

Hydrate Philly – Analytic Plan

Aim 1: Assess the impact of the Hydrate Philly intervention on changes in center water use at drinking water sources.

Primary Outcome: Change in average gallons of water per day used at the center drinking water source as measured by flow meters over each 2-week measurement period.

Covariates: Covariates will include center size and a center level age category (3-5, 6-12, or 13-17 years) of the youth primarily served at the center as recorded by administrative data. Additional covariates that will be considered include: temperature, number of functional water fountains at baseline, the number of vending machines in the center, fountain location, program and visitor attendance, fountain water temperature, and number of days reporting water use. Covariates will be considered based on testing their association with the outcome variable and whether or not treatment and control sites differ.

Data Analysis: Distributions of the outcome variable will be assessed. To retain interpretability, transformations will be considered for heavily skewed or non-normal distributions data. Multivariable linear regression models will be used to compare changes in average gallons of water used per day over time between treatment and control centers. Generalized linear mixed effects models with individual days clustered within centers will also be considered. Each model will include variables for time (baseline, midpoint, post), treatment status (intervention, control), and their interaction (time x treatment). The interaction coefficient will be interpreted as the difference in change of average gallons per day in treatment centers compared to control centers. Models using only baseline and post datapoints will be run to examine the effect of seasonality due to midpoint data collection occurring during winter when recreation center programming was lower compared to baseline and post (summer time) and during times when weather temperatures were cooler. For all analyses, self-reported measures will be compared with analogous or proxy variables from research staff observations as a validity check.

Missing Data: Some centers may not report all measures for a full 10 days at each measurement period. Patterns of missingness will be examined in treatment versus control sites, including whether treatment status or water use was associated with differences in compliance with reporting measures. Centers that have at least 2 days of measures reported within each measurement period will have sufficient data to calculate average gallons of water used per day.

Secondary outcomes:

Proportion of Visitors Using Fountain. Change in the proportion of visitors using the fountain as measured by five 30-minute observations per site conducted only at post.

Time the Fountain is in Use. Change in the sum of time across five days of 30-minute observation periods that the fountain was on and in use as measured by research staff observations conducted only at post. Average time per day (instead of the sum of time) will also be considered pending reliability assessments.

Aim 2: Assess the impact of the Hydrate Philly intervention on changes in youth consumption of sugary beverages.

Primary Outcomes: Changes in the average number of sugary beverages per day brought to summer camp.

Covariates: Covariates will include center size, average youth attendance during summer camp, and the age category (3-5, 6-12, or 13-17 years) of the youth primarily served at the center. Additional covariates that will be considered (following covariate assessment described in Aim 1) include: temperature, number of functional water fountains at baseline, the number of vending machines in the center, fountain location, fountain water temperature, and number of corner stores within 3 blocks of the center.

Data Analysis: Distributions of the outcome variable will be assessed. To retain interpretability, transformations will be considered for heavily skewed data. Analytic models as described above will also be utilized for this outcome. The interaction coefficient will be interpreted as the difference in change of average count of sugary beverages per day in treatment centers compared to control centers. For all analyses, self-reported measures will be compared with analogous or proxy variables from research staff observations as a validity check.

Missing Data: Some centers may not report counts of sugary beverages for all 10 days at each measurement period. Patterns of missingness will be examined in treatment versus control sites, including whether treatment status or water use was associated with differences in compliance with reporting measures. Centers that have at least 2 days of measures reported within each measurement period will have sufficient data to calculate average sugary beverage counts per day.

Secondary outcomes:

Observed Sugary Beverages: Differences between treatment and control at post-intervention only of observed sugary drinks as measured by research assistant observations.

Secondary Aim 1: Assess the impact of the Hydrate Philly intervention on changes in the amount of single use beverage containers.

Primary Outcomes: Average number of single use containers (bottled water + sugary beverages) as measured by recreation center staff daily reports

Covariates: Covariates will include center size, average youth attendance during summer camp, and the age category (3-5, 6-12, or 13-17 years) of the youth primarily served at the center. Additional covariates that will be considered include: temperature, number of functional water fountains at baseline, the number of vending machines in the center, fountain location, fountain water temperature, and number of corner stores within 3 blocks of the center.

Data Analysis: Distributions of the outcome variable will be assessed. To retain interpretability, transformations will be considered for heavily skewed data. Analytic models as described in Aim 1 will also be utilized for this outcome. The interaction coefficient will be interpreted as the difference in change of average count of single use beverages per day (bottled water + sugary beverages) in treatment centers compared to control centers. For all analyses, self-reported measures will be compared with analogous or proxy variables from research staff observations as a validity check.

Missing Data: Some centers may not report counts of bottled water and sugary beverages for all 10 days at each measurement period. Patterns of missingness will be examined in treatment versus control sites, including whether treatment status or water use was associated with differences in compliance with reporting measures. Centers that have at least 2 days of measures reported within each measurement period will have sufficient data to calculate average sugary beverage counts per day.

Secondary outcomes:

Reusable water bottles. Counts of reusable water bottles used during the summer camp program as measured by recreation center staff daily reports

Single Use Bottles: Differences between treatment and control at post-intervention only of observed single-use bottles as measured by research assistant observations.

Weight of trash: Changes in the average weight of trash per day during summer camp as measured by recreation center staff daily reports.

Secondary Aim 2: Assess the impact of the Hydrate Philly intervention on changes in center staffs' consumption of sugary beverages.

Primary Outcomes: Change in frequency of staff consumption of sugary beverages (i.e., number of days in past 30 days with sugary beverages consumed) as measured by the BEVQ-15 survey assessing past 30 day recall of overall beverage intake.

Covariates: Covariates will include the number of functional water fountains at baseline, the number of vending machines in the center, fountain water temperature, and number of corner stores within 3 blocks of the center. Additional covariates will be considered including temperature and fountain water flow rate.

Data Analysis: Distributions of the outcome variable will be assessed. To retain interpretability, transformations will be considered for heavily skewed data. Linear mixed effects models with staff clustered within center will be used. Interaction terms as described in Aim 1 will be used. The interaction coefficient will be interpreted as the difference in change of frequency of staff sugary beverage consumption in treatment centers compared to control centers.

Missing Data: Centers may have different numbers of consented staff members throughout the study period as a function of center staffing patterns. Therefore, both longitudinal and cross-sectional analyses will be considered depending on staff turnover patterns. Sensitivity analyses will examine the impact of only including the primary staff liaison's SSB consumption (i.e., one respondent per center). Patterns of missingness will be examined. Complete case analyses at the individual level as well as at the center level will be considered under the MCAR assumption, and multiple imputation will be considered for high levels of missing data under the MAR assumption with repeated measures from other time periods as predictors of missingness.

Secondary outcomes:

Total ounces. The total ounces of SSBs consumed (i.e., calculated as the typical ounces consumed multiplied by the frequency of consumption in the past 30 days) will be examined as a secondary measure using the BEVQ15 survey.

Daily SSB consumption. The odds of being a daily SSB consumer (i.e., drank SSBs on 30 out of the past 30 days) will be examined using logistic regression.

Secondary Aim 3: Assess the impact of the Hydrate Philly intervention on changes in the amount and severity of fountain related maintenance issues.

Primary Outcomes: Average maintenance rating of scale with 8 items (4-point scale) at post.

Covariates: Covariates will include center size, average youth attendance during summer camp, the age category (3-5, 6-12, or 13-17 years) of the youth primarily served at the center, and baseline levels of center water use. Additional covariates that will be considered include: temperature, number of functional water fountains at baseline, age of the center, number of newly added water access points (i.e., adding a new fountain where there was not one at baseline), and availability of a full-time maintenance staff person at the center.

Data Analysis: Distributions of the outcome variable will be assessed. A range of 2-4 completed surveys will be available for each site and will be considered both as a single measure (i.e., averaged to form one center level measure of fountain maintenance) and repeated measures (i.e., repeated surveys nested within center) dependent on survey reliability and within center variability (Cronbach's alpha; intraclass correlations). Multiple linear regression will be used to examine center level maintenance ratings at post, adjusting for covariates. Linear mixed effects models with repeated maintenance ratings clustered within center will be considered. The binary treatment variable will be interpreted as the average difference in maintenance ratings between treatment and control sites post-intervention.

Missing Data: There will be no center level missing data. Patterns of missing surveys for repeated measures within each center will be examined and will inform whether averaging the repeated surveys or treating them as repeated measures is most appropriate.

Secondary outcomes:

Routine cleaning. The three items measuring routine cleaning (removing dirt/dust, removing trash, wiping down fountain) will be examined separately to investigate whether intervention sites engage in more or less routine cleaning compared to control sites at post.

Maintenance problems. The five items measuring more severe maintenance issues (removing graffiti, removing bodily fluids, clogging, flooding, or removing gum/food) will be examined separately to investigate whether intervention sites have more or fewer major maintenance problems compared to control sites at post.

Time spent maintaining. The typical time spent maintaining the fountains will be examined to investigate whether intervention or control sites report spending more time maintaining fountains.

Secondary Aim 4: Assess the impact of the Hydrate Philly intervention on changes in center attendance and number of visitors.

Primary Outcomes:

- Average number of program youth as measured by recreation center staff daily reports
- Average number of total visits observed in the fountain area as measured by research assistant observations

Covariates: Covariates will include center size, average youth attendance during summer camp, and the age category (3-5, 6-12, or 13-17 years) of the youth primarily served at the center. Additional covariates that will be considered include: temperature, number of functional water fountains at baseline, age of the center, and population density (i.e., residents per square mile in the recreation center's census tract).

Data Analysis: Distributions of the outcome variable will be assessed. Analytic models as described in Aim 1 will also be utilized for this outcome. The interaction coefficient will be interpreted as the difference in change of program attendance (or total visits) in treatment centers compared to control centers.

Missing Data: There will not be any missing data for these outcomes as program attendance is department required reporting for centers and observations will be completed by study staff at all centers.