

# Project Proposal: Water You Waiting For?

## Executive Summary

When it comes to water, there are two problems of major consequences which have been overlooked for centuries: contamination and hydration. It is absolutely vital to any living creature for them to keep these two aspects in check. Due to humans' treatment of the world's resources, it is critical for humans to keep an eye on these factors, both on the individual as well as societal scale. However, even though this information is publicly available to the average person, people do not take advantage of the facilitated accessibility of today's world. Whatever the reason for this neglect, an attempt must be made to help society pay attention to their personal health.

## Introduction

### Problem

#### *Water Contamination*

Water contamination refers to the presence of harmful or undesirable pollutants in the water supply. As a result of contamination, water is often unusable for drinking, cooking, cleaning, swimming, and other purposes (Harvard School of Public Health). With the rise of industrialization in the past decade, water contamination issues have become more prominent. This can be attributed to the improper disposal of industrial or radioactive waste, fertilizer-run-off, natural disasters, or oil spills (East Central University, 2019), as shown in Figure 1.



Figure 1. Water contamination data from the United Nations in 2014.

Common contaminants in public water supplies include microorganisms, industrial chemicals, and heavy metals. The U.S. Environmental Protection Agency, commonly referred to as the EPA, regulates drinking water quality in public water systems across the nation. The EPA sets limits for germs and chemicals in water, and determines at which point contamination is too high, deeming the water unsafe to drink. Water utility systems are required by the EPA to be tested for contaminants, and report these findings back to customers (Centers for Disease Control and Prevention, 2022). Although public water systems are frequently monitored and treated to ensure the cleanliness of water, the risk of contamination is still present.

**Impacts of Contamination.** Water contamination heavily impacts the body, with the impact varying by the contaminant and the level of contamination. Some contaminants, like heavy metals, are slow-acting due to their gradual build up in the human body.

**Current Accessibility.**

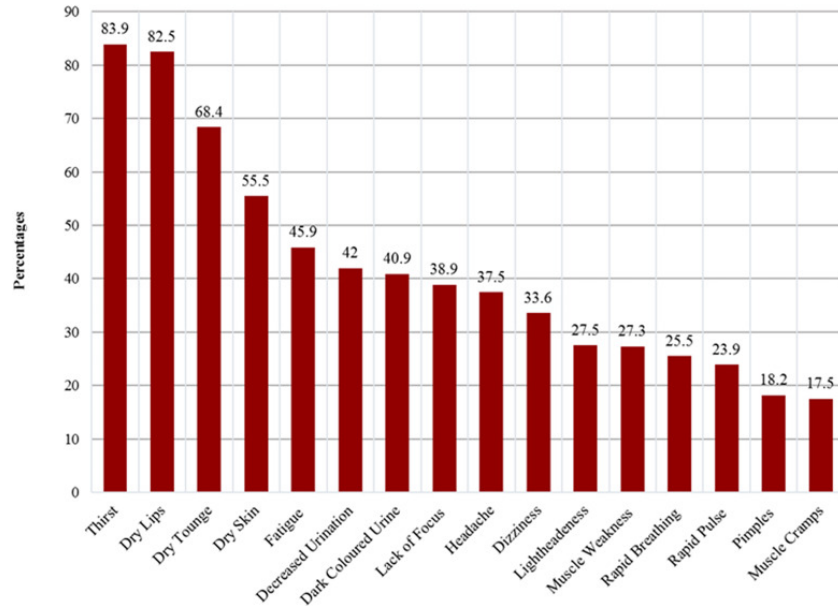
Public water companies are legally required to send out a quarterly report on the contaminants and issues that may impact an individual's water-supply. However, these reports are often highly technical and wordy, making it hard for the general public to understand. Additionally, if an individual wishes to locate those reports on the internet, it is unlikely that the content will be up to date, similar to most digital reports. The public must be made aware of what contaminants are present in their drinking water, and the risks that they pose to public health.

## ***Water Hydration***

Water is widely known to be one of the essential building blocks of life and makes up 50-75% of a human's body weight (Popkin et al., 2010). Water is needed for a significant number of processes through the body—everything from homeostasis, to digestion assistance, to skin protection. Therefore, it is unsurprising to hear that a person needs a large amount of water in order to maintain a healthy lifestyle, and that a deficiency of water in the human diet can quickly become fatal. Knowing this, it is concerning to learn that 75% of Americans are chronically dehydrated (Taylor & Jones, 2022). The recent increases in caloric beverages have only served to heighten the potential risk, increasing both the water needed as well as having other adverse effects (García-Arroyo et al., 2016). Water dehydration problems are simply greating in number overtime, making the problems greater and more apparent.

An additional problem is the lack of information or forgetfulness associated with hydration. Although many people understand its importance, they do not have a good grasp on the recommended water intake (Albasheer et al., 2021). Therefore, they do not have proper knowledge regarding the rate of drinking, and will simply remain in this harmful state until a health concern arises. Dehydration is an even greater concern for the elderly population, particularly due to the increased risk of neurodegenerative diseases impacting their memory, leading them to forget to drink water throughout the day at an even greater rate (Lauriola et al., 2018; Taylor & Jones, 2022).

**Impacts of Dehydration.** Dehydration is not something which only *sounds* scary. It is a large cause of general hospital admissions and can cause a large variety of serious issues beyond minor headaches and tiredness (Figure 1), including increased aging, lesser immune system strength, and even mortality (Rogers, 2023).



**Figure 2.** Commonly reported symptoms of dehydration and the percentage of those surveyed who reported such by Albasheer et al. in 2021.

All the while, it is hard to determine the cause as it mimics the detriments of other diseases. However, these are only the problems it causes when alone. When the patient has other illnesses, dehydration can worsen their symptoms, and even help to develop further illnesses, such as dementia or Alzheimer’s disease, which only promote the problem (Sfera et al., 2016; Lauriola et al., 2018; *Drinking, hydration and dementia*).

**Current Knowledge.** As aforementioned, the general community understands that water is needed, however many do not understand the scope and severity of the problem (Albasheer et al., 2021). They are not aware of the amount that they must ingest, and what exactly is happening to them as a result of doing otherwise. They are more worried about their health due to food consumption than due to liquid consumption. People do not realize that underconsumption of liquids is actually a significant cause of feelings of hunger, which can lead to obesity (Chang et al., 2016). People can also survive weeks without food, but only days without water (Deakin

University, 2000), showing their fallacious knowledge. If the general public knew the importance and extent of staying hydrated, then they would learn that a large quantity of what seem like unrelated problems can be solved by the quick and simple action of taking the occasional swig.

## **Audience**

The target audience for this app is the general public, more specifically those who are struggling with dehydration. In particular, older clients with potential memory disorders, such as Alzheimer's or Dementia, or those who are simply forgetful. Through this app, clients will receive notifications throughout the day reminding them to take a sip of water. These notifications are customized, and take into account the user's weight to determine the optimal amount of water needed to stay hydrated each day. By prompting the user to drink water, this app aims to address dehydration, and encourages users to maintain a healthy water intake. In addition, the user has the ability to check the water they are drinking for potential risk via contamination awareness.

## **Competition**

Dehydration is a considerable problem for the general public, particularly for older adults and those with memory disorders. While water tracker and reminder apps do currently exist, they often require in-app purchases, are designed inefficiently, and do not take into account the needs of the target audience. Keeping cost in mind, we aim to create a free app, making this tool accessible to all users regardless of financial status. Additionally, the majority of these apps require manual user input, which could be difficult for elderly persons to navigate. Our app, through incorporating an assistive Smart Water Bottle device, will automatically record the user's hydration data. In addition, this app will provide users with information on contaminants present in their drinking water. Currently, information on water quality is inaccessible to the general

public in an up to date manner. While websites displaying water quality data do exist, they are often difficult to navigate, contain complex terminology, and difficult for the everyday person to comprehend. By combining these two functions into a single app, this is a novel approach to not only bring attention to water contamination issues, but also promotes hydration. There is yet to be an app on the market that serves the same purpose. Although there are similar apps on the market, like the Wikiwatershed App or the Safer Seas and Rivers app, they are often targeted for a smaller audience. Since the apps are intended for a specific use, for example logging scientific data, they are not accessible to the general public.

### **Specification Features**

Our prioritized feature lies in the category of water hydration, specifically reminding users to drink after a long period of absence or due to a limited amount within a certain amount of time. Our other main feature is the ability to accurately inform the user about water pollution in an area while using simple, everyday terminology. This would mostly consist of labeling each pollution content with a risk level, and warning the user when the risk level is high as well as why. In order to solve these problems, our app would need to obtain information both from the user as well as from the web. The user-inputted information would comprise of their physical attributes, such as weight or age, in order to gain an approximation for their daily water goal. Water consumption data will be supplied from the bottle or from the user to calculate their current progress on their water quota. In addition, location information would either be obtained from the user or from mobile location services. This information would then be used along with web information to find out the recent findings of contamination levels in their area. The location-based contamination data can be obtained from a variety of websites, including government-led ones such as [data.gov](https://data.gov).

## Feedback

If a customer were to approach us with their experiences, and allow us access to their information in-app, then we would be able to learn about possible improvements. For instance, we would be able to view changes in drinking amounts and the number of reminders needed for them to hit their daily goal of water consumption. If the user required less reminders after a period of time with the water bottle, then it would be considered successful. We would respond to customer suggestions and problems by either adding and changing features or implementing patches, respectively. Some nice-to-have features for the future include more adaptability to the user's hydration requirements due to variables such as their activity level, increasing the scope of contamination information and coverage, and water access or conservation information.

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