Clinical Trial Registration PRS Cover Page

Document:
Analysis Plan

Official Title:
Personalized Mobile Intervention to Reduce Exposure to Endocrine Disrupting Chemicals (EDCs) in Women of Child-Bearing Age and Their Partners

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Analysis Plan, Sample Size and Power

This effort will be led by Million Marker's chief statistician and data scientist Dr. Eric Daza.

For our primary hypothesis (Aim 1), we will test and validate this first-of-its-kind mobile EDC reduction program (MM *Detect and Detox* kit) in a prospective longitudinal cohort intervention trial. We hypothesize that participants will have a reduction in EDC exposures after intervention.

Our **outcome variables** are concentrations of urinary metabolites of bisphenols (BPA, BPS, BPF), phthalates (MBP, MEP, MEHP, MEHHP, MECPP), parabens (methyl, ethyl, propyl and butyl paraben) and oxybenzone (BP-3) at baseline (pre-intervention) and second test (post-intervention, after using Million Marker's *Detect and Detox* kit, receiving the rest report with actionable insights). We will examine the distribution and concentrations of each of eight chemical analytes in urine to determine geometric means, medians, percentiles and ranges of exposures. We expect the creatinine-adjusted urinary concentration of these chemicals to beatic log-normally distributed. We will compare the geometric means with those reported in the NHANES study. We will include BMI, age, gender, diet, education and household income as **covariates**. Participants' dietary patterns will be captured in the exposure journal prior to sample collection by looking at their consumption of packaged food and times eating out as these are important culprits of EDC exposures. Other covariates have been collected as part of their participation in the Healthy Nevada Project. We will conduct an **intent-to-treat analysis**, such that all participants will be included in the post-intervention analysis. The primary outcomes are the mean pre-post (first and second tests) differences in creatinine-adjusted concentration levels per analyte (i.e., the mean of the within-subject differences in analyte values from baseline/first test to post-intervention/ second test).

In terms of **sample size and power**, an intervention study conducted by Harley et al.[37] showed statistically significant reduction in urinary metabolite concentration of similar EDCs pre-post intervention in adolescent girls (n=100). However, we did not find any analyte standard deviations (SDs) reported in Harley et al. We based our power and sample size calculations on the data from Rudel et al.,[52] a dietary intervention to reduce EDCs (n=20), where the standard deviation of the difference in urinary metabolite concentrations before and after the intervention was 0.4. Our power calculation indicates that a sample size of 100 will provide 80% power to detect a 10% geometric mean difference in concentrations at baseline (pre-intervention) and second test (post-intervention) with a two-sided $\alpha=0.05$.

For our secondary hypothesis (Aim 2)**,** we will assess changes in participants' environmental health literacy, attitudes, knowledge, and behaviors after using MM's products and services. We hypothesize that participants' environmental health literacy, attitudes, knowledge and behaviors will change after using MM's *Detect and Detox* kit and receiving their reports and personalized recommendations. We will first generate summary statistics on participants' responses. Changes will be calculated based on paired values of individual responses. We will analyze percentage changes by individual responses as well as response categories (attitude, knowledge and behaviors). A Chi-square goodness of fit test will be used for pre-post comparisons. For pre-post category comparisons within individual participants, the Wilcoxon rank-sum test will be used to compare the differences.