Analysis Plan

Project Name: Increasing School Attendance in Seattle
Project Code: 1809
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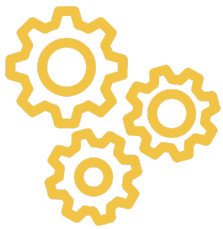

Overview

This project consists of three distinct interventions targeting two (overlapping) populations of interest – students who are Seattle Housing Authority (SHA) residents and Seattle Public Schools (SPS) students with poor records of prior attendance – and two time periods – the fall and spring semesters in the 2018-2019 academic year.

Fall Interventions

1. SHA Fall Letter versus Postcard: SHA students were randomly assigned to get a postcard or a letter describing the importance of good attendance for the first 20 days of the school year.
2. SPS Fall Robocall: SPS students with prior poor attendance were randomly assigned to be sent a robocall describing the importance of good attendance or to a control group.

Spring Intervention

3. SHA Spring Text Messages: SHA students were randomly assigned to be sent a series of text messages encouraging good attendance or to a control group. Students selected to be sent text messages were randomly assigned to a group with a gain frame or a loss frame.

Data and Data Structure

This section describes variables that will be analyzed, as well as changes that will be made to the raw data with respect to data structure and variables.

Outcome Variables to Be Analyzed:

Using data from Seattle Public Schools (SPS) and Seattle Housing Authority (SHA), we will analyze school attendance patterns. Specifically, we will examine both the number of days missed and the percentage of days missed.

Transformations of Variables:

Absences appear in the data as the proportion of the school day that was missed for each day of school. The total number of days absent is the sum of all absences, including partial absence days over the relevant time period for each intervention. Intervention 1 will take the total number of

days absent over the first 20 days of the fall semester; Intervention 2 will use the total number of days absent over the fall semester; Intervention 3 will take the total number of days absent over the spring semester.

Additionally, for Interventions 2 and 3 we will generate our percentage of days missed variable by taking the total number of days missed over the total days enrolled. The total days of enrollment are calculated by SPS and included as a field in the data. This transformation accounts for any delayed enrollment in school or those students exiting the school district prior to the end of the spring semester.

All other data provided by SPS will be used in the raw form provided.

Imported Variables:

SHA will provide SPS with an indicator for the treatment assignment that will be matched to SPS data by the SPS ID.

For the planned analyses for the OES project abstract, we do not plan to import any additional sources of data to conduct the analysis. For follow-up and exploratory analyses, we will gather publicly available school-level data, from the National Center for Education Statistics (NCES). Data from NCES will be matched using a school level NCES ID provided by Seattle Public Schools.

Transformations of Data Structure:

The primary measures of school attendance and enrollment days will be aggregated from the daily attendance files provided by SPS.

Data Exclusion:

The analysis will exclude any students who were initially included in our randomization file, but failed to have an active enrollment record within SPS during the spring semester. We will formal check that non-spring enrollment is not associated with assignment to treatment.

Treatment of Missing Data:

Since SPS maintains a comprehensive administrative student dataset, we do not anticipate have significant missing data that would warrant any adjustments or special treatment. Data on households who opt-out of receiving the text message treatment will be included in the analysis.

Statistical Models & Hypothesis Tests

This section describes the statistical models and hypothesis tests that will make up the analysis – including any follow-ups on effects in the main statistical model and any exploratory analyses that can be anticipated prior to analysis. Each of the three interventions will follow the same plan, unless otherwise noted, with the outcomes of interest differing slightly by intervention.

Statistical Models:

Randomization Test

Before continuing with analysis, we will check the initial randomization by conducting d^2 omnibus balance tests using observable characteristics — in particular, we will test for balance on demographic characteristics (i.e. race/ethnicity, gender), prior school attendance, and prior academic performance.

Planned Analysis: OES Abstract

The planned analysis for the OES abstract will examine the intent-to-treat (ITT) effect between the control group (no robocall) and the treatment group (robocall), using ordinary least squares (OLS) regression and the Lin estimator[1] as specified in Equation 1 below, with HC2 standard errors:

$$y_i = \alpha + \beta_1 T_i + z_i + T_i(z_i - \bar{z}) + e_i \quad (1)$$

Where y_i is the outcome of interest, T_i is a binary treatment indicator that signifies whether a student lives in a household that was assigned to the treatment group, z_i is a vector or individual covariates, $T_i(z_i - \bar{z})$ is a set of treatment-covariate interactions on the mean centered covariates (where $\bar{z}$ is vector of sample average covariates), and e_i is an idiosyncratic error term.

Primary Outcomes of Interest

Intervention 1: SHA Fall Letter versus Postcard

- Total number of days absent over the first 20 days of the fall semester

Intervention 2: SPS Fall Robocall

- Total number of days absent over the fall semester
- Percent of days missed over the fall semester

Intervention 3: SHA Spring Text Messages

- Total number of days absent over the spring semester
- Percent of days missed over the spring semester

[1] Lin, Winston. 2013. Agnostic notes on regression adjustments to experimental data: Reexamining Freedman's critique. *The Annals of Applied Statistics* 7 (no. 1): 295-318.

Inference Criteria, Including Any Adjustments for Multiple Comparisons:

This project will use standard inference criteria without any adjustment for multiple comparisons. This project will use two-tailed tests and three threshold *p*-values: 1%, 5%, and 10%. We will report estimates as statistically significant if they have a *p*-value of less than or equal to 0.05.

Limitations:

The primary limitation of this study is the limited sample size of SHA households. The study is not powered to detect small changes in the number of days missed for the letter versus postcard intervention. The text message study is designed to be able to detect a 1.24 day change in the number of days absent during the spring semester. While the size of the SPS sample is larger, the primary limitation of Intervention 2 is the likely effect size of a single priming robocall.

Additional Analyses

Intervention 2: SPS Fall Robocall

Follow-Up Analyses:

Treatment on the Treated Analysis

Our SPS partners capture data on if receipt of the robocall, if it was delivered to an inactive phone number, if a voicemail was left, or if a call was received by an active caller. To this end, we will estimate a treatment-on-the-treated (ToT) effect using a two-stage least squares (2SLS). Specifically, we will instrument for an indicator variable for accessing the treatment (i.e. actively received the robocall) using an indicator variable for assignment to treatment (i.e. assigned to receive the robocall).

Timing Effects

Our SPS partners are interested in understanding the potential phase-out effects of the intervention. To this end, we will examine the treatment effects on attendance in ten day increments (ie. 0-10 days, 11-20 days, etc.).

Follow-Up Analyses:

We also hypothesize that the response to the intervention will vary by subgroups of students. To this end, we will examine heterogeneous treatment effects by the following subgroups:

1) Prior school attendance levels (moderately chronic, chronic, extremely chronic)
2) Race/Ethnicity
3) Gender
4) Grade level (elementary, middle, high school)

Inference Criteria, Including Any Adjustments for Multiple Comparisons:

These analyses will use standard inference criteria without any adjustment for multiple comparisons. This project will use two-tailed tests and three threshold *p*-values: 1%, 5%, and 10%. We will report estimates as statistically significant if they have a *p*-value of less than or equal to 0.05.

Intervention 3: SHA Spring Text Messages

Follow-Up Analyses:

Treatment on the Treated Analysis

SHA captures data on delivery of text messages; however, they do not capture read receipt information. To this end, we will estimate a treatment-on-the-treated (ToT) effect using a two-stage least squares (2SLS). Specifically, we will use random assignment as an instrument for an indicator variable for accessing the treatment (i.e. receiving the text message) . We believe that random assignment to be sent a text message and non-random receipt of a text message and school absences satisfy the criteria for valid identification of a LATE or CACE or oT effect because (1) students are unlikely to share the messages with each other (the SUTVA condition), (2) the messages can only influence absences if they are received (the exclusion condition), (3) the messages can only increase the probability of receipt of the messages and can only decrease absences (the monotonicity condition), (4) the assignment to messages should be strongly correlated with receipt of messages (the strong instrument condition – without which 2SLS produces inconsistent standard errors), and (5) assignment to messages is random (the ignorability of instrument condition).[2]

We also hypothesize that the response to the intervention will vary by subgroups of students. To this end, we will examine heterogeneous treatment effects by the following subgroups:

1) Prior school attendance levels (moderately chronic, chronic, extremely chronic)
2) Race/Ethnicity
3) Gender
4) Grade level (elementary, middle, high school)
5) Number of siblings in the household.

Exploratory Analysis:

The treatment group was divided into loss and gain framed text messages. Our primary analysis will treat through groups as one single treatment group; however, our exploratory analysis will test any differences between our two groups. This analysis will not be powered to detect small changes in attendance; however, we will rely on a combination of descriptive and estimates effects to tease out any differences that may be present.

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[2] Angrist, Joshua D., Guido W. Imbens, and Donald B. Rubin. 1996. Identification of causal effects using instrumental variables. *Journal of the American Statistical Association* 91 (no. 434): 444-455.

This project also proposes to use an event study that examines the distribution of attendance as it related to the dates of the text messages were sent. This will allow the analysis to examine if each text message had a short-term or lasting impact on attendance. Comparison will be made on the relative impact of each text message to see if there is a desensitization to the four messages.

Finally, we will conduct various school-level subgroup analyses (i.e. Title I vs. Non-Title I) of the treatment group. School-level data for this analysis will come from SPS and will align with strategic priorities for SPS and SHA.

Inference Criteria, Including Any Adjustments for Multiple Comparisons:

These analyses will use standard inference criteria without any adjustment for multiple comparisons. This project will use two-tailed tests and three threshold *p*-values: 1%, 5%, and 10%. We will report estimates as statistically significant if they have a *p*-value of less than or equal to 0.05. For our exploratory analyses, which are more underpowered, we will adjust for multiple comparisons using the Bonferroni adjustment.

Given the very small cost of the intervention and the large educational benefits of increasing postsecondary enrollment intensity, any measurable effect is likely policy relevant.