TODO: Trial Name

TODO: Name and institution(26 Aug 2024)

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# Introduction

This document presents methods and results for the TODO trial.

# Methods

We performed a prespecified exploratory analysis to identify time-varying covariates that may be associated with the primary outcome and assess the sensitivity of the treatment effect estimates to these covariates. We used partialing-out lasso Poisson regression (Stata's xpopoisson command) with the lasso penalty chosen using 10-fold cross-validation to select among the following covariates: indoor relative humidity; the school's existing ventilation system setting (low or high); weekday; baseline morning PM2.5 (modelled on the log scale); number of students attending class; and mean outdoor temperature. The model would not converge when we attempted to account for undefined lagged PM2.5 values, or if indoor temperature was included. We could not include indoor CO2 or sound level because a large number of values were missing for these variables.

# Results

## Estimates of treatment effect for the primary and secondary analyses

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Estimates of treatment effect for the primary and secondary outcomes | | | | | | | | | | | |
|  | None | Ceiling | Portable | Ceiling | | | Portable | | | Superiority of air purification | Noninferiority (portable vs ceiling) |
|  | Mean | Mean | Mean | RR | [95% | CI] | RR | [95% | CI] |  |  |
| PM2.5 | 1.03 | 0.86 | 0.55 | 0.85 | [0.65 | 1.12] | 0.70 | [0.57 | 0.85] | <0.001 | <0.001 |
| VOC | 192.39 | 197.78 | 202.85 | 1.05 | [0.99 | 1.12] | 1.03 | [0.90 | 1.18] | 0.136 | <0.001 |
| *Sample means are unadjusted and do no account for the crossover design. Rate ratios (RRs) are adjusted for the crossover design, sensor type, first-order autocorrelation, and clustering within classroom. RR < 1 disfavors the reference (no air purification).* | | | | | | | | | | | |

## Exploratory per-protocol estimates of treatment effect for the primary and secondary analyses

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Per-protocol estimates of treatment effect for the primary and secondary outcomes | | | | | | | | | | | |
|  | None | Ceiling | Portable | Ceiling | | | Portable | | | Superiority of air purification | Noninferiority (portable vs ceiling) |
|  | Mean | Mean | Mean | RR | [95% | CI] | RR | [95% | CI] |  |  |
| PM2.5 | 1.03 | 0.86 | 0.55 | 0.86 | [0.64 | 1.14] | 0.68 | [0.56 | 0.83] | <0.001 | <0.001 |
| VOC | 192.39 | 197.78 | 202.85 | 1.07 | [0.99 | 1.15] | 1.03 | [0.90 | 1.18] | 0.118 | <0.001 |
| *Sample means are unadjusted and do no account for the crossover design. Rate ratios (RRs) are adjusted for the crossover design, sensor type, first-order autocorrelation, and clustering within classroom. The estimation sample was restricted to exclude measurements made when air purifiers were not running as planned. RR < 1 disfavors the reference (no air purification).* | | | | | | | | | | | |

## Exploratory time-varying covariate adjusted analysis

The time-varying covariates selected by lasso were indoor relative humidity, weekday, baseline morning PM2.5, and the school's existing ventilation system setting.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time-varying covariate adjusted estimates of treatment effect for the primary outcome | | | | | | | | | | | |
|  | None | Ceiling | Portable | Ceiling | | | Portable | | | Superiority of air purification | Noninferiority (portable vs ceiling) |
|  | Mean | Mean | Mean | RR | [95% | CI] | RR | [95% | CI] |  |  |
| PM2.5 | 1.03 | 0.86 | 0.55 | 0.94 | [0.79 | 1.12] | 0.70 | [0.64 | 0.76] | <0.001 | <0.001 |
| *Sample means are unadjusted and do no account for the crossover design. Rate ratios (RRs) are adjusted for the crossover design, sensor type, first-order autocorrelation, the time-varying covariates selected by the cross-validated lasso, and clustering within classroom. RR < 1 disfavors the reference (no air purification).* | | | | | | | | | | | |

TODO: Add results.

# Discussion

The results of the prespecified exploratory analysis should be interpreted cautiously because we were unable to account for undefined lags and could not include all time-varying covariates. Further, it was not possible to use a negative binomial model for this analysis, as was selected over the Poisson model on the basis of AIC in the main analyses, because Stata does not currently provide xpopoisson-like commands for negative binomial models.

# References

TODO: Add references.

# Appendix 1 — Protocol Deviations

TODO: Describe any protocol deviations.

# Appendix 2 — Full Regression Results

TODO: Present full regression tables.