
W241 Experimentation & Causality
ESSAY 2
The effects of 'A gallon of water a day challenge' on health

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BACKGROUND

Water is essential for a healthy living and it cannot be supplemented entirely. We all know that sufficient water intake is necessary and have grown up hearing that we need to drink at least 8 glasses, each of about 8 ounces of water a day. A lot of research has gone into how much of water an adult should consume on a daily basis and also on its health benefits. I attribute my interest in this topic to my son, who got hooked onto this 'drink a gallon of water a day' challenge and has been on it for almost a year claiming that it has done good in many ways. So, the intent here is to conduct this field experiment to understand effects of drinking a gallon of water a day across different age groups.

CDC has published facts about drinking water intake and lists that sufficient water intake is necessary to keep dehydration, mood change, overheat, constipation etc. under control. There are articles that have captured effects of low water intake that has resulted in unhealthful behaviors and attitudes (https://www.cdc.gov/pcd/issues/2013/12_0248.htm). There are articles which have reported 5 key benefits associated with drinking sufficient amount of water (<https://www.harrisschool.edu/the-health-benefits-of-drinking-water/#.W6fJY-hKiUk>). The benefits include improved brain function, weight loss, better physical performance, hydration and of course the intangible benefit of saving money. National Academies Press has also published adequate intake (AI) of water through its DRI (Dietary Reference Intakes) reports. According to this report, adults (19 years and older) can consume 1 gallon (3.7 liters per day).

RESEARCH QUESTION

With this premise, I hope to conduct this field experiment to establish the effects of consuming 1 gallon of water per day among different age groups. The goal is to understand if there is any effect on physical performance, energy levels, weight loss through adequate water intake, ensuring the levels match recommended intake, as per DRI reports (http://www.nationalacademies.org/hmd/~media/Files/Activity%20Files/Nutrition/DRI-Tables/9_Electrolytes_Water%20Summary.pdf).

PURPOSE

This experiment will serve as a way to understand effects of drinking sufficient water on people's health conditions and to promote this healthy habit among all if it can be shown to have significant positive impacts on physical wellbeing of mankind.

EXPERIMENT DESIGN

The fact that DRI report recommends adults age 19+ to consume 1 gallon of water per day, we can recruit subjects with ease and above all, it is not something hard to do for the subjects as part of this study. We can recruit subjects of different age groups and study how the effect varies across the groups.

Treatment vs. Control

As a first step, we will send out a short survey to gather some preliminary information of subjects, which will include friends circle and family members, primarily in the age group of 30 to 50 years. It is essential to ensure that we are recruiting subjects who are drinking about 2 liters (8 glasses, each of 8 ounces) or less water a day on an average. The questionnaire will gather general information that includes age, demographics, food / eating habits, weight, physical activity, current water intake (approx.) etc. The respondents will be filtered based on their feedback and subjects who are almost similar will remain as part of the experiment. The subjects will be categorized into blocks based on the age group: 30-34, 35-39, 40-44, 45-50. This is done, so that we are performing the comparison within the group where there isn't too much variation due to age of the subjects. They are then further randomly assigned to 'treatment' and 'control' groups.

Although the purpose of recruitment will be shared to the prospective subjects, they will be informed that the recommended amount of water will be shared just before the start of the experiment. Subjects in the treatment group will be informed to consume one gallon of water per day, which is equivalent to about 16 glasses. Subjects in the control group will be informed to consume about 8 glasses of water or just continue to have their usual. Additionally, we can setup a reminder service to send periodic reminders if the subjects opt for that, so that it will remind them to consume about 1-2 glasses of water (based on the frequency they choose). Alternatively, we can offer them a chart that they can self-maintain, to record their daily water consumption (for subjects in both treatment and control groups). It is recommended that subjects consume water in a spread-out manner, throughout the day.

OUTCOME MEASURE

Some of the commonly listed benefits of drinking sufficient amounts of water include:

- Maximize physical performance
- Energy levels and brain function (as a result of good hydration)
- Prevent and treat headaches
- Help relieve constipation
- Help treat kidney stones
- Help prevent hangovers
- Help with weight loss

Although it may be hard to measure brain function in a short duration, we can certainly design questionnaires that can capture information around most of the above listed factors on a periodic basis (say twice a week). The primary outcome that we are interested is change in weight of the individual, compared to what it was at the start of the experiment. The reason for choosing this is because it is a metric that can be measured easily and is not subjective like instances of headaches / constipation issues. The information from the respondents is recorded for the duration of the experiment for subjects in both treatment and control groups. It is of utmost importance that the subject doesn't know

if they are in treatment or control group. Along with the personal information, it would be helpful to collect weather information in the area our subjects are from. As this study applies to folks in different age groups, we perform comparisons between the treatment and control groups in each of the blocks.

The key covariates to collect information on include demographics, gender, age, physical activity, work schedule, sleep pattern, weight and health information. As we are interested in understanding effect of drinking one gallon of water per day, we would use hypothesis testing to validate our experiment. The hypotheses in this case are:

H₀: No effect of consuming one gallon of water per day (ATE=0)

H_A: Drinking one gallon of water per day has a positive effect on health of individual (ATE > 0)

ANALYSIS

As the data involves recorded information for same set of subjects over time, we will use either fixed-effects or random-effects model. We will further review the recorded information and filter out data wherein the subjects haven't followed the stipulated guidelines, especially those in treatment group if they didn't maintain the 1-gallon per day consumption. In order to ensure that we have sufficient data (at least 100 observations) for analysis, we need to recruit 3-4 times the number of subjects initially within each set / age group.

Information recorded from the questionnaires will be consolidated and transformed as appropriate categorical / binary variables will be derived to suit definition of the model. The results will be compared between subjects in treatment and control groups to estimate the effects of drinking 1-gallon of water per day.

LIMITATIONS

Although consuming water is not an arduous task, it is unlikely that all subjects will follow a similar schedule or consume same amount of water. We expect there would be a small differential in the amount consumed by the subjects and our model has to be able to accommodate this. Also, as people are not used to drinking so much water in a day, they may forget to drink similar amounts every day. These factors have to be carefully analyzed in the responses captured and used appropriately in the analysis. In addition, people might also consume other beverages / alcoholic drinks, which could come in as potential confounding factors and they need to be handled accordingly.

REFERENCES

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