of its convenience [16–19]. A study conducted among students in the USA has shown that lack of water refill stations near student dorm rooms is one of the key reasons for choosing bottled water [16]. Jones et al. [17] also find convenience to be a major reason for using bottled water, based on focus groups in Canada. A large number of participants bought bottled water simply because the bottle was portable, convenient, and generally well-received in the workplace and schools. Many of these study participants also said they only buy bottled water when they are out and about.

Environmental aspects include environmental concerns and pro-environmental behaviour. In a Polish study, Borusiak et al. [21] showed that environmental concern, defined as a belief in the importance of environmental issues to human beings, leads to a reduction in bottled water consumption.

Sociodemographic characteristics are often utilized to segment water consumers. Most of studies analyse the effects of gender, age, and education. While Geerts et al. [23] report a more frequent consumption of bottled water among men, female university students in Singapore drank bottled water slightly more often compared to tap water [18]. In southern Italy, tap water consumption was positively associated with the age group 16 years and below [22]. People with lower levels of education tend to have higher consumption of bottled water [9,23]. Canadian respondents with higher education reported more frequent consumption of tap water [10]. Differences according to ethnicity are discussed in the US, where Blacks and Hispanics are more likely to drink bottled water due to their relatively greater exposure to hazardous water and greater beliefs about potential risk [19].

The theory of planned behaviour (TPB) is based on the assumption of conscious intention to act as a key determinant of actual behaviour. This intention is explained by attitudes, perceived behavioural control, and subjective norms. While behavioural beliefs lead to a favourable or unfavourable attitude toward the behaviour, normative beliefs form subjective norm, and control beliefs determine perceived behavioural control [24]. Only a few studies used the TPB constructs to explain bottled or tap water consumption. While an Iranian study found subjective norms (family and friends who think the respondent should consume bottled water rather than tap water) to be key in explaining the consumption of bottled water [26], an Indonesian study showed the importance of

all factors that they relate to the TPB framework in encouraging tap water consumption among students [25].

Most studies have been conducted on samples that were not representative of the general population [7–10,12,13,15,16,18,21,22,25,26] except for a few that have been conducted in countries such as the USA [14,19], Poland and Ukraine [11], or in the Flemish population within Belgium [23].

To our knowledge, no similar study exists in the context of the Czech Republic and the following analysis aims to fill this gap. The novelty of this article lies in the incorporation of constructs from the theory of planned behaviour [24] and its extension with habit into research on predictors of tap and bottled water consumption.

2. Materials and Methods

2.1. Data

In order to identify barriers and motivations for tap and bottled water consumption, we conducted a questionnaire survey in the Czech Republic. The questionnaire included questions that elicited attitudes, norms, perceived barriers, habits, socioeconomic characteristics, consumption behaviour, and values.

Data collection took place 4th October to 8th November 2022. The recruitment of respondents for the survey was carried out by a contractor from an actively managed online access panel, i.e. a panel in which the identity of respondents was verified during recruitment and, where applicable, during the respondent's participation in the panel (e.g. survey questions that check one of the indicators listed in the registration questionnaire, telephone checks or checks on the uniqueness of the bank account number provided), and in which each respondent was controlled to take a maximum of 2 surveys per week, up to a maximum of 36 surveys per year.

Participation in the survey posed a risk to respondents comparable to normal internet surfing. The questionnaire survey did not ask controversial questions or questions that would be traumatic for the respondents to answer. The questionnaires were anonymous. The panel operator assigned a random identification number to the respondent at the beginning of the questionnaire, and only this random identification number is available to the researchers analysing the survey data. Respondents gave informed consent before participating in the survey. The ethical approval was obtained from the Institutional Review Board of the Charles University Environment Centre (Number 1/2022).

The sample of respondents was selected by quota sampling with quotas for region, size of place of residence, age, gender, and education. The resulting sample is representative of the Czech population aged 18 to 69 years based on socio-demographic characteristics, see Table 1 in the Appendix.

Table 1. Characteristics of the national sample (final) and target population.

	Set up quotas (%)	Proportion in the sample (%)	Chi-square test
Gender			
male	51	51	0.908
female	49	49	
other	-	0	
Age			
18-34 y.o.	28	27	0.168
35-50 y.o.	37	37	
51-69 y.o.	35	36	
Region			
Prague	13	13	1.000
Central Bohemia	13	13	
South Bohemia	6	6	
Pilsen	6	6	

Karlovy Vary	3	3	
Ústí nad Labem	7	7	
Liberec	4	4	
Hradec Králové	5	5	
Pardubice	5	5	
Vysočina	5	5	
South Moravian	11	11	
Olomouc	6	6	
Zlín	5	5	
Moravian-Silesian	11	11	
Education			
primary and lower secondary	42	41	0.747
upper secondary	37	37	
tertiary	21	21	
Size of place of residence			
Up to 4 999	40	40	0.930
5 000 - 49 999	30	30	
Over 50 000	30	30	

Note: *Sources for setting the national quotas*: Czech Statistical Office (2021). Population and Housing Census.

In the data cleaning process, incomplete records, records with logical inconsistencies, and „speeders", i.e. questionnaires below 48% of the median completion time (217 questionnaires in total), were discarded. The pilot survey was conducted approximately one week before the main data collection, with approximately 200 valid observations. The final total number of valid questionnaires in the dataset is 3411.

2.2. Measures

In this section, we describe the questions and response scales utilised to construct variables used in our models.

Bottled and tap water consumption was recorded as frequency of consumption. Respondents answered the questions "How often do you personally drink tap water (water from the public tap)?" and "How often do you drink bottled water (sparkling or still, flavoured or unflavoured, mineral, drinking, spring, or baby water)?" and had a total of 6 choices indicating the extent of their consumption ("Several times a day," "Once a day," "Several times a week," "Several times a month," "Less frequently," and "Never").

The variable "taste" was measured by letting respondents indicate either the option "Bad taste" for the question "For what reasons do you not drink tap water, or do you drink it infrequently?" or "Taste" for the question "What are your reasons for drinking bottled water?". Health concern was measured using identical questions to "taste", i.e. when respondents reported having health concerns about tap water (response options "Health concern" or "The water in our house is defective") or perceiving bottled water to be beneficial to their health (response options "It is healthier than tap" or "Safety"). The question "For what reasons do you not drink tap water, or do you drink it infrequently?" was close-ended with a response option "Other", which was followed by an open-ended question allowing to provide further reasons. The responses to the open-ended question were coded and counted. The percentages in Figure 2 include also responses to the open-ended question.

The habit of drinking tap water was constructed based on the question "How often do the following situations happen to you?" which takes into account respondents' answers to only the following two statements: "If tap water is available, I prefer it to bottled water without thinking." and "I drink tap water automatically." [29]. The frequency of situations was measured on a 7-point Likert scale, where 1 represented "Rarely" and 7 represented "Very often." The resulting variable was created by adding two items (statements) and dividing them by the appropriate number (in this case two). The internal consistency of the scale was measured using Cronbach's alpha and has a value of 0.80,

which is a result above 0.70 and indicates good scale consistency [27]. The calculated value indicates the average of the scores on the items included in the scale.

Environmental concern was measured by incorporating several statements related to biospheric values [30]. Participants were presented with descriptions of some people and were asked to evaluate how similar the persons described are to them ("It is important to him/her to…"" …prevent pollution", "…live in harmony with nature", "…protect the environment"). Responses to these are measured by a Likert scale containing six points ranging from one ('Not at all like me') to six ('Very much like me') [31]. The variable was constructed as in the previous case (Cronbach's α=0.88).

The construct called behavioural beliefs in the TPB [24] is labelled "attitudesf" in our regression models to shorten the variable name. The variable "attitudesf" was constructed by multiplying measures of behavioural belief strength by their corresponding measures of evaluation and by averaging the multiplication products (Cronbach's α=0.74). The behavioural belief strength was measured using a seven-point Likert scale with response anchors "Strongly Disagree" and "Strongly Agree". The following statements were used: "If I drink mostly tap water for the next 3 months…": …I will save money on bottled water, …I will save time shopping and taking plastic bottles to the dumpster, …I will have a mineral deficiency, …I will get much less microplastics into my body, …I will get harmful substances from chlorinating water, …I will drink fresh water. Evaluations of beliefs were also measured using a Likert scale format, but with a rating of 1 indicating "Very Bad" and a 7 indicating "Very Good" in response to the question "How good or bad do you think these situations are?". Not all situations presented to respondents were in the same direction, so reverse coding was needed in some cases.

The construct of normative beliefs [24] was measured as a combination of a question to elicit injunctive normative belief strength ("Do the following people think you should drink mostly tap water over the next 3 months?" with items "My parents", "My spouse", "My children", "Good friends") and motivation to comply ("To what extent do you care about what the following people think you should do?" with the same items). In both cases, a seven-point Likert scale was used. For the injunctive normative belief strength, response anchors are "Definitely not" and "Definitely yes". For the motivation to comply, response anchors are "I don't care at all" and "I care a lot". The variable "norm" was constructed by multiplying the injunctive normative belief strength by the motivation to comply and by averaging the multiplication products. The internal consistency was acceptable (Cronbach's α=0.78).

The construct of control beliefs is composed of control belief strength and power of control factor [24]. To measure the control belief strength, participants reported on frequency with which they face barriers to getting tap water when on-the-go (question: "How often do the following situations happen to you?"; statements: "In restaurants or cafes, it is not possible to order tap water"; "At petrol stations, it is not possible to turn on or buy tap water."; "In public places, it is not possible to turn on tap water".; scored 1 = "Rarely" and 7 ="Very often"). To elicit the power of control factor, respondents were asked how much they agreed or disagreed with the following statements: "Drinking mostly tap water over the next 3 months will be easier for me…" "… if it can be ordered at more restaurants and cafes", "… if it can be bought at petrol stations in own bottle and its price is lower than price of bottled water", and "… if there are more drinking fountains in public places". A 7-point Likert scale with a rating of one corresponding to "Strongly disagree" and a rating of seven corresponding to "Strongly agree" was utilised. The variable "behave control" was constructed in an identical manner to variable "norm" and "attitudesf" (Cronbach's alpha α=0.75).

Respondents were asked to rate the statements related to the TPB in context of the possibility they will predominantly (90%) drink tap water over the next three months, either in general or outside the home, in case their households are not connected to a public water supply.

Quota and several socio-demographic questions were also included in the questionnaire. In the regression models, we use dummy variables for gender, age, education, income, employment status, marital status, and number of household members. In our sample, 49% of participants are female and 51% male. There was also an option "Other" as the preferred gender. Only 0.12% of the respondents gave this answer, therefore this category is merged together with the female gender. Respondents

were asked to indicate their age in years. The median age of the participants was 45 years. Survey participants were also asked for their highest level of education, choosing from a list of 11 possible levels. To compare groups, age was divided into three categories: younger people (18 to 34 years old), middle-aged (35 to 50 years old) and older people (51 years old and above). Education was also divided into three categories: primary and lower secondary (maximum of vocational secondary without a high school diploma), secondary (those who had not reached higher education than grammar school) and tertiary (education level higher than grammar school), see Table 1 in the Appendix.

The income was measured as the respondent's total net monthly household income from all sources after deducting taxes and levies using 12 income categories, ranging from "Less than 13,000 CZK" to "More than 70,000 CZK", and options "Don't know" or "Don't want to answer". To create continuous variable, we assigned the midpoint of each income category to all observations in that category. We computed per capita adjusted household income by dividing this continuous variable by the respective number of household members. As the per capita adjusted household income was not significant in the regression models, we present only models with dummy income variables in this paper. Dummy income variables were created by recoding per capita adjusted household categories. Three categories were created: income per household member less than or equal to 12,250 CZK (low income), income greater than 12,250 CZK and less than or equal to 21,000 CZK (medium), and income higher than 21,000 CZK (high). The fourth dummy variable was created for missing information on income.

To measure the employment status, 10 options were offered in the survey. The employment status was categorized as follows: working (full-time, part-time and self-employed), unemployed (unemployed, retired, studying or disabled) and at home (maternity leave, full-time caring). In our sample, the most represented were full-time employed (50%) and retired (15%).

Respondents were asked to mark one of seven marital status categories or "Don't want to answer". Most of respondents are married (43%). Again, 3 categories were constructed for modelling. The first category represents people who are not single (married, in a partnership or living together without being married), the second is single (single and never been in a formal relationship), and the third category is lost partner (people who are widowed, divorced or separated from their partner).

Survey participants were also asked to state the number of household members, including themselves. Most of them (34%) lived in a two-person household. Those who indicated a household size of 2 or more were also asked about the number of children under the age of 18 and retired persons in their household. The most common number was 1 child (20%) or 1 retiree (25%) in the respondent's household.

3. Results

3.1. Frequency and Reasons for Drinking Tap and Bottled Water

The majority of Czechs drink tap water several times a day (75%). Only 6% once a day, 7% several times a week, 2% several times a month, 7% less often than several times a month and 3% never drink tap water (see Figure 1). Regarding the reasons why people do not drink tap water or drink it infrequently, the main reason given by 42% respondents is that it tastes bad (see Figure 2). Other frequently cited reasons included the lack of connection to a water supply (21%), water being too soft or hard (19%) and health concern (15%). Only 2% of participants expressed health problems from drinking and 1% cited higher water temperature as a reason for not drinking tap water.

How often do you personally drink tap water (water from the public tap)?
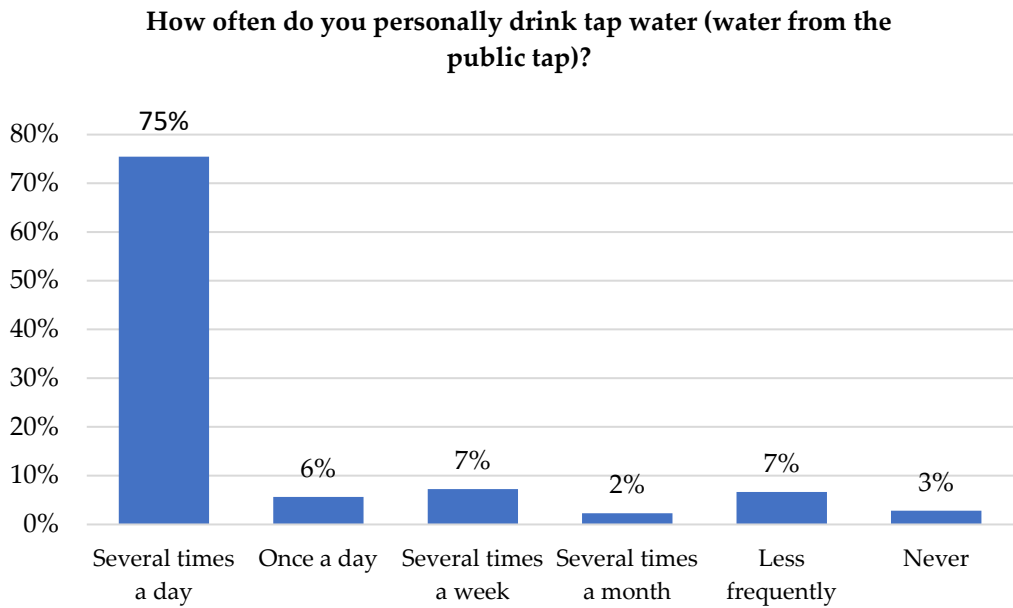
Figure 1. Percentages of frequency of drinking tap water (water from the public tap) among respondents (N = 3411).

For what reasons do you not drink tap water, or do you drink it infrequently?
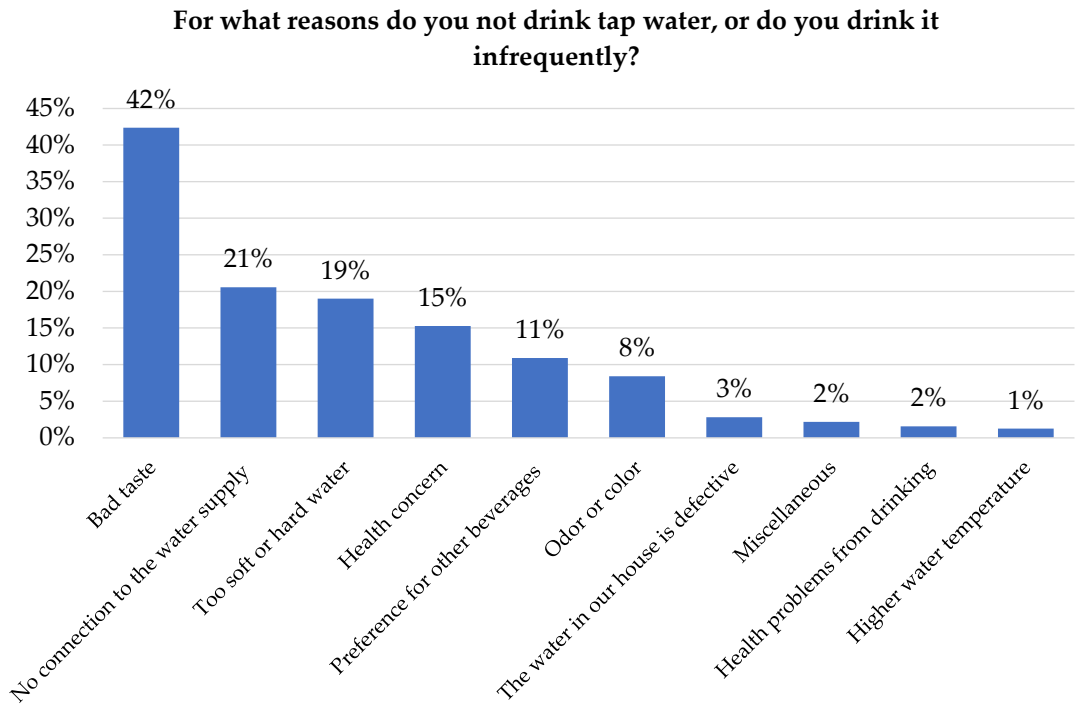

Figure 2. Percentages of respondents who stated reasons for not drinking tap water or drinking it infrequently (N=321; only respondents who never drink tap water or drink it less often than several times a month).

Bottled water (sparkling or still, flavoured or unflavoured, mineral, drinking, spring or baby water) was consumed several times a day by 21% of the participants, once a day by 7%, several times a week by 19%, several times a month by 21%, less frequently by 27% and never by only 4% (see Figure 3). The main reasons given by respondents for drinking bottled water were the unavailability of tap water (40%), its taste (32%) and its effervescence or mineral content (27%) (see Figure 4).

How often do you drink bottled water (sparkling or still, flavored or unflavored, mineral , drinking, spring, or baby water)?
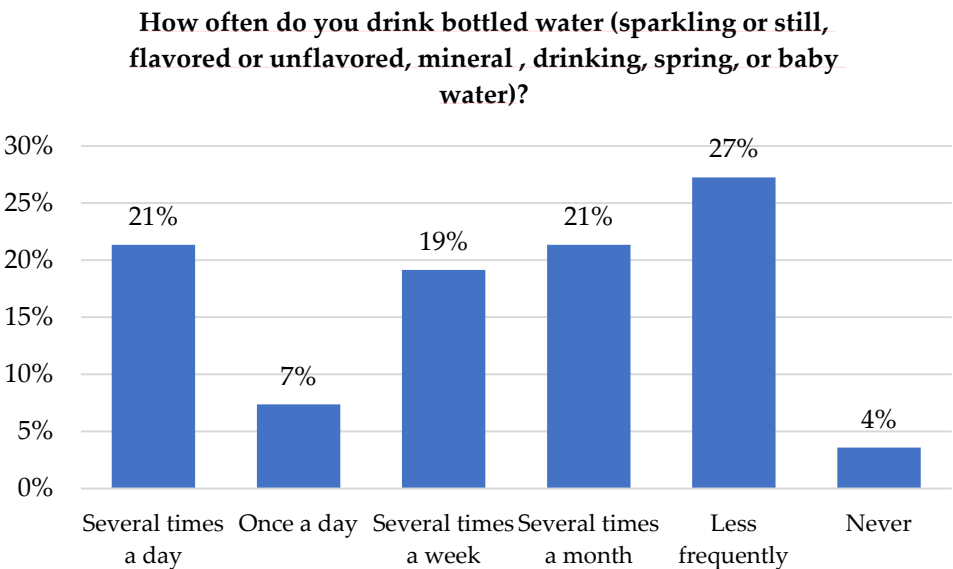
Figure 3. Percentages of frequency of drinking bottled water among respondents (N = 3411).

What are your reasons for drinking bottled water?
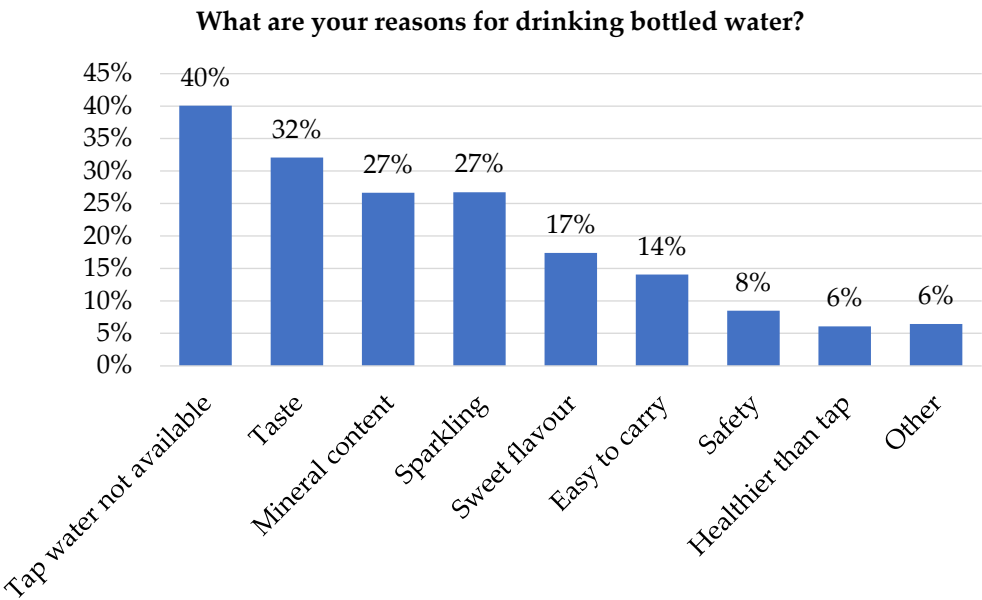
Figure 4. Percentages of respondents who stated reasons for drinking bottled water (N=3289; only respondents who drink bottled water at least sometimes).

While 42% of the respondents drank 7 to 13 litres of tap water in the past 7 days (i.e. on average 1 to less than 2 litres per day), and 29% drank 14 litres or more (i.e. on average 2 litres or more per day), the consumption of bottled water in the same period was zero for more than half of the people (of those who drink tap or bottled water at least several times a week). The most frequent category of bottled water consumed by people who drink it at least a few times a week was 24% mineral and

functional unflavoured water and 20% mineral and functional flavoured water, in quantities of 1 to 2 litres per week.

Bottled lemonades, juices, fruit and vegetable juices, nectars, energy drinks and iced teas were drunk several times a day by 7% of people, once a day by 6%, several times a week by 18%, several times a month by 26% and even less frequently by 35%. A total of 8% of the participants never drink these types of beverages. Respondents reported drinking juice, nectar and juice most often (54% in the week, 47% in the 30 days) and least often energy drinks and iced teas (27% in the week, 17% in the 30 days), in quantities of 1 to 2 litres, both in the past week (those who consumed drinks at least several times a week) and 30 days (others who reported consuming drinks at least several times a month).

3.2. Habit, Normative, Behavioural and Control Beliefs in Relation to Drinking Tap Water

Habit, normative, behavioural and control beliefs, and rate of connection to public water supply are described in detail in what follows.

Habit

The survey shows that drinking tap water is a habitual behaviour for between 31% and 41% of respondents. Specifically, 41% of respondents drink tap water very often automatically and 31% claim that very often prefer tap water to bottled water without thinking, when tap water is available.

Normative beliefs

In terms of normative beliefs, the proportion of respondents who perceive social pressure to drink tap water slightly outweighs those who perceive that they should not drink it. At the same time, approximately one third of respondents perceive no social pressure in this regard. Specifically, 39% of respondents expressed the view that most people who are important to them think that they should drink mostly tap water in the next 3 months. This compares to 8% of respondents who said that most people think they should not drink it. Similarly, 37% of respondents think people who are important to them drink mostly tap water (compared to 13% who think people who are important to them do not drink tap water). However, perceptions of the norm differ significantly for drinking tap water outside the home, where the norm of drinking mostly tap water is perceived more weakly and there is a higher proportion of neutral responses.

Behavioural Beliefs

Over half of respondents believed that if they drank mostly tap water over the next 3 months they would save money on bottled water (54% strongly agreed). Furthermore, they would save time buying and taking plastic bottles to the bin (strongly agreed by 47%) and reduce environmental pollution (strongly agreed by 38%). In all the mentioned cases, those who would drink tap water away from home also expressed their opinion in the same or very similar percentage (see Figure 5). People reported that they would miss the taste of sugary lemonade or sparkling water (31% strongly disagreed) and would not like the taste of water (32% strongly disagreed) as the least disadvantages of the idea of drinking tap water in the next 3 months. Even for these statements, there were no significant differences between those who would consume tap water outside the home.
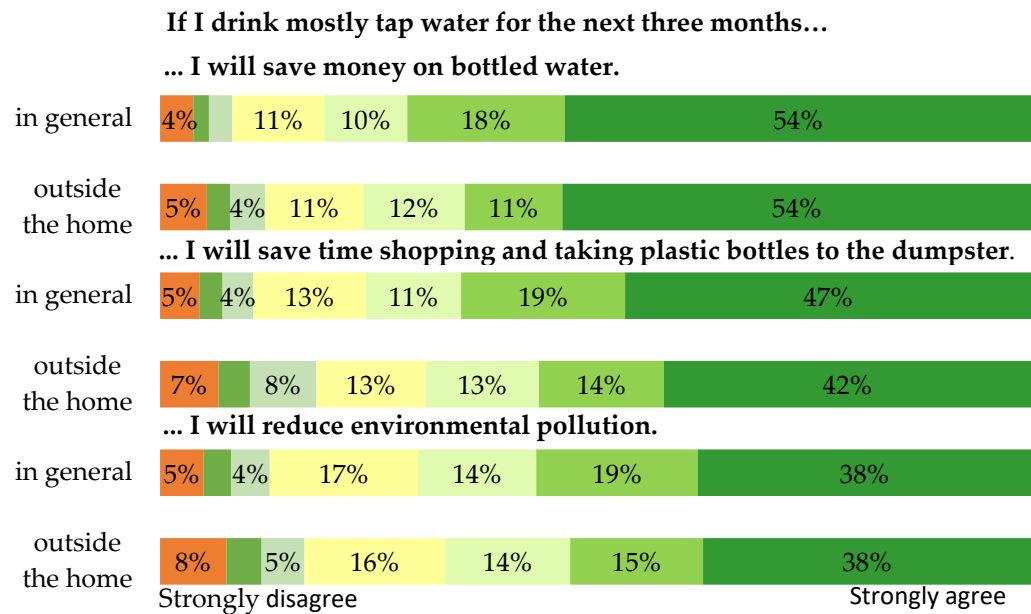
If I drink mostly tap water for the next three months…

… I will save money on bottled water.

in general	4%	11%	10%	18%	54%
outside the home	5% 4%	11%	12%	11%	54%

… I will save time shopping and taking plastic bottles to the dumpster.

in general	5% 4%	13%	11%	19%	47%
outside the home	7%	8%	13%	13%	14%	42%

… I will reduce environmental pollution.

in general	5% 4%	17%	14%	19%	38%
outside the home	8% 5%	16%	14%	15%	38%

Strongly disagree   Strongly agree

Figure 5. Level of agreement or disagreement with statements about the consequences of drinking mostly tap water during the next 3 months, in percent (N = 3411).

Control Beliefs

Almost two thirds generally agreed with the statement that it was up to them to drink mostly tap water and over half were confident that they could drink mostly tap water if they wanted to over the next 3 months. Of respondents not connected to a public water supply, just over half (53%) strongly agreed that it was up to them to drink mostly tap water outside the home and 40% thought it was possible if they wanted to.

More drinking fountains in public places would make it easier for 44% of respondents to drink tap water. If tap water could be ordered in more restaurants and cafes, this would make it easier for 40% of respondents to drink tap water. Almost the same proportion of respondents would find it easier to drink tap water if it could be bought at petrol stations in its own bottle and its price was lower than bottled water.

Household Connection to Public Water Supply

As expected, household connection to the public water supply is not a barrier to drinking tap water for most people. In the questionnaire, 93% of respondents indicated that their household is connected to a public water supply, which is broadly in line with the data from 2020, when 10.13 million inhabitants in the Czech Republic, i.e. 94.6% of the total population, were supplied from water supply systems [28]. Only 16% of respondents have some purification devices (filters) for tap water at home.

3.3. Factors Explaining Bottled and Tap Water Drinking

In this section, we identify segments of the population that drink bottled or tap water more or less often. We merged the underrepresented categories of the variables frequency of drinking of bottled and tap water (see Figure 3), so that the explained variables have 4 categories: 1) Never or seldom, 2) Several times a month, 3) Several times a week or once a day, 4) Several times a day (see Figure 1). Several variables did not meet the assumptions of the ordinal logit model, therefore a generalized ordinal logit model (partial restriction) was used. Since many researchers still choose the multinomial logit model (unconstrained model) if the assumption of parallelism of the curves is violated, this model was used for robustness checking. The constructs of the theory of planned behaviour and habit, which enter the model as independent variables, were checked for internal

consistency with the help of factor analysis, Cronbach's alpha and McDonald's omega. Based on the above models, several relationships between the independent variables and frequencies of bottled and tap water consumption were revealed, and those that emerged as statistically most significant are further elaborated below. Results from the multinomial logit model estimation are shown in the Appendix in Tables 4 and 7. Results from the generalized ordinal logit model estimation can be seen in the Appendix in Tables 2 and 5, with marginal effects in Tables 3 and 6, and graphic depiction in Figures 6 to 10.

Table 2. Generalized ordinal logit model explaining the frequency of drinking bottled water (1 = never or seldom; 2 = several times a month; 3 = several times a week or once a day; 4 = several times a day).

	Never or seldom (1 vs. 2,3,4)			Several times a month (1,2 vs. 3,4)			Several times a week or once a day (1,2,3 vs. 4)		
	koef.	s.e.		koef.	s.e.		koef.	s.e.	
woman	0,026	(0,085)		-0,003	(0,082)		0,255	(0,099)	**
man				reference	group				
primary and lower secondary	-0,148	(0,091)		0,174	(0,086)	**	0,071	(0,102)	
secondary				reference	group				
tertiary	-0,220	(0,089)	**	-0,220	(0,089)	**	-0,220	(0,089)	**
age 18-34	0,235	(0,11)	**	-0,096	(0,102)		-0,411	(0,122)	***
age 35-50				reference	group				
age 51 and older	-0,105	(0,093)		-0,105	(0,093)		-0,105	(0,093)	
inc less than or equal 1.225 CZK	-0,077	(0,091)		-0,077	(0,091)		-0,077	(0,091)	
inc more than 1.225 CZK or equal 2.1 CZK				reference	group				
inc higher than 2.1 CZK	0,075	(0,109)		-0,020	(0,104)		0,243	(0,123)	**
income missing	-0,107	(0,099)		-0,107	(0,099)		-0,107	(0,099)	
working	0,230	(0,091)	**	0,230	(0,091)	**	0,230	(0,091)	**
athome	-0,050	(0,156)		-0,050	(0,156)		-0,050	(0,156)	
unemployed				reference	group				
notsingle	0,082	(0,106)		0,011	(0,1)		0,146	(0,115)	
lostpartner	-0,092	(0,123)		-0,092	(0,123)		-0,092	(0,123)	
single				reference	group				
retired household members	-0,068	(0,068)		0,042	(0,067)		0,194	(0,075)	**
children in household	-0,052	(0,061)		-0,052	(0,061)		-0,052	(0,061)	
enviroconcern	0,039	(0,025)		0,039	(0,025)		0,039	(0,025)	
taste	1,250	(0,109)	***	0,905	(0,086)	***	0,812	(0,098)	***
healthconcern	0,933	(0,105)	***	0,933	(0,105)	***	0,933	(0,105)	***
attitudesf	-0,024	(0,004)	***	-0,024	(0,004)	***	-0,024	(0,004)	***
norms	-0,004	(0,004)		-0,007	(0,004)	*	-0,026	(0,005)	***
behave control	0,010	(0,003)	***	0,010	(0,003)	***	0,010	(0,003)	***
taphabit	-0,308	(0,028)	***	-0,403	(0,026)	***	-0,464	(0,029)	***
constant	2,450	(0,229)	***	1,953	(0,217)	***	0,766	(0,232)	***

Significance levels: p < 0,1; * p < 0,05; ** p < 0,01; ***

Number of observations	3411
LR chi2(39)	1341,5
Prob > chi2	0,00
Pseudo R2	0,14
Log-likelihood	-4015,74

Table 3. Marginal effects from the generalized ordinal logit model for the frequency of drinking bottled water.

	Never or seldom		Several times a month		Several times a week or once a day		Several times a day	
	me	s.e.	me	s.e.	me	s.e.	me	s.e.
woman	-0,005 (0,016)		0,006 (0,016)		-0,034 (0,018) *		0,033 (0,013) **	
primary and lower secondary	0,028 (0,018)		-0,072 (0,017) ***		0,034 (0,019) *		0,009 (0,013)	
tertiary	0,043 (0,018) **		0,012 (0,004) ***		-0,028 (0,012) **		-0,027 (0,01) **	
age 18-34	-0,043 (0,02) **		0,067 (0,021) ***		0,026 (0,022)		-0,050 (0,014) ***	
age 51 and older	0,020 (0,018)		0,006 (0,005)		-0,013 (0,011)		-0,013 (0,012)	
inc less than or equal 1.225 CZK	0,015 (0,018)		0,004 (0,005)		-0,009 (0,011)		-0,010 (0,011)	
inc higher than 2.1 CZK	-0,014 (0,02)		0,019 (0,021)		-0,038 (0,022) *		0,033 (0,017) *	
income missing	0,021 (0,02)		0,006 (0,005)		-0,013 (0,013)		-0,013 (0,012)	
working	-0,044 (0,018) **		-0,013 (0,005) ***		0,028 (0,011) **		0,029 (0,011) **	
athome	0,010 (0,03)		0,003 (0,009)		-0,006 (0,019)		-0,006 (0,02)	
notsingle	-0,016 (0,02)		0,013 (0,018)		-0,016 (0,02)		0,019 (0,014)	
lostpartner	0,018 (0,024)		0,005 (0,006)		-0,011 (0,016)		-0,012 (0,015)	
retired household members	0,013 (0,013)		-0,024 (0,011) **		-0,014 (0,013)		0,025 (0,01) **	
children in household	0,010 (0,012)		0,003 (0,004)		-0,006 (0,007)		-0,007 (0,008)	
enviroconcern	-0,007 (0,005)		-0,002 (0,001)		0,005 (0,003)		0,005 (0,003)	
taste	-0,211 (0,015) ***		-0,011 (0,018)		0,106 (0,02) ***		0,116 (0,015) ***	
healthconcern	-0,147 (0,013) ***		-0,077 (0,011) ***		0,074 (0,006) ***		0,151 (0,021) ***	
attitudesf	0,005 (0,001) ***		0,001 (0) ***		-0,003 (0,001) ***		-0,003 (0,001) ***	
norms	0,001 (0,001)		0,001 (0,001)		0,002 (0,001) *		-0,003 (0,001) ***	
behave control	-0,002 (0,001) ***		-0,001 (0) ***		0,001 (0) ***		0,001 (0) ***	
taphabit	0,059 (0,005) ***		0,042 (0,005) ***		-0,041 (0,006) ***		-0,060 (0,004) ***	

Significance levels: p < 0,1; * p < 0,05; ** p < 0,01; ***

Table 4. Multinomial logit results for the frequency of drinking bottled water, reference category = several times a day.

	Never or seldom			Several times a month			Base category		Several times a week or once a day		
	koef.	s.e.		koef.	s.e.				koef.	s.e.	
woman	0,153	(0,106)		0,012	(0,112)				0,368	(0,116)	***
man							reference	group			
primary and lower secondary	-0,109	(0,113)		-0,423	(0,121)	***			-0,140	(0,122)	
secondary							reference	group			
tertiary	0,087	(0,135)		0,077	(0,137)				-0,424	(0,162)	***
age 18-34	-0,187	(0,137)		0,112	(0,136)				-0,330	(0,145)	**
age 35-50							reference	group			
age 51 and older	0,138	(0,139)		-0,151	(0,15)				-0,118	(0,152)	
inc less than or equal 1.225 CZK	0,122	(0,135)		-0,036	(0,145)				-0,004	(0,149)	
inc more than 1.225 CZK or equal 2.1 CZK							reference	group			
inc higher than 2.1 CZK	0,088	(0,139)		0,167	(0,145)				0,416	(0,151)	***
income missing	0,023	(0,15)		0,249	(0,153)				-0,103	(0,168)	
working	-0,353	(0,136)	**	0,032	(0,146)				0,065	(0,147)	
athome	-0,208	(0,241)		0,237	(0,245)				-0,167	(0,257)	
unemployed							reference	group			
notsingle	0,183	(0,138)		0,167	(0,14)				0,422	(0,144)	***
lostpartner	0,348	(0,184)	*	0,225	(0,199)				0,327	(0,199)	*
single			***				reference	group			
retired household members	0,104	(0,094)		0,080	(0,102)				0,263	(0,1)	***
children in household	0,106	(0,096)		0,111	(0,097)				-0,027	(0,106)	
enviroconcern	-0,039	(0,037)		-0,014	(0,04)				0,018	(0,04)	
taste	-1,290	(0,124)	***	-0,206	(0,112)	*			0,437	(0,112)	***
healthconcern	-0,890	(0,188)	***	-0,426	(0,176)	**			0,609	(0,137)	***
attitudesf	0,029	(0,006)	***	0,026	(0,007)	***			-0,009	(0,007)	
norms	-0,001	(0,005)		-0,002	(0,005)				-0,028	(0,006)	***
behave control	-0,013	(0,005)	***	-0,006	(0,005)				0,005	(0,006)	
taphabit	0,302	(0,035)	***	0,223	(0,037)	***			-0,306	(0,034)	***
constant	-1,577	(0,302)	***	-1,945	(0,321)	***			0,830	(0,31)	***

Significance levels: p < 0,1; * p < 0,05; ** p < 0,01; ***

Number of observations	3411
LR chi2(39)	1354,24
Prob > chi2	0,00
Pseudo R2	0,14
Log-likelihood	-4009,37

Table 5. Generalized ordinal logit model explaining the frequency of drinking tap water (1 = never or seldom; 2 = several times a month; 3 = several times a week or once a day; 4 = several times a day).

	Never or seldom (1 vs. 2,3,4)			Several times a month (1,2 vs. 3,4)			Several times a week or once a day (1,2,3 vs. 4)		
	koef.	s.e.		koef.	s.e.		koef.	s.e.	
woman	-0,209	(0,151)		0,077	(0,134)		0,286	(0,103)	***
man		reference			group				
primary and lower secondary	-0,431	(0,145)	***	-0,131	(0,13)		-0,069	(0,106)	
secondary		reference			group				
tertiary	0,176	(0,135)		0,176	(0,135)		0,176	(0,135)	
age 18-34	0,470	(0,125)	***	0,470	(0,125)	***	0,470	(0,125)	***
age 35-50		reference			group				
age 51 and older	-0,809	(0,184)	***	-0,349	(0,165)	**	0,155	(0,133)	
inc less than or equal 1.225 CZK	-0,268	(0,124)	**	-0,268	(0,124)	**	-0,268	(0,124)	**
inc more than 1.225 CZK or equal 2.1 CZK		reference			group				
inc higher than 2.1 CZK	-0,148	(0,126)		-0,148	(0,126)		-0,148	(0,126)	
income missing	-0,780	(0,196)	***	-0,314	(0,179)	*	0,098	(0,147)	
working	-0,318	(0,18)	*	-0,011	(0,167)		0,116	(0,13)	
athome	-0,959	(0,292)	***	-0,514	(0,269)	*	0,128	(0,226)	
unemployed		reference			group				
notsingle	0,319	(0,179)	*	0,088	(0,167)		-0,119	(0,131)	
lostpartner	0,637	(0,246)	**	0,276	(0,226)		0,032	(0,177)	
single		reference			group				
retired household members	-0,254	(0,125)	**	-0,033	(0,114)		-0,008	(0,087)	
children in household	0,081	(0,088)		0,081	(0,088)		0,081	(0,088)	
enviroconcern	0,059	(0,047)		0,094	(0,043)	**	-0,035	(0,036)	
taste	-0,853	(0,141)	***	-0,886	(0,127)	***	-0,575	(0,099)	***
healthconcern	-0,871	(0,115)	***	-0,871	(0,115)	***	-0,871	(0,115)	***
attitudesf	0,034	(0,009)	***	0,019	(0,008)	**	0,030	(0,006)	***
norms	0,017	(0,005)	***	0,017	(0,005)	***	0,017	(0,005)	***
behave control	0,002	(0,005)		0,002	(0,005)		0,002	(0,005)	
taphabit	0,540	(0,029)	***	0,540	(0,029)	***	0,540	(0,029)	***
constant	0,060	(0,369)		-0,691	(0,332)	**	-2,201	(0,276)	***

Significance levels: p < 0,1; * p < 0,05; ** p < 0,01; ***	
Number of observations	3411
LR chi2(39)	1194,32
Prob > chi2	0,00
Pseudo R2	0,22
Log-likelihood	-2078,13

Table 6. Marginal effects from the generalized ordinal logit model for the frequency of drinking tap water.

	Never or seldom		Several times a month		Several times a week or once a day		Several times a day	
	me s.e.		me s.e.		me s.e.		me s.e.	
woman	0,007 (0,005)		-0,011 (0,004)	***	-0,038 (0,013)	***	0,042 (0,015)	***
primary and lower secondary	0,016 (0,005)	***	-0,009 (0,004)	**	0,003 (0,013)		-0,010 (0,016)	
tertiary	-0,006 (0,004)		-0,003 (0,002)		-0,016 (0,012)		0,025 (0,018)	
age 18-34	-0,015 (0,004)	***	-0,007 (0,002)	***	-0,042 (0,011)	***	0,064 (0,016)	***
age 51 and older	0,032 (0,008)	***	-0,013 (0,005)	**	-0,041 (0,015)	***	0,022 (0,019)	
inc less than or equal 1.225 CZK	0,010 (0,005)	**	0,005 (0,002)	**	0,026 (0,013)	**	-0,041 (0,02)	**
inc higher than 2.1 CZK	0,005 (0,005)		0,003 (0,002)		0,014 (0,012)		-0,022 (0,019)	
income missing	0,036 (0,012)	***	-0,018 (0,006)	***	-0,032 (0,016)	**	0,014 (0,02)	
working	0,011 (0,006)	*	-0,010 (0,005)	**	-0,018 (0,016)		0,017 (0,019)	
athome	0,050 (0,021)	**	-0,017 (0,011)		-0,050 (0,023)	**	0,018 (0,031)	
notsingle	-0,012 (0,007)	*	0,007 (0,005)		0,022 (0,016)		-0,017 (0,019)	
lostpartner	-0,018 (0,006)	***	0,005 (0,006)		0,009 (0,022)		0,005 (0,025)	
retired household members	0,009 (0,004)	**	-0,007 (0,003)	**	-0,001 (0,011)		-0,001 (0,013)	
children in household	-0,003 (0,003)		-0,001 (0,001)		-0,008 (0,008)		0,012 (0,013)	
enviroconcern	-0,002 (0,002)		-0,003 (0,001)	**	0,010 (0,004)	**	-0,005 (0,005)	
taste	0,035 (0,007)	***	0,019 (0,005)	***	0,036 (0,013)	***	-0,089 (0,016)	***
healthconcern	0,042 (0,008)	***	0,019 (0,004)	***	0,093 (0,014)	***	-0,153 (0,024)	***
attitudesf	-0,001 (0)	***	0,000 (0)		-0,003 (0,001)	***	0,004 (0,001)	***
norms	-0,001 (0)	***	0,000 (0)	***	-0,002 (0)	***	0,002 (0,001)	***
behave control	0,000 (0)		0,000 (0)		0,000 (0)		0,000 (0,001)	
taphabit	-0,019 (0,002)	***	-0,009 (0,001)	***	-0,051 (0,003)	***	0,079 (0,004)	***

Significance levels: p < 0,1; * p < 0,05; ** p < 0,01; ***

Table 7. Multinomial logit results for the frequency of drinking tap water, reference category = several times a day.

	Never or seldom		Several times a month		Base category		Several times a week or once a day	
	koef. s.e.		koef. s.e.				koef. s.e.	
woman	0,239 (0,172)		0,102 (0,277)				0,325 (0,121)	***
man					reference	group		
primary and lower secondary	0,173 (0,177)		-0,146 (0,289)				-0,037 (0,126)	
secondary					reference	group		
tertiary	-0,230 (0,252)		0,137 (0,359)				0,126 (0,162)	
age 18-34	-0,673 (0,226)	***	-0,221 (0,329)				0,170 (0,151)	
age 35-50					reference	group		
age 51 and older	0,750 (0,219)	***	-0,074 (0,374)				0,294 (0,161)	*
inc less than or equal 1.225 CZK	-0,111 (0,219)		-0,225 (0,355)				-0,325 (0,149)	**
inc more than 1.225 CZK or equal 2.1 CZK					reference	group		
inc higher than 2.1 CZK	-0,089 (0,224)		0,488 (0,332)				-0,152 (0,156)	
income missing	0,498 (0,244)	**	-0,196 (0,445)				0,195 (0,182)	
working	0,114 (0,213)		-0,685 (0,341)	**			0,049 (0,153)	
athome	1,152 (0,369)	***	-0,205 (0,581)				0,480 (0,291)	*
unemployed					reference	group		
notsingle	-0,277 (0,211)		0,214 (0,339)				-0,190 (0,154)	
lostpartner	-0,539 (0,285)	*	-0,048 (0,474)				-0,128 (0,207)	
single		***			reference	group		
retired household members	-0,007 (0,139)		-0,455 (0,281)				-0,064 (0,103)	
children in household	-0,097 (0,154)		0,166 (0,205)				0,029 (0,106)	
enviroconcern	-0,149 (0,057)	***	-0,193 (0,091)	**			-0,088 (0,043)	**
taste	0,791 (0,165)	***	0,644 (0,266)	**			-0,252 (0,12)	**
healthconcern	0,666 (0,18)	***	0,313 (0,294)				-0,592 (0,151)	***
attitudesf	0,000 (0,011)		0,044 (0,017)	***			0,036 (0,007)	***
norms	-0,016 (0,009)	*	-0,022 (0,015)				0,011 (0,006)	*
behave control	0,000 (0,008)		-0,005 (0,013)				0,000 (0,006)	
taphabit	-0,261 (0,051)	***	-0,123 (0,079)				0,425 (0,036)	***
constant	0,533 (0,445)		-1,268 (0,713)	*			-1,002 (0,327)	***

Significance levels: p < 0,1; * p < 0,05; ** p < 0,01; ***

Number of observations	3411
LR chi2(39)	1163,37
Prob > chi2	0,00
Pseudo R2	0,22
Log-likelihood	-2093,61

Regarding socio-demographic characteristics, it was found that people with lower education (primary, vocational and high school without high school diploma) drink bottled water more often at least several times a week, and tap water rather never and seldom. On the contrary, people with higher education (higher vocational and higher education) drink bottled water consistently less often, and for tap water, there is no statistical difference compared to the reference group (secondary education with a high school diploma). Women drink both bottled and tap water more likely several times a day.

While younger people aged 18-34 drink bottled water in moderation, i.e. at least several times a month but no more than once a day, they have a consistently higher tap water consumption compared to the middle-aged group. Respondents aged 51 and over have a lower chance of drinking tap water several times a month or less than the middle age group. No significant differences were found in the case of bottled water.

In terms of income, while consumption of bottled water by low-income per household member is not statistically significant, tap water is statistically significantly lower among low-income per household members in all categories compared to the middle-income group. People with a higher income drink more bottled water several times a day, but their tap water consumption was not statistically significant compared to the reference group. Those who did not state their income then have a lower chance of drinking tap water several times a month at most.

There are differences between the employed and the unemployed in bottled water and partly tap water consumption. Employed people drink more bottled water than their counterparts. Comparing those who are at home (e.g. on maternity leave) with the unemployed, such results do not occur, and those who are at home drink tap water are less likely to drink it never and seldom.

Marital status was analysed by comparing people in a relationship and those who had lost a partner with single people as a reference category. While no statistically different consumption was shown for bottled water, in the case of tap water, people who have lost a partner have significantly higher consumption several times a month compared to singles. The number of retired household members was statistically significant, which means a higher chance of drinking bottled water several times a day or, conversely, a lower chance of never or seldom drinking tap water. For the variable number of children present in the household, statistical significance was not demonstrated in the modelling in connection with the consumption of bottled/tap water. Environmental concern is a significant predictor for higher consumption of tap water several times a week or once a day, but this is not the case with bottled water (see Figures 6 and 7).
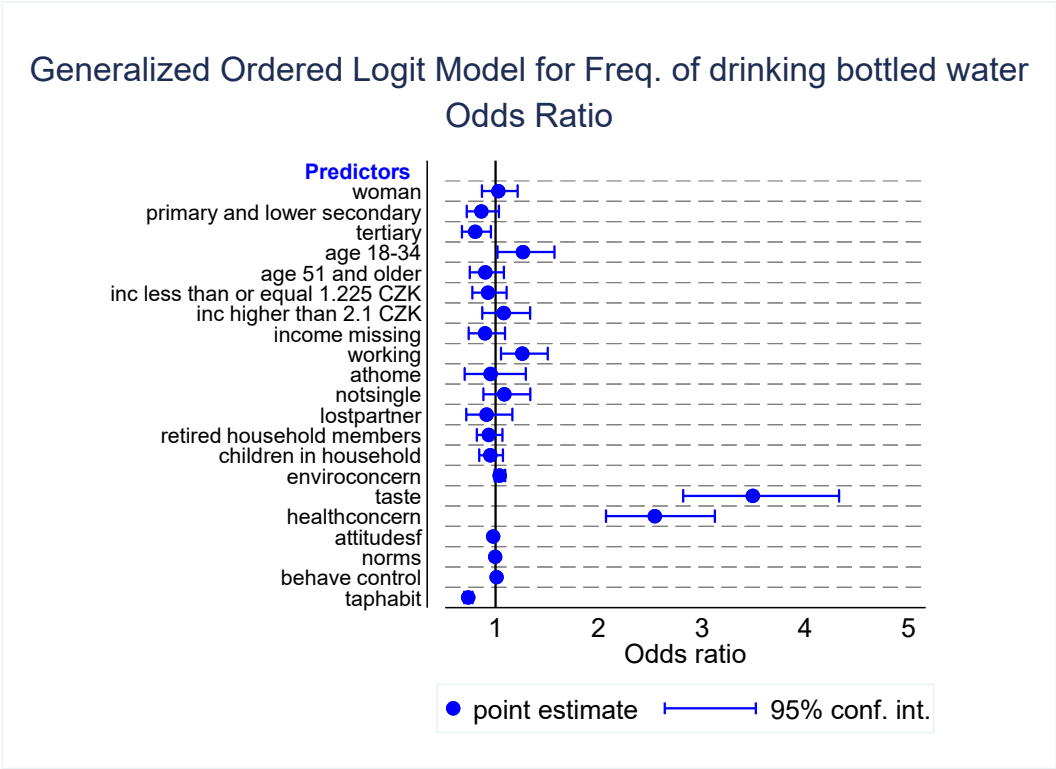
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Figure 6. Odds ratio of predictors for frequency of bottled water consumption (N = 3411).
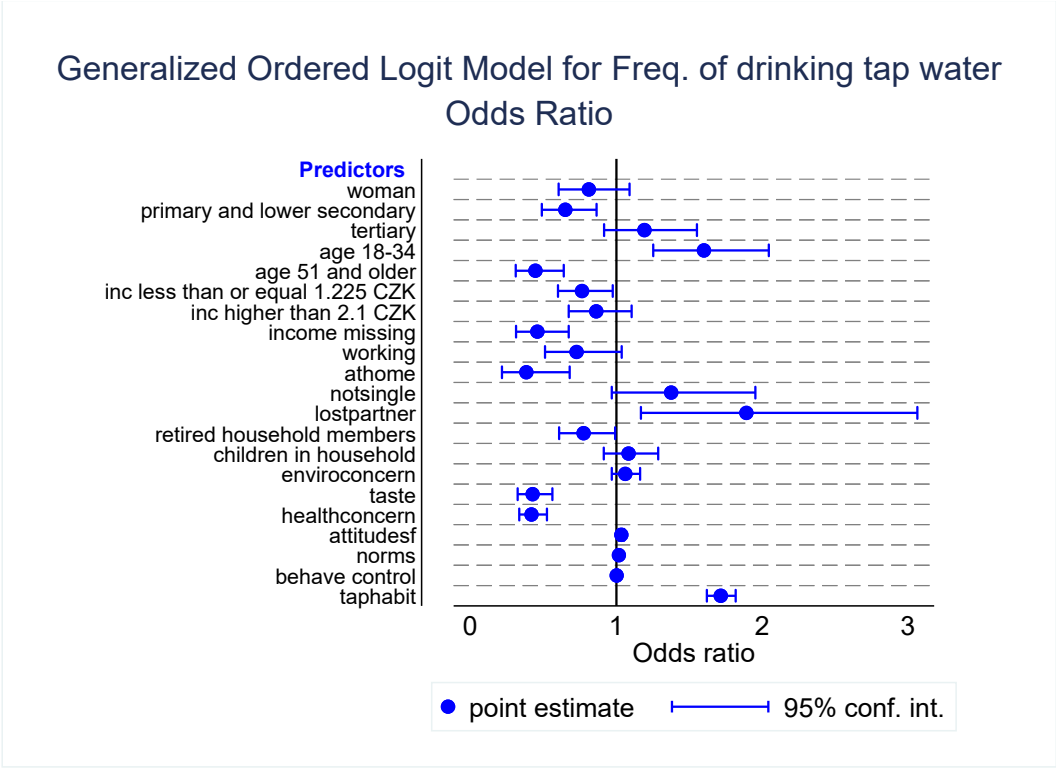

Figure 7. Odds ratio of predictors for frequency of tap water consumption (N = 3411).

Three predictors appear to be relatively the most important both in terms of statistical significance and effect size. These include taste perception, health concern and habit. The perception of the pleasant taste of bottled water or the unpleasant taste of tap water is associated with a significant increase in the consumption of bottled water. Average marginal effects show that variable taste is associated with 22% less likelihood of never or seldom drinking bottled water, nearly 5% more

likely to drink it several times a month, and 7% more likely to drink it at least several times a week or once a day and 10% more likely to consume several times a day.

A high consumption of bottled water is also associated with a negative perception of the healthiness of tap water and a positive perception of the healthiness of bottled water. The average marginal effects show a 17% lower probability of drinking bottled water at most several times a month and an 18% higher probability of drinking at least several times a week. Strong tap water drinking habits were found to be a significant predictor of lower bottled water consumption. Increasing the habit of drinking tap water by one unit is 5% and 2% more likely to consume bottled water never or seldom and several times a month. In contrast, a unit increase in habit corresponds to being 2% and 6% less likely to drink bottled water at least several times a week, once a day, and several times a day, respectively (see Figure 8).
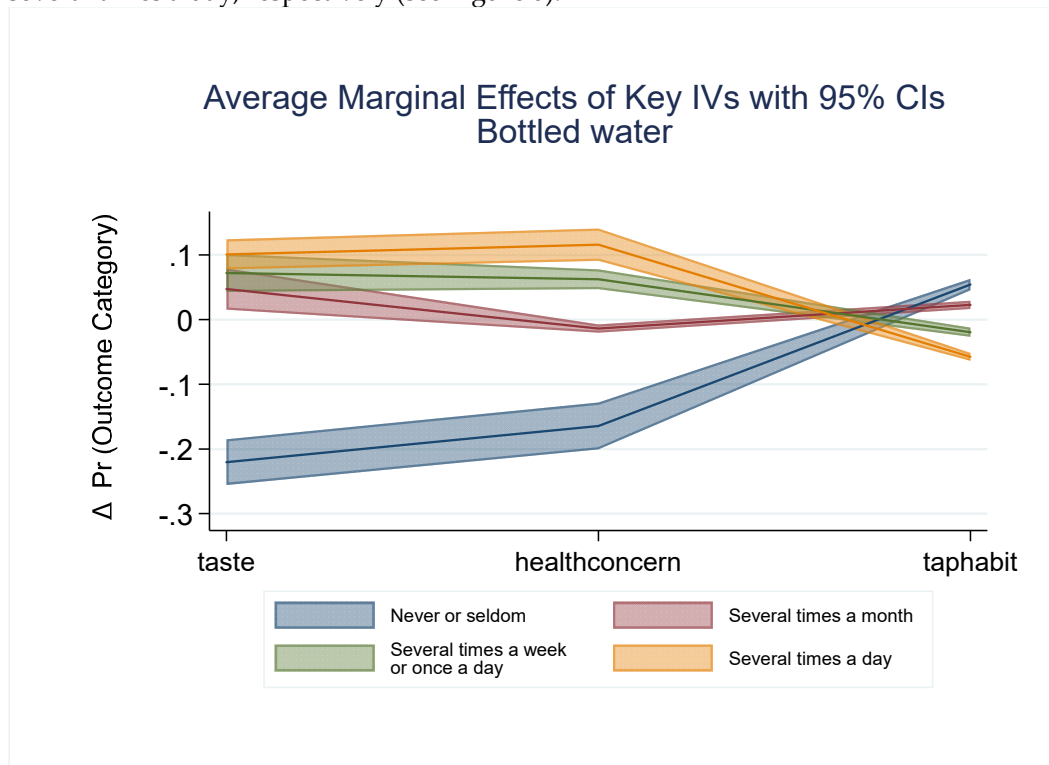
Figure 8. Average marginal effects of key independent variables on bottled water consumption at the 95% confidence level, $\triangle$Pr denotes a change in the probability (N = 3411).

A negative perception of the taste of tap water or a positive perception of the taste of bottled water increases the probability of never drinking tap water or drinking it rarely by 5% and, conversely, decreases it by 7% in the case of consumption several times a day. Having health concerns about tap water or perceiving bottled water as beneficial to one's health is then associated with a total 11% higher probability of drinking tap water at most once a day and, on the other hand, with an 11% lower probability of drinking it several times a day. The habit of drinking tap water is the main predictor of higher tap water consumption. An increase in the habit of drinking tap water by one unit corresponds to a total of 7% less probability of consuming tap water in the categories of never or seldom to several times a week or once a day, and conversely, a 7% higher probability that respondents will drink it several times a day (see Figure 9).
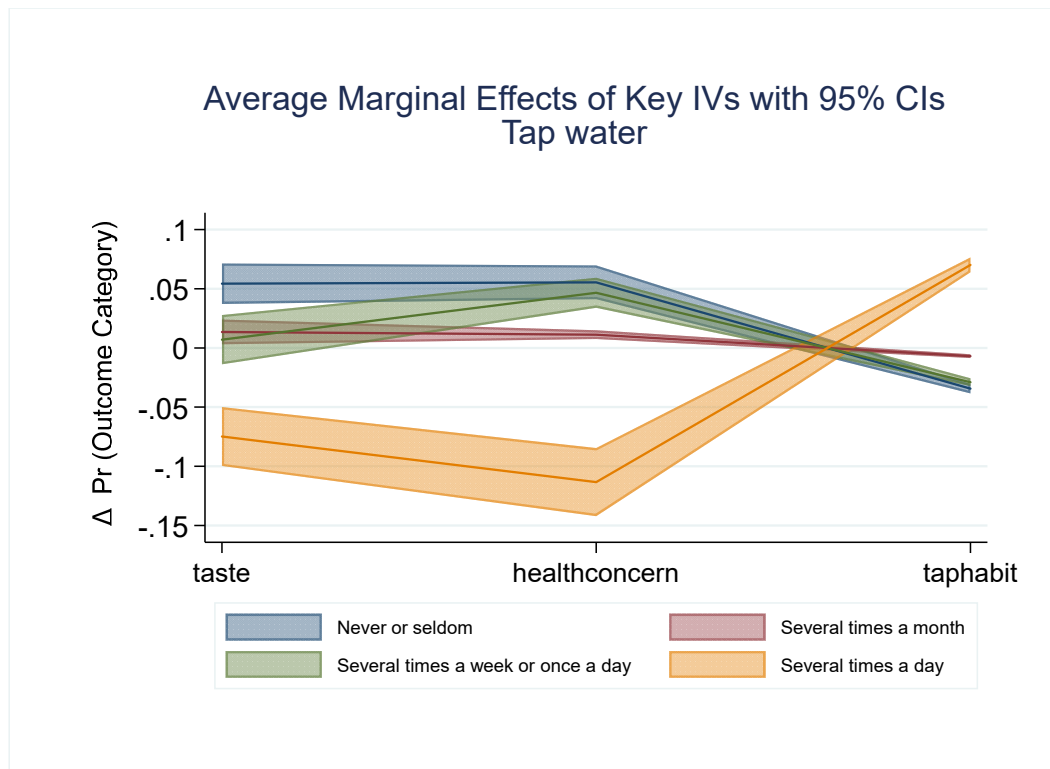
Figure 9. Average marginal effects of key independent variables on tap water consumption at the 95% confidence level, △Pr denotes a change in the probability (N = 3411).

People with positive behavioural beliefs towards tap water consumption tend to drink bottled water less frequently. Average marginal effects show that a unit increase in water consumption behavioural beliefs makes people almost 0.5% more likely to consume bottled water no more than several times a month or, conversely, 0.5% less likely to drink it at least several times a week. Respondents who perceive that it is the norm for their significant others (family and friends) to drink tap water are less likely to drink bottled water more often. If normative beliefs increase by one unit, then there is a 0.3% higher probability of drinking bottled water in the frequencies of never to once a day or a 0.3% lower probability that respondents drink bottled water several times a day. People who perceive it is difficult to get water from the tap in restaurants, cafes, gas stations, and public places drink bottled water more often. The control beliefs and its increase by one unit represents a 0.2% lower (never or seldom and several times a month) or 0.2% higher (several times a week or once a day and several times a day) probability of consuming bottled water (see Figure 10).
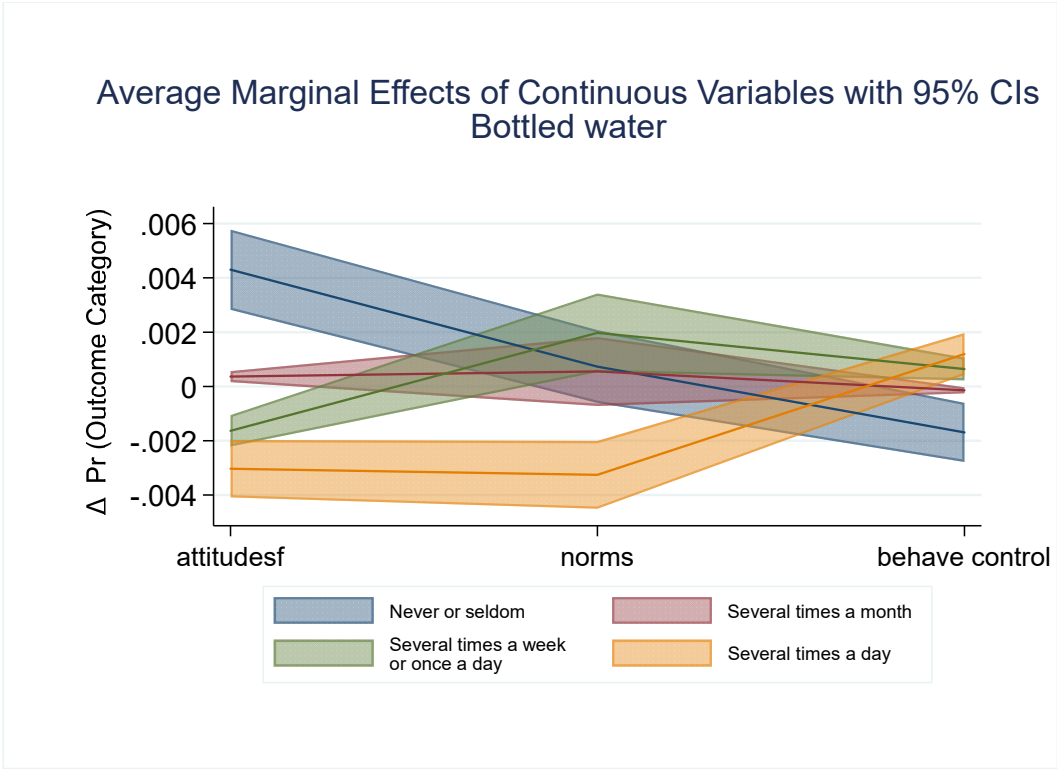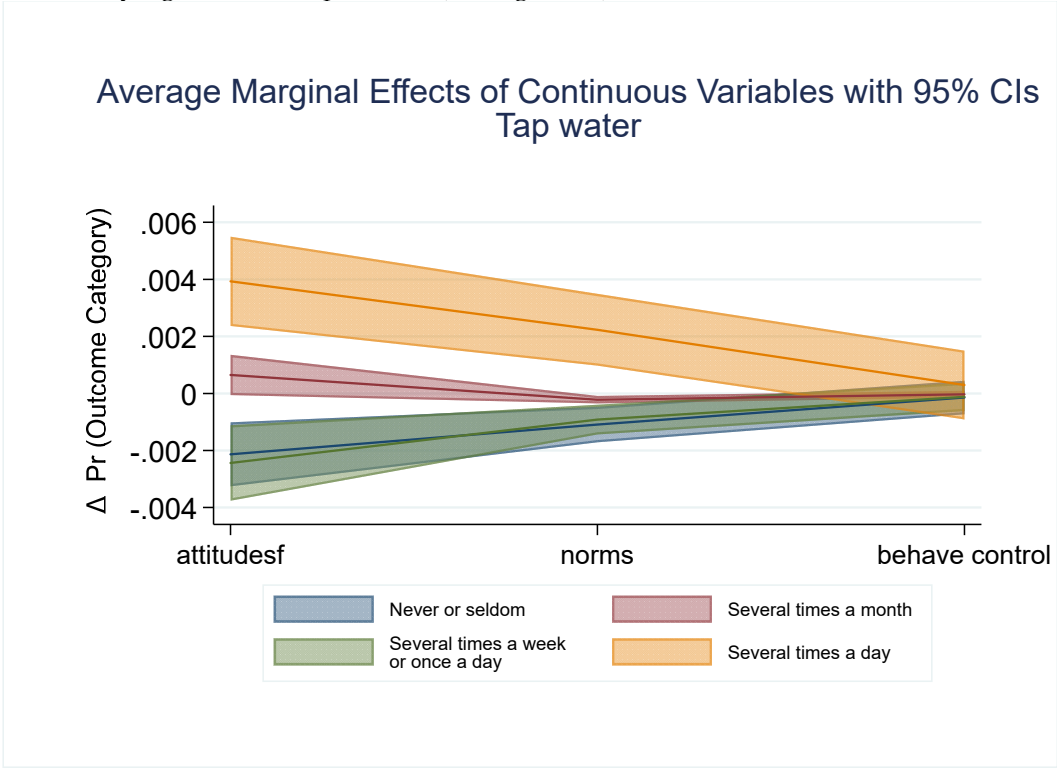
Figure 10. Average marginal effects of continuous variables on bottled water consumption at the 95% confidence level, △Pr denotes a change in the probability (N = 3411).

The average marginal effects show that with a unit increase in positive behavioural beliefs towards tap water consumption, people are 0.4% more likely to drink tap water several times a day and 0.2% less likely to drink tap water never or seldom and several times a week or once a day. For normative beliefs, a one-unit increase in perception of social pressure to drink tap water is associated with respondents being 0.2% more likely to drink tap water more than once daily and 0.2% less likely to do so no more than once per day. The construct of control beliefs in the case of tap water was not statistically significant as a predictor (see Figure 11).

Figure 11. Average marginal effects of continuous variables on tap water consumption at the 95% confidence level, △Pr denotes a change in the probability (N = 3411).

4. Discussion and Conclusions

The most common reason for people not drinking tap water, or drinking it infrequently, is its bad taste (38%). Other important factors are water being too soft or hard (19%) and the household not being connected to a public water supply (18%), while the least common reasons were odour or colour (8%) and the water being defective in respondents' houses (3%). The main reasons for drinking bottled water were the unavailability of tap water (40%), its taste (32%) and sparkling or mineral content (27%), while the least frequent reasons are safety (8%) and the claim that it is healthier than tap water (6%). These findings therefore suggest that taste is particularly important for our respondents' preferences, while reasons related to safety and health concerns are less important. Together with Geerts et al. [23] and Delpla et al. [10], it can be concluded that the taste characteristics of bottled water are often preferred over the taste of tap water. Even Viscusi et al. [19] in their research report that bottled water has a better taste compared to tap water for more than 40% of people, but also that for almost a third of all respondents bottled water is safer and then a slightly lower percentage believe that drinking bottled water is more convenient than tap water, which on the other hand was not as significant in our data. Jones et al. [17] then describe that the unpleasant sensory properties (odour and colour) of tap water even emerged as one of the topics that was mentioned prominently by research participants. Finally, the importance of the aforementioned water characteristics is confirmed by Qian [18], who found in a sample of university students that the more they felt that tap water was safe, hygienic, convenient and widely available, as well as tasty, the less often they would drink bottled water on campus.

The results of data analysis indicate more frequent consumption of bottled water among those with lower education, higher income, those in employment, the number of retired household members, and women. More frequent tap water consumption seems to be also among women (statistically more significant than bottled water) and moderate consumption among those who have lost a partner or are single. While the results suggest less frequent consumption of bottled water among those with higher education, for tap water, on the other hand, lower frequency of consumption were found among those with lower income, aged 51 years and over, with unstated income, and those who are at home. In terms of age, young people appear to be moderate consumers of bottled water (absent or very frequent consumption) and big consumers of tap water. These findings are broadly consistent with those of a number of other studies [9,10,18,19,22,23], but some differences can be pointed out. While Geerts et al. [23] report more frequent consumption of bottled water among men and the elderly, our findings instead point to higher consumption among women, and do not support a statistically different consumption among those aged 51 years and older from that of middle-aged respondents. Delpla et al. [10], for example, mention more frequent consumption of tap water among people with higher education, but in our case the results were not statistically significant. Environmental concerned people are more likely to drink tap water several times a week or once a day.

Constructs from the theory of planned behaviour [24] were found to be influential as well. In the case of perceived behavioural control, people who perceive that it is difficult to get tap water in restaurants, cafes, gas stations, and public places are more likely to drink bottled water. In terms of behavioural beliefs towards tap water consumption, people with positive behavioural beliefs towards tap water consumption are more likely to drink tap water, while those with positive behavioural beliefs towards tap water consuming are less likely to drink bottled water. These behavioural beliefs are largely influenced by responses to the construct question, where more than half of respondents believe that if they drank mostly tap water over the next 3 months they would save money on bottled water (strongly agreed by 54% of respondents), and would also save time shopping for and taking plastic bottles to the bin (strongly agreed by 47%). Thus, in this regard, we concur with the findings that price and convenience are also important for consumer choice of tap or bottled water [16–20]. The association between social norms and behavioural influence was reflected

in less frequent drinking of bottled water (and conversely, more frequent consumption of tap water) among people who perceived that it was the norm for their significant others (family and friends) to drink tap water. Our findings differ from other studies and thus make it important to consider the broader social context in interpretation. For example, Geerts et al. [23] show in their research in Belgium that despite environmental and financial considerations, bottled water consumption is still widespread among people, and the existing social norms that promote it play an important role. Similarly, Qian [18] identifies family habits as a factor that influenced behaviours leading to a preference for bottled water in the case of her research among university students. Subjective norms were identified as one of the strongest predictors for bottled water consumption among respondents in Iran [26].

Taste perception, health concerns, and the habit of drinking tap water are significant predictors of drinking bottled and tap water, both in terms of statistical significance and strength of influence, the first two even being the most influential. Health concerns about tap water and unpleasant taste of tap water influence higher/lower consumption of bottled/tap water. For example, unfavourable perceptions of the healthiness of tap water and positive perceptions of the healthiness of bottled water imply a 17% lower likelihood of consuming bottled water at most a few times a month and an 18% higher likelihood of drinking it at least a few times a week. Similarly, perceptions of the pleasant taste of bottled water or the unpleasant taste of tap water are associated with a 22% lower likelihood of never or seldom drinking bottled water and, conversely, a 10% higher likelihood of drinking it several times a day. Our results confirm the importance of the organoleptic properties of water for its consumers [7–12], here specifically the taste of bottled water, which Geerts et al. [23] report is often preferred over the taste of tap water. It also suggests that water safety may be an issue for many people. These findings are consistent with a number of international studies showing that people consider tap water less healthy and less safe compared to bottled water [10,13–15,17,20,23]. As such, drinking tap water may be perceived as risky for some consumers, which according to Viscusi et al. [19] is a reason to consume more bottled water. In terms of habit, those who drink bottled water less frequently and those who have a strong habit of drinking tap water more frequently drink tap water. The significance of this predictor for water consumption confirmed the appropriateness of extending the constructs from the theory of planned behaviour [24] to include habit in this paper.

While findings from this study contribute to understanding of motives and barriers of drinking tap water, there some limitations that need to be taken into account. The study relies on self-report measures, which may lead to social desirability bias. However, the online questionnaire was anonymous and drinking tap or bottled water is not a sensitive topic, therefore we think that the social desirability effects may not be too pronounced [32]. Another limitation stems from the nature of the data. As we use cross-sectional survey data, we cannot draw causal inferences. While beliefs and perceptions influence behaviour, the past behaviour also affects beliefs.

To conclude the factors that appear to have the greatest influence on bottled and tap water consumption are perceived taste of both tap and bottled water, health concerns and habit. A campaign that focuses on improving the perception of taste of tap water and that addresses perceived health concerns about this water source could lead to a reduction in bottled water consumption. At the same time, it would be appropriate to introduce measures in water treatment that would further improve the taste of tap water. As the habit of drinking tap water plays a significant role in explaining the frequency of drinking bottled water, a campaign could also be targeted to encourage habit formation.

Drinking tap water outside the home appears to be more challenging and is less often perceived as the norm. More drinking fountains in public places would make drinking tap water easier for 44% of respondents. In addition, people perceive that drinking tap water would be easier if tap water could be ordered from more restaurants and cafes, or if it could be bought from gas stations in its own bottle and its price was lower than bottled water.

International studies show that measures combining the installation of drinking fountains with the distribution of water bottles and information and education activities are particularly effective in promoting tap water. Our study shows that although 39% of Czechs do not have a bottle, only 21%

of them would find a free bottle easier to drink tap water. For the Czech Republic, we would therefore rather suggest measures that combine the installation of water fountains in public places, promoting the availability of tap water in restaurants and petrol stations, combined with a campaign focusing on taste and health perception, and promoting the habit of drinking tap water.

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