



# Emerging Water Contaminants Consumer Study: Understanding Consumer Awareness and Decision-Making on Using In- Home Water Treatment Devices

## Executive Summary

### **Principal Investigators:**

Marcia Silva, Ph.D., MBA, Water Technology Accelerator (WaTA),  
University of Wisconsin-Milwaukee, [msilva@uwm.edu](mailto:msilva@uwm.edu).

Sakib Mahmud, Ph.D., School of Business and Economics, University of  
Wisconsin Superior, [smahmud@uwsuper.edu](mailto:smahmud@uwsuper.edu).

Submitted to Water Quality Research Foundation on March 24, 2022.

# Executive Summary

This independent study was performed by researchers from the University of Wisconsin system in June 2021, to gauge the American public's knowledge of emerging contaminants in drinking water and their interest and willingness to pay for Point-of-Use (POU)/Point-of-Entry (POE) home water filtration devices. POU devices treat drinking water at the point of consumption (e.g., kitchen faucet) while POE devices are whole-house water treatment systems.

The research objectives of this project are threefold:

- (1) To understand which emerging contaminants are known by consumer per geographic region and per demographic group in the United States.
- (2) To find whether consumers are aware about multiple POU and/or POE drinking water treatment products to reduce the concentration of emerging contaminants.
- (3) To understand through statistical analysis which type of communication process and messaging on the POU/POE products have significant influence on a consumer's (or a household's) choice of drinking water treatment systems.

The significance of this project is the understanding of which emerging contaminants are known by consumer per geographic region and demographically in the United States. This project also assesses the level of consumer knowledge about multiple POU/POE product and through statistical analysis understand which messaging of a POU/POE product influences a consumer's decisions to treat their water.

The nationwide, online consumer survey was sent out using Prime Panels, an online social cloud research platform, to randomly recruit research participants that are 18 years or older from all fifty (50) states. Participants in the study were involved in the economic decisions of their household and had no immediate plans of moving from their current state in the next six months. The survey was initiated on June 3<sup>rd</sup>, 2021, and completed on June 15<sup>th</sup>, 2021. Prime Panel provided compensation for survey completion with monetary compensation, rewards points or gift cards.

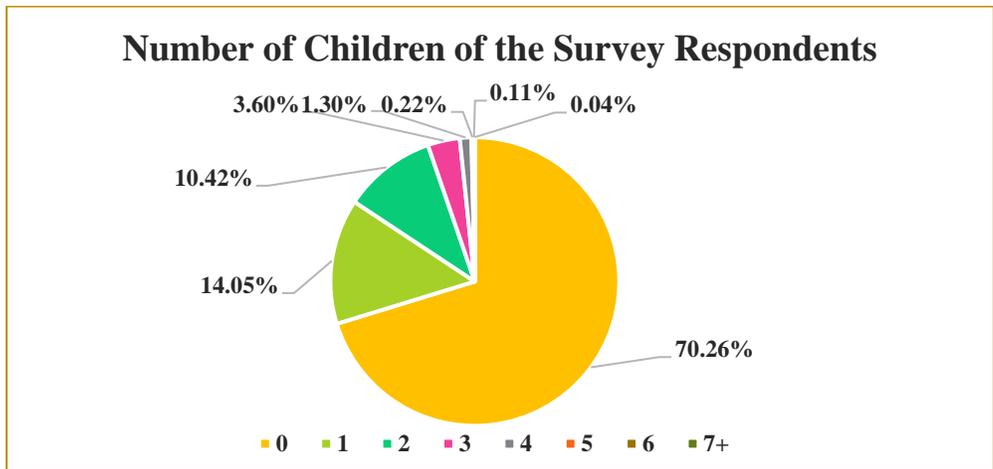
The survey consisted of pre-screening questions, an attention check question, and a 10-min questionnaire (primarily multiple choice). The pre-screening questions ensured participation of qualified parties only. To further increase quality of responses, an attention check question was included to ensure the respondents were fully reading the question before responding to answers. The pre-screening process addressed any further response, non-response, and order biases. Rather than asking the respondent about their awareness of each emerging contaminant individually, respondents were prompted to select all emerging contaminants that they were aware of from the list included in the survey. Once our online survey was completed, we downloaded the survey data from Qualtrics into IBM® SPSS® software for statistical analysis.

To determine how the messaging of a Point of Use (POU)/ Point of Entry (POE) product influences the public's decision to treat their drinking water, survey participants were divided randomly by

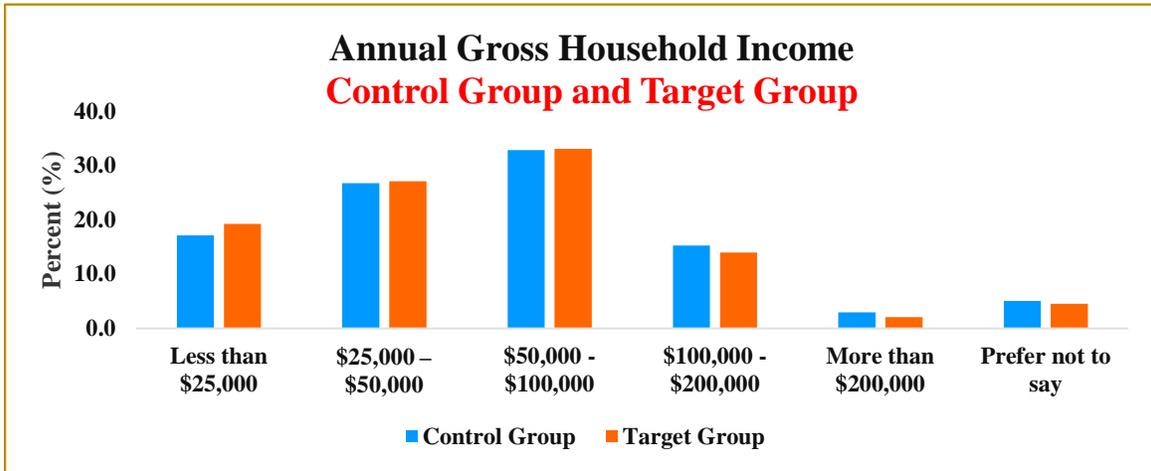
state into 2 groups. One group (the control) was exposed to a message “without benefit information” while the other (target group) was exposed to a message “with benefit” information. The “without benefit information” statement was as follows: *“In-home water treatment systems act as a final layer of protection against contaminants for your drinking water.”* The “with benefit information” statement was: *“In-home water treatment systems that are tested and certified to industry standards act as a final layer of protection against contaminants for your drinking water.”* Apart from the messaging statement, all other questions were identical. Using the “with benefit” versus “without benefit” messaging scenario, we investigated whether the “with benefit” information (“tested and certified to industry standards”) played a key role in motivating the public to use in-home water treatment systems.

**DEMOGRAPHIC PROFILE OF RESPONDENTS**

- 64.01% are female, 35.06% male, 0.48% non-binary or non-listed gender, 0.19% transgender man, 0.04% transgender woman, and 0.2% prefer not to say categories.
- 23.5% have a bachelor’s degree, 22.6% have a high school degree, and 22.4% have some college credit.
- 70.3% have no children under 18 years-old living with them.

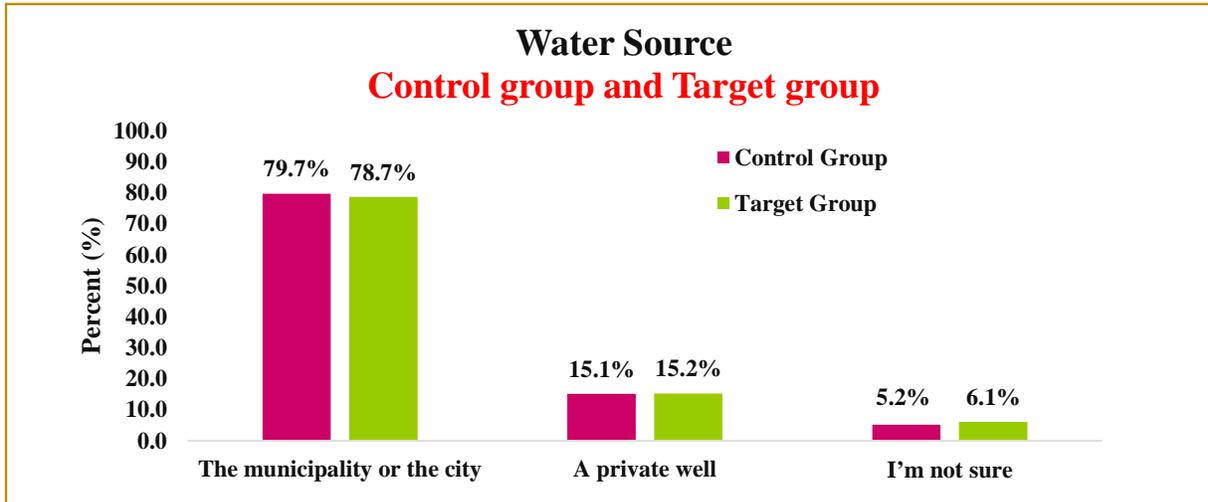


- 66.7% own their home; 30.5% rent and 2.8% have other types of arrangements.
- The majority of respondents are 61-70 years-old (23.1% and 18.9%, control and target groups, respectively), followed by 31-40 years-old (16.5% for control and 17.6% for target). However, the control group has 16.5% of respondents 71 years or older.
- Demographic data by race reveals white being the majority. The survey findings related to race are in agreement with data published by the U.S. Census Bureau (USCB, 2021b), where 76.3% of Americans are white, 13.4% are black/African American, 18.5% are of Hispanic/Latino descent, 5.9% are of Asian descent, 1.3% American Indian and Alaska native, 0.2% Hawaiian and Pacific Islander, while 2.8% have two or more races.
- More than 32% have an annual household income between US \$50,000 and US \$100,000.

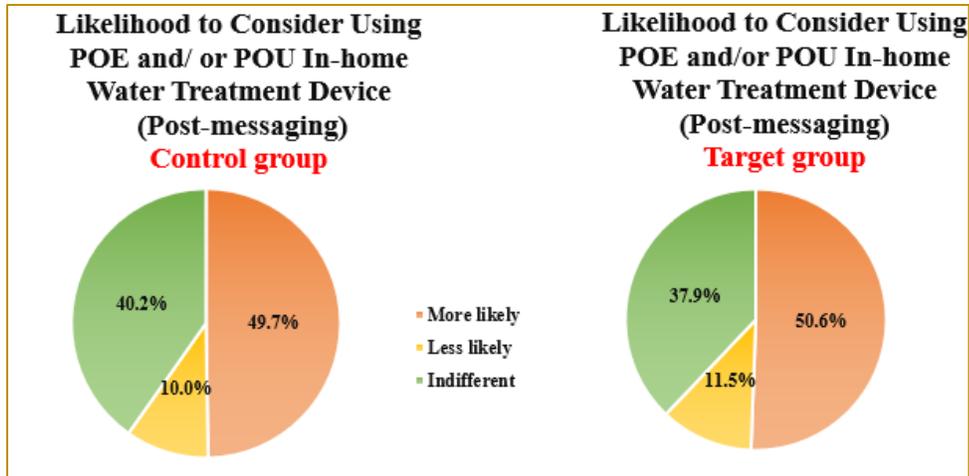


## MAJOR FINDINGS

- In every state, most residents reported receiving their water supply from the municipality or the city, except the state of Maine.
- 5.2% and 6.1% (control and target groups, respectively) are not sure about the origin of their drinking water.

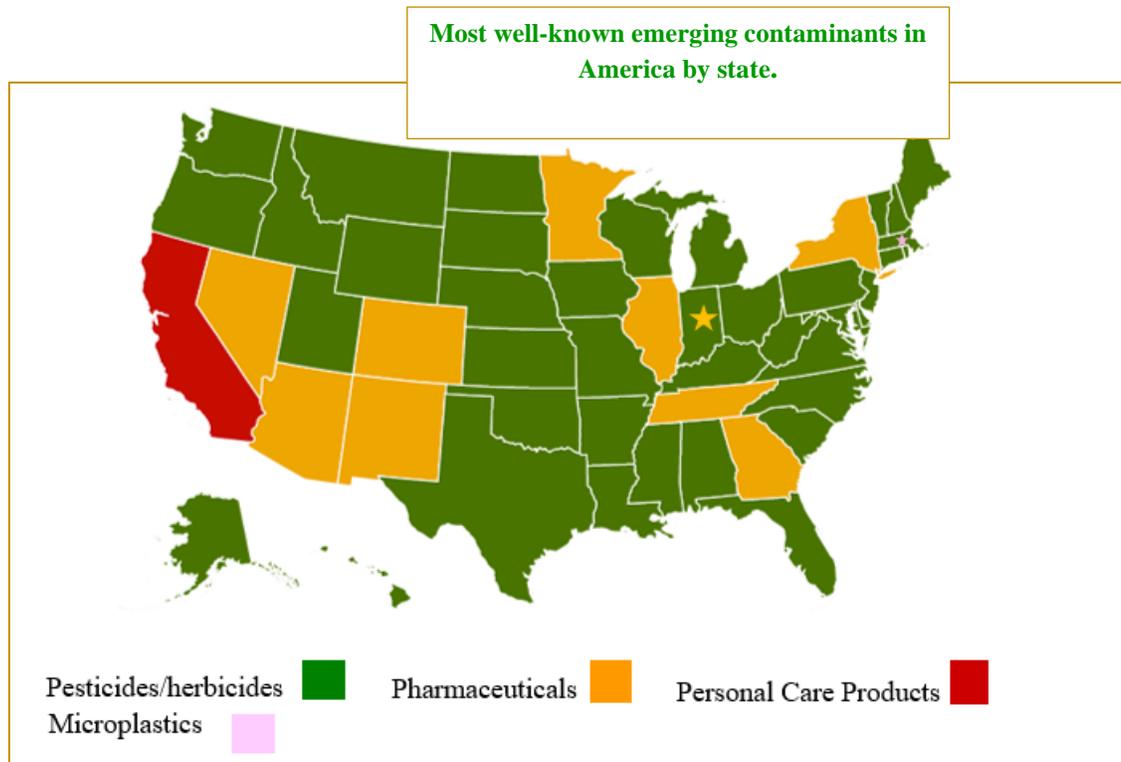


- With benefit and without benefit messaging had no impact on respondent's willingness to pay (WTP) to purchase a POE/POU water treatment device for their home (there is no statistically significant difference between groups).
- A respondent's group type (Control Group or Target group) has no influence on the likelihood to consider using in-home POE and/or POU water treatment device.

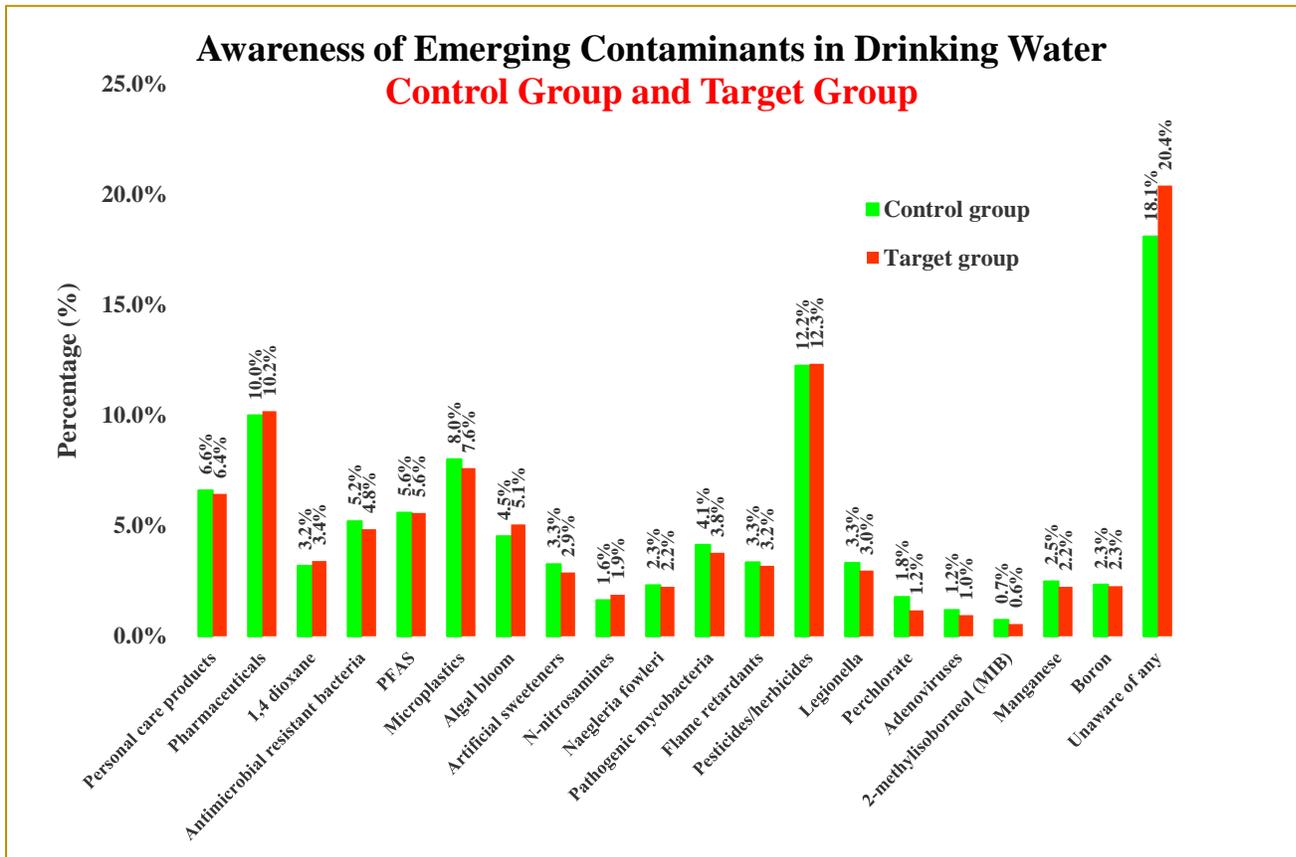


### CONSUMER AWARENESS OF EMERGING CONTAMINANTS

- The most well-known emerging contaminants in America are *Pesticides/herbicides*; the second most well-known are *Pharmaceuticals*; the third most well-known are *Microplastics*. There was a tie for the fourth and fifth most well-known emerging contaminants. The fourth most well-known are *Personal Care Products* and *Antimicrobial Resistant Bacteria*, and the fifth most well-known contaminants are *PFAS* and *Pathogenic Mycobacteria*.



- About 20% of the respondents from combined target and control groups are unaware of any of the emerging contaminants included in the survey.

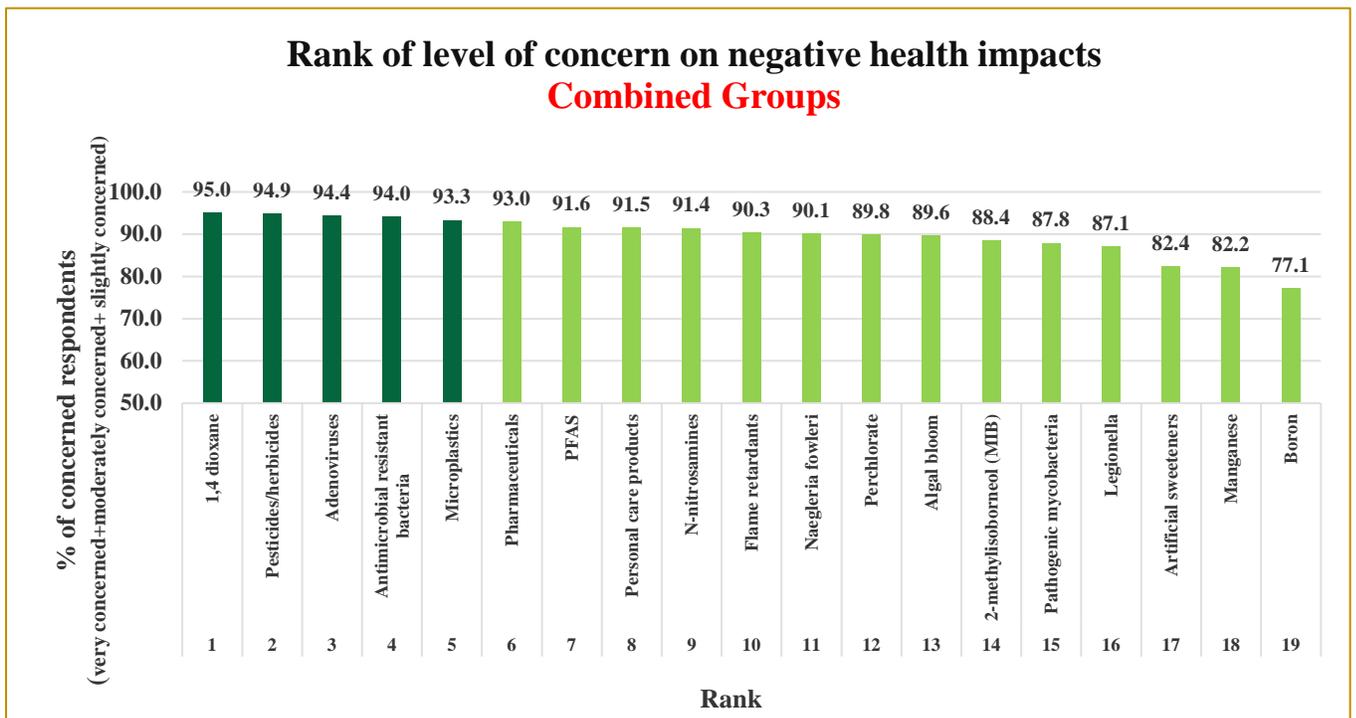


- Less than 3.5% of respondents in both groups combined claimed knowledge of the following emerging contaminants: 1-4 dioxane, Flame retardants, *Legionella*, artificial sweeteners, manganese, boron, *Naegleria fowleri*, N-nitrosamines and halo(nitro)organics, perchlorate, adenoviruses, and 2-methylisoborneol.
- Regardless of their source of water, the top two emerging contaminants that respondents demonstrated awareness of are *Pesticides/herbicides* (12.4% and 13.0%, for the municipality/the city and private wells, respectively) and *Pharmaceuticals* (10.4% and 10.7%, for the municipality/the city and private wells, respectively).

### **CONSUMER CONCERN ABOUT NEGATIVE HEALTH IMPACTS**

- Most respondents who are aware of emerging contaminants are somewhat concerned about potential negative health impacts (combined responses of highly concerned, moderately concerned, and slightly concerned) across all 19 emerging contaminants presented in this survey, hovering 77.1% to 95.0% for the combined groups.

- Out of the top five well known emerging contaminants in the United States (*Pesticides/herbicides*, *Pharmaceuticals*, *Microplastics*, *Personal Care Products* and *Antimicrobial Resistant Bacteria* and *PFAS* and *Pathogenic Mycobacteria*), three of them show up as the top five emerging contaminants that respondents showed the highest level of concern in relation to negative health impacts in the combined groups (*Pesticides/herbicides* (rank 2), *Antimicrobial Resistant Bacteria* (rank 4), and *Microplastics* (rank 5). Interestingly, *1,4 dioxane* (rank 1) and *Adenoviruses* (rank 3) are not among the five most well-known emerging contaminants in the country but show up among the top five ranked emerging contaminants of level of concern in relation to negative health outcomes.

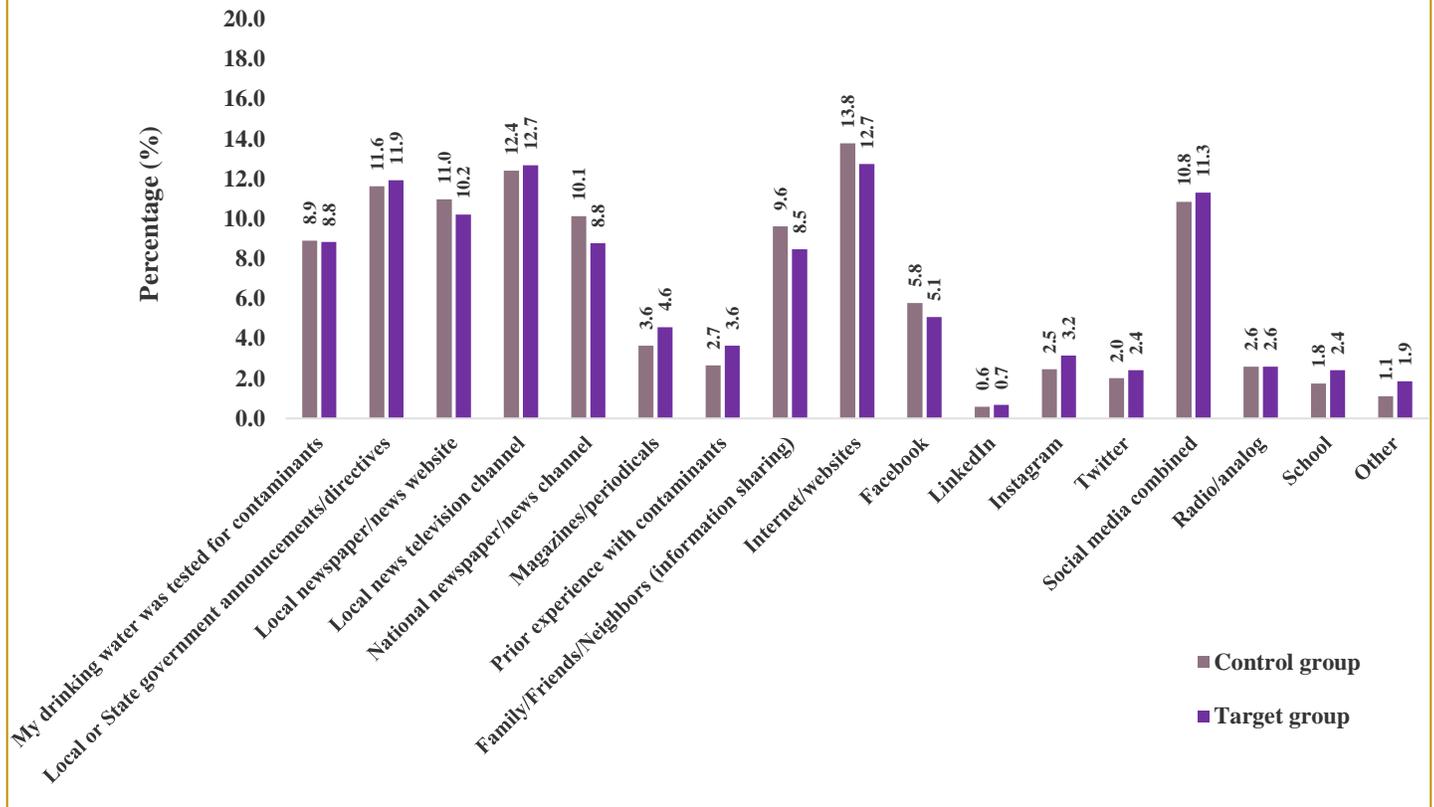


- Regardless of type of neighborhood/community, over 90% of the respondents are somewhat concerned about the negative health impacts of *Pesticides/herbicides*.
- Regardless of type of neighborhood/community, over 80% of the respondents are somewhat concerned about the negative health impacts from *Pharmaceuticals* and *Microplastics*, *PFAS*, *Antimicrobial Resistant Bacteria*, and *Pathogenic Bacteria*.
- 90% of respondents from suburban communities are somewhat concerned about negative health impacts of *Personal Care Products* in drinking water.

## SOURCES OF CONSUMER AWARENESS

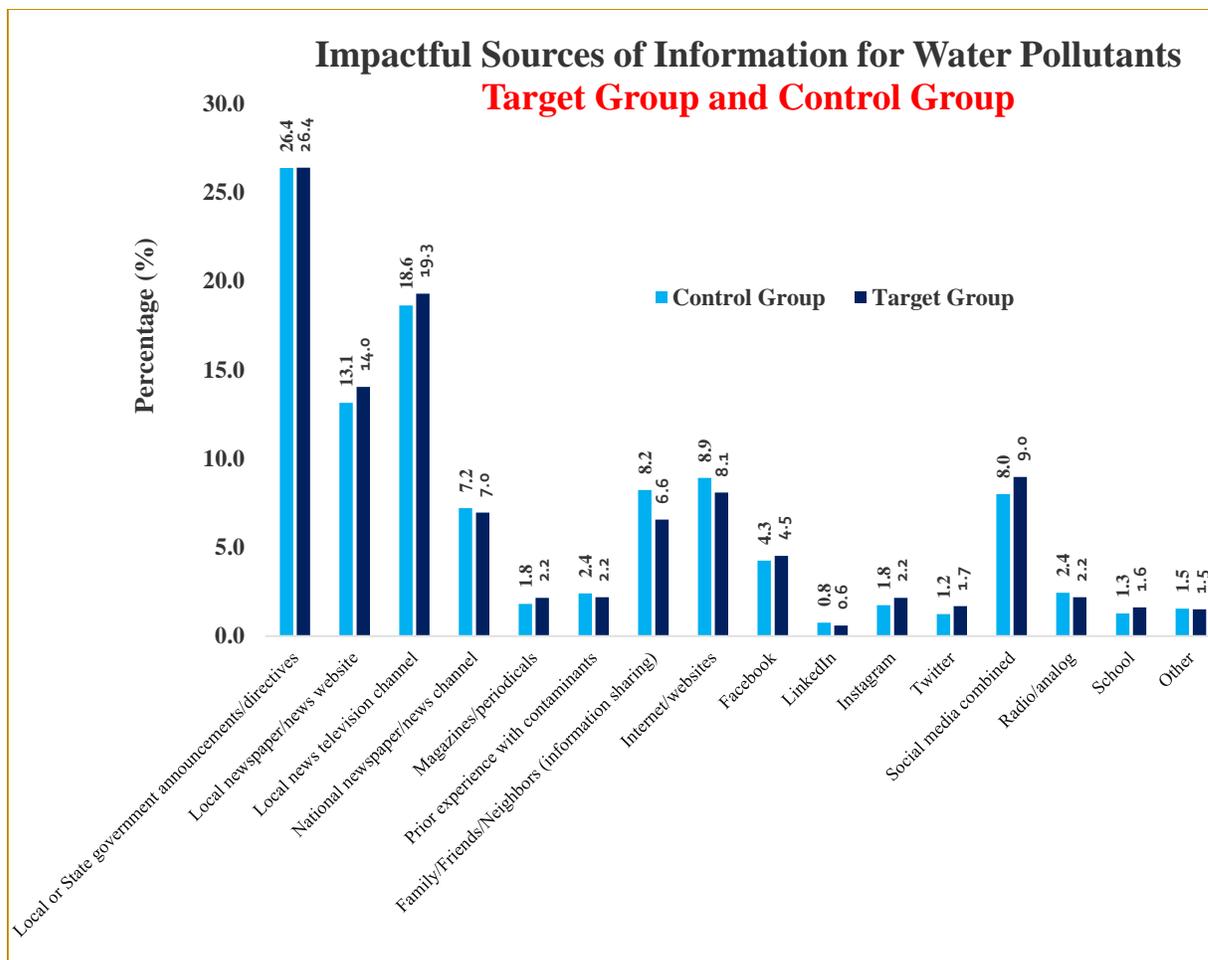
- The survey respondents learned about emerging contaminants in their drinking water primarily from internet websites.

## Source of Information of Emerging Contaminants in Drinking Water Control Group and Target Group



### IMPACTFUL SOURCES OF INFORMATION ON CONTAMINANTS

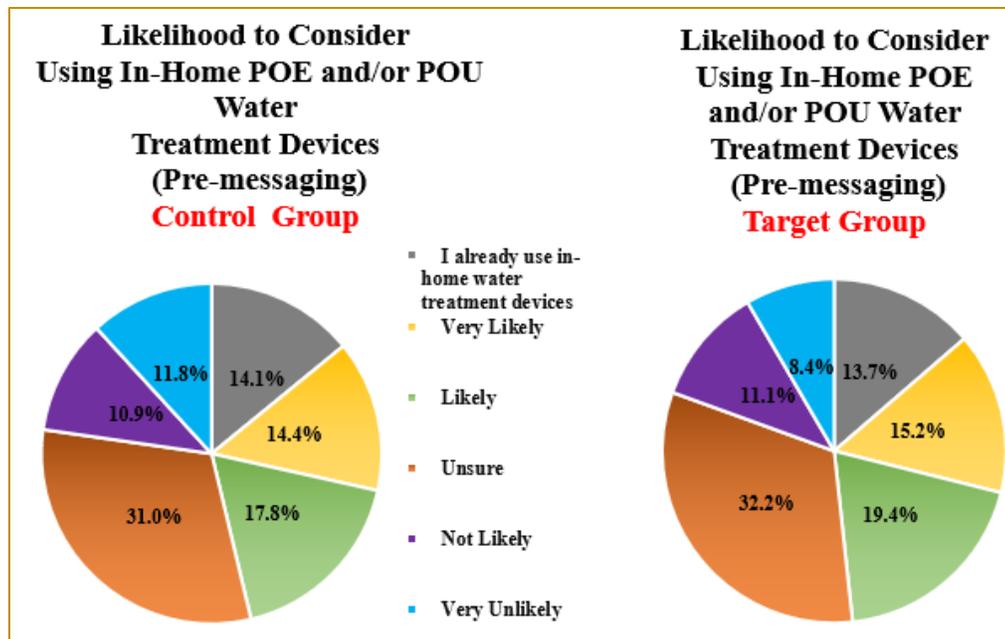
- The survey respondents reveal that they find local or state government announcements/directives as the most impactful source of information on water pollutants. Local state or government announcements are also the most impactful source of information for those aware of at least one of the top five most known emerging contaminants.



- Across most well-known emerging contaminants, respondents reveal Local/State Government Announcements/ Directives (21.6% to 26.3%) to be the most impactful source of information on water pollutants. This is followed by local news channel (15.5% to 17.5%), and local newspapers/local news websites (11.4% to 13.7%). Interestingly, our survey also shows that internet/websites (9.1% to 10.9%) have similar impact of national newspaper/news channel (8.2% to 10.5%). Conversely, social media turned out to be less impactful source of information for water pollutants (3.6% to 10.3%).

### **ATTITUDES TOWARD POE AND POU DEVICES**

- Among our survey respondents, about 14% of the respondents in both groups revealed that they already use in-home water treatment devices.
- 31% (control group) to 32% (target group) of the respondents are unsure about using POU/POE in-home water treatment devices.
- Regardless of the number of children under 18 residing in the household, the most common response is “unsure” when respondents were asked how likely they were to use POE/POU water treatment devices.
- Only 14% to 15% of the respondents revealed that they are “very likely” to consider using water treatment devices at their homes.



### **REASONS FOR USING POE/POE & DEVICES COMMONLY USED**

- Regardless of type of residence, the three most important reasons consumers use POE/POE are: the presence of hard water, improve taste/odor of the water, and add an extra layer of protection against potential contaminants.
- Regardless of neighborhood/community type, refrigerator filter systems are the most widely used. This is followed by water softeners for rural agriculture, filter pitcher/bottle for rural manufacturing and suburban communities, and under the counter/sink for urban/city.
- Earners under \$25,000 annually use primarily faucet/tap mounted device (19.1%), followed by refrigerator filter system, under the counter/sink and water softener (each of them 14.7%) and filter pitcher/bottle (13.2%). For respondents who earn more than \$25,000 up to \$200,000+, they primarily use refrigerator filter system (22.9 to 27.1%). This is followed by water softener (12.5% to 16.8%), filter under the counter/sink (12.2% to 15.0%), Filter Pitcher/Bottle (10.3% to 14.6%), and faucet/tap mounted device (9.8% to 15.3%). For earners above \$200,000, refrigerator filter system is followed by whole house supply (20%) and filter Pitcher/bottle (13.3%).

### **REASONS FOR NOT USING POE/POE**

- Primary reasons for not using POE/POU devices for respondents between 18 and 50 years-old are: (a) uncertainty regarding appropriate treatment (17.1% to 19.9%) and (b) cost (16.0% to 21.0%). For respondents over 51 years-old, the primary reasons are cost (16.6% to 20.7%) followed by belief that they do not have any water quality issues at their homes (17.1% and 23.7%).
- Cost concerns (15.0% to 23.1%) and uncertainty regarding appropriate treatment (14.1% to 20.0%) and uncertainty about presence of contaminants in their water (13.2% to 15.0%) are the largest factors when considering the reasons for not using POE/POU by type of residence.

## **HOW TO INCREASE CONSUMER MOTIVATION TO USE POU/POE**

- 23.1% of respondents among all private well users, 26.9% of the respondents among all public water users, and 24.9% of respondents unsure about their drinking water sources consider information from town/city officials the most impactful motivator to use POU/POE water treatment devices. This is followed by information provided by the U.S. Environmental Protection Agency (EPA) with 18.1% for public water users, 18.3% for private well users and 15.7% for those who are unsure of their source of home water supply.
- Regardless of age, the most impactful source of information about POU/POE are from town/city officials (19.7% to 29.9%) and the EPA identifying the contaminant as a potential human health (15.7% to 19.5%). For respondents between 18-20 years-old, news media reports are considered impactful (17.9%), whereas for the 21 years and older, it varies from 9.3% to 11.7%.

## **POE INSTALLATION AND MAINTENANCE COSTS**

- Across income groups of those who already have POE water treatment systems at home, less than \$1000 (26.7% to 54.3%) or “don’t know” (19.7% to 38.9%) were the most frequent responses to the questioning on how much money was spent on the original purchase of the POE device. In addition, our survey data reveals that for earners between \$100,000 and \$200,000, their expenses with POE devices were between \$1000 and \$3000 (28.6%) and earners with \$200,000+, their expenses with POE devices were more than \$3000 (26.7%). Across the board, we also find that between 19.7% to 38.9% of the respondents do not know the original purchase price of the POE water treatment device for their homes.
- Respondents with earnings across all groups, the most frequent occurrence was that installation was either done by the respondents (25.0% to 41.7%) or installation cost was included in the device purchase price (19.4% to 37.5%). A significant portion of the respondents reported that they do not know their installation cost for POE (11.7% to 30.0%).
- 31.1% of the respondents among the homeowners prefer “installation cost included in purchase price” for the POE water treatment device. On the other hand, close to 50% of the renters opted for self-installation of the POE water treatment device.
- Between 40% and 53.8% of the survey respondents under different gross annual household income categories incurred “less than \$100” regular annual maintenance costs for POE water treatment systems at home. The next chosen annual maintenance costs for POU water treatment systems at home is “between \$100 and \$250” for all income groups (17.6% to 40%) except for households who picked “prefer not to say” category (15.8%).

## **POU INSTALLATION AND MAINTENANCE COSTS**

- Households with gross annual household income “less than \$25,000,” “\$25,000 to \$50,000,” and “\$50,000 to \$100,000,” spent *less than \$150* on the original purchase of the POU water treatment device at their homes (38% to 42.3%). Respondents with income “between \$100,000 and \$200,000,” incurred expenditures *between \$150 to \$750* for original purchase of the POU water treatment device (32.7%). For respondents with income above \$200,000, expressed that they spent more than US\$750 on the original purchase of in-home POU water

treatment device. However, a significant portion of the respondents stated that they do not know how much they spent on the original purchase of the POU water treatment device at their homes (18.3% to 34.2%).

- 55.6% of the respondents with “less than \$25,000” annual income prefer self- installation of the POU water treatment device, which is also the choice of at least 21.4% of the respondents in higher gross annual income categories. Conversely, at least 20% of the respondents in higher gross annual income categories selected installation cost included in the purchase price, whereas 57.1 % of the respondents with gross annual income of “more than \$200,000” opted this selection.
- Between 29.4% and 62% of the respondents installed the POU water treatment devices themselves irrespective they have rental, home ownership, and other arrangements. Among the homeowners, 27.4% have installation cost included in the original purchase price for the POU water treatment device. However, among other residence arrangements, around 53% stated that they do not know how much they spent on installation of the POU water treatment device.
- Between 43.8% and 64.3% of the survey respondents under different gross annual household income categories incurred “less than \$100” regular annual maintenance costs for POU water treatment systems at home. Except for respondents with “prefer not to say” category, the next annual maintenance costs for POU water treatment systems at home is “between \$100 and \$250” for rest of the income categories (21.1% to 37%).

## **RECOMMENDATIONS FOR POU/POE INDUSTRY**

- Water treatment manufacturers should work in tandem with local or state government, federal agencies like US-EPA, and other local key stakeholders to disseminate information among rural, suburban, and urban/city communities about the health benefits of installing in-home POE and/or POU water treatment systems.
- Water treatment manufacturers should ensure news media reports and independent research data are accurately presented through *internet/websites* and various *social media platforms*, such as, Facebook, Twitter, LinkedIn, Instagram, etc., since the survey results showed that respondents consider these information sources to be the second most impactful about emerging contaminants in drinking water following local or State Government announcements/directives, local newspaper/local news websites, and local news channel.
- Water treatment manufacturers should form *public-private partnerships involving multiple stakeholders* including minority communities with local or state government support to promote educational and community-based programs on water pollutants, including emerging contaminants. Having support from Federal agencies like US-EPA as well as local and state level pollution control agencies will help establish the much-needed trust and long-term relationships for increasing uptake of in-home water treatment devices among rural agriculture, rural manufacturing, suburban, and urban/city dwellers. Since our survey results reveal that a large percentage of the population is unaware of any emerging contaminants (about 20%), programs as such have the potential to impact communities at personal, organizational/institutional, environmental, and policy levels.

- Water treatment manufacturers should focus on reducing costs and uncertainties associated with in-home POE/POU water treatment systems. More emphasis should be placed on information sharing on appropriate treatment and detection of contaminants in drinking water considering the potential negative health outcomes of contaminated drinking water.