What is the effect of facility-level characteristics on continuation of contraceptive use?

A causal inference approach using approximate balancing weights

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In a nutshell…

- Does the facility where a woman receive FP services make any difference on contraceptive discontinuation?

    - Can we say, for example, that receiving FP in one facility is better than receiving FP somewhere else?

- We have data on facilities and their clients from Performance Monitoring for Action (PMA) in Kenya

- It is difficult to compare outcomes across facilities because facilities serve different populations.

- We use direct standardization to estimate the outcome we would have observed if all facilities served the same population (part 1)

- We check for "performance drivers" (part 2)

Data: Performance Monitoring for Action (PMA) Project Kenya 2020

- Sample of 399 facilities: facility characteristics (e.g., staff; LARC/SARC; stockouts; fees for FP services)

- Sample of 4,283 women 15-49 who visit one of these facilities for FP reasons: women's background characteristics (e.g., marital status, education, births, wealth)

- 90% follow up 4-6 month by phone: contraceptive "dynamics" (e.g., adoption, discontinuation, switching)

LARC: Long-Acting Reversible Contraception;
SARC: Short-Acting Reversible Contraception

The question: when looking at contraceptive discontinuation, does the FP facility makes any difference?
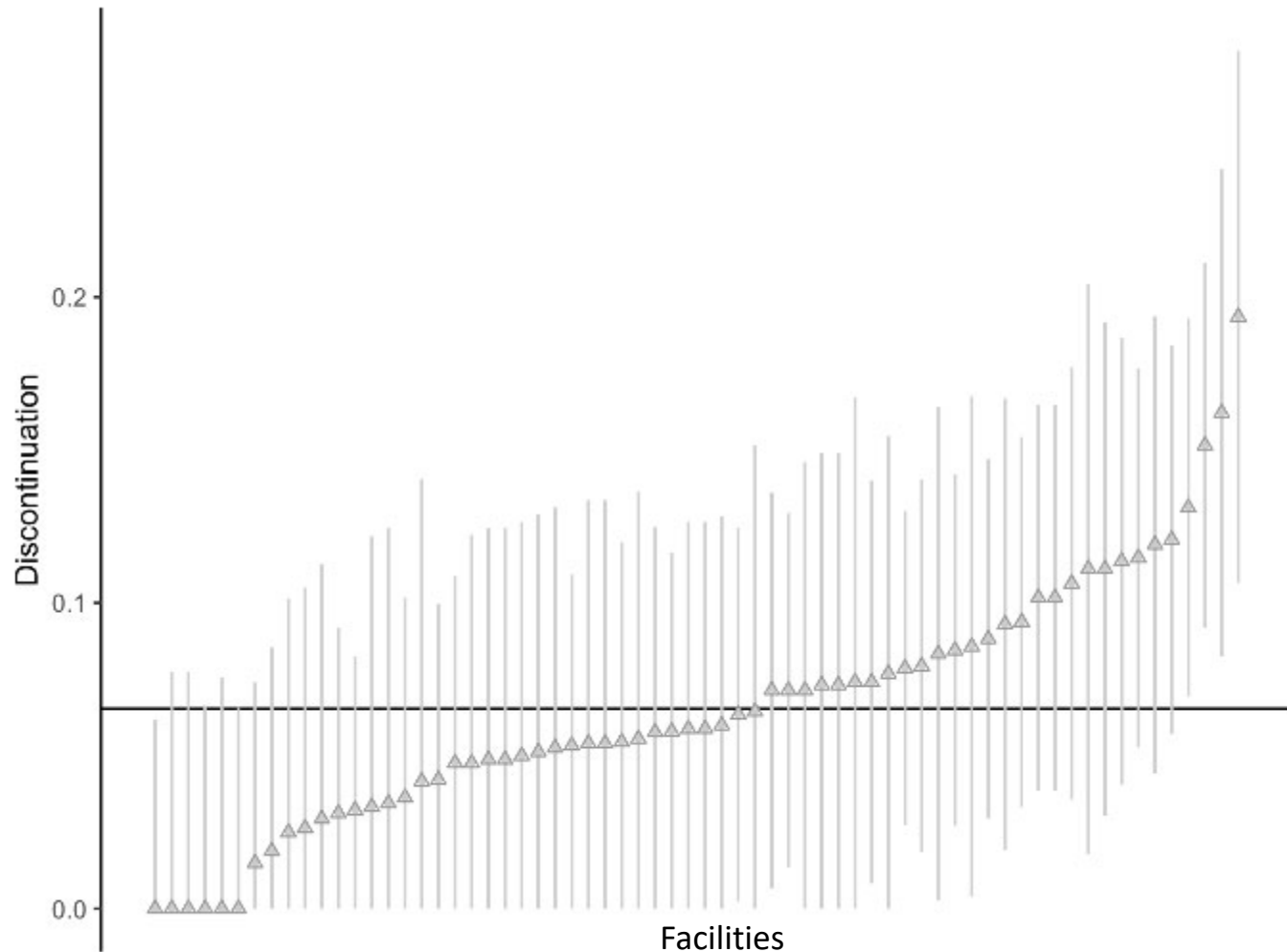
- A woman is considered to discontinue contraceptive use if at follow up she indicates that

  - she is no longer using the contraceptive received at baseline,

  - she has not switched to an alternative contraceptive,

  - she has no intention of becoming pregnant.

- Discontinuation rates across facilities ranges from 0 to about 20%

The issue: Why cannot we compare observed discontinuation across facilities?
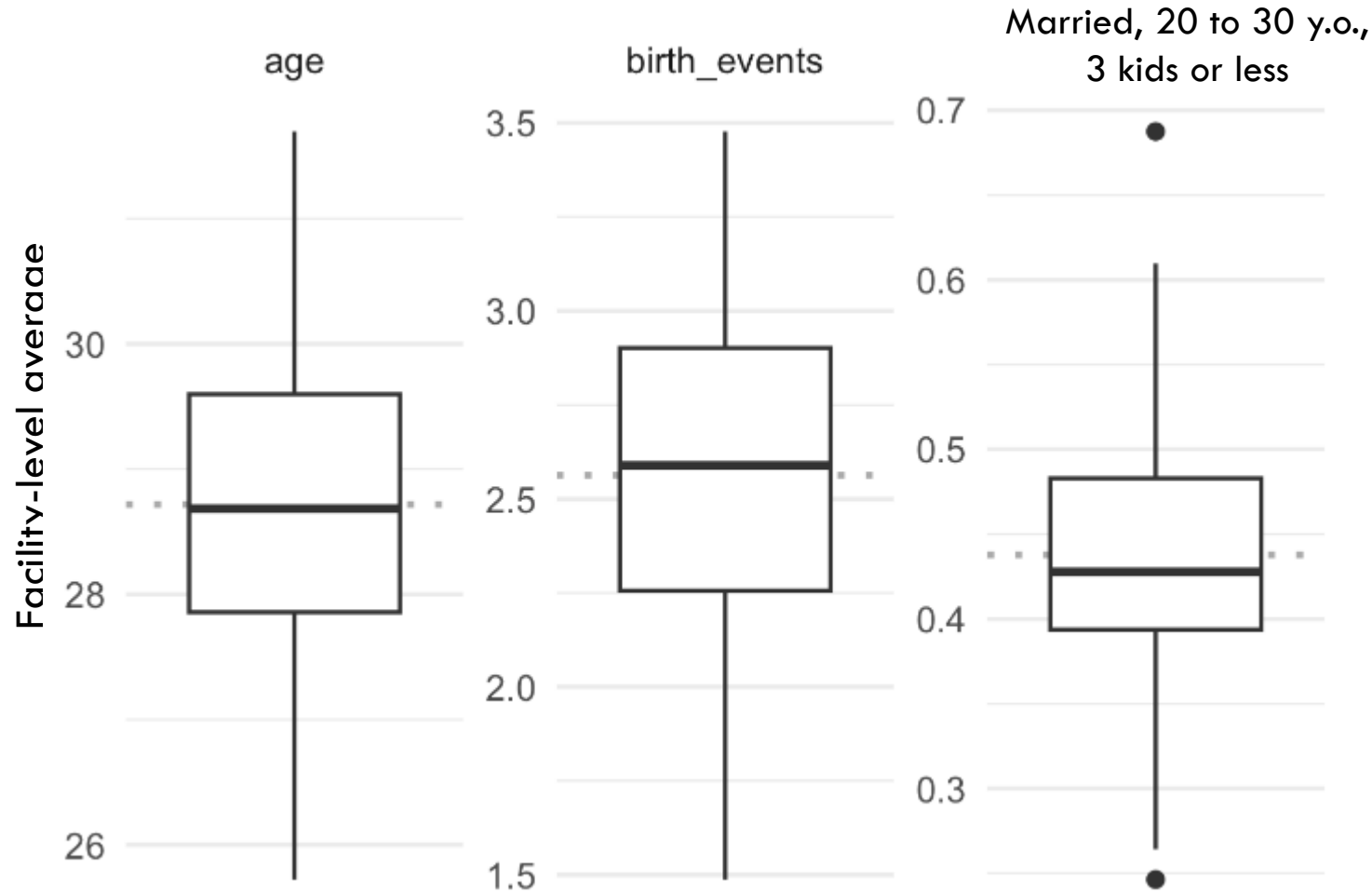
Differences in outcomes may reflect differences in composition of population served ("client-mix")

A counterfactual target: What would be the discontinuation had all facilities served the same population?

- For facility j, we observe the discontinuation among the women who attended that facility

$$\mu_j = \frac{1}{n_j} \sum_{Z_i=j} m_j(X_i)$$

observed discontinuation

- What we want is a **counterfactual**: what would be the discontinuation in facility j if it had served all women in our sample?

$$\mu_j^* = \frac{1}{n} \sum_{i=1}^{n} m_j(X_i)$$

counterfactual discontinuation

m_j: *expected discontinuation in facility j for a woman with x characteristics*

X_i: *vector of characteristics of ith woman*

Z_i: *facility indicator for the ith woman*

n_j: *number of clients in facility j*

n: *total number of clients*

Approach: How to estimate standardized discontinuation rates?

- We use an approach frequently used to address survey nonresponse

  - Our estimate is a weighted average of observed outcome in each facility

  - The weights (w) are chosen so that the distribution of covariate characteristics in each facility mimics the overall distribution

- Before weighting we clustered facilities to increase sample size

- After weighting we use regression to adjust remaining imbalances
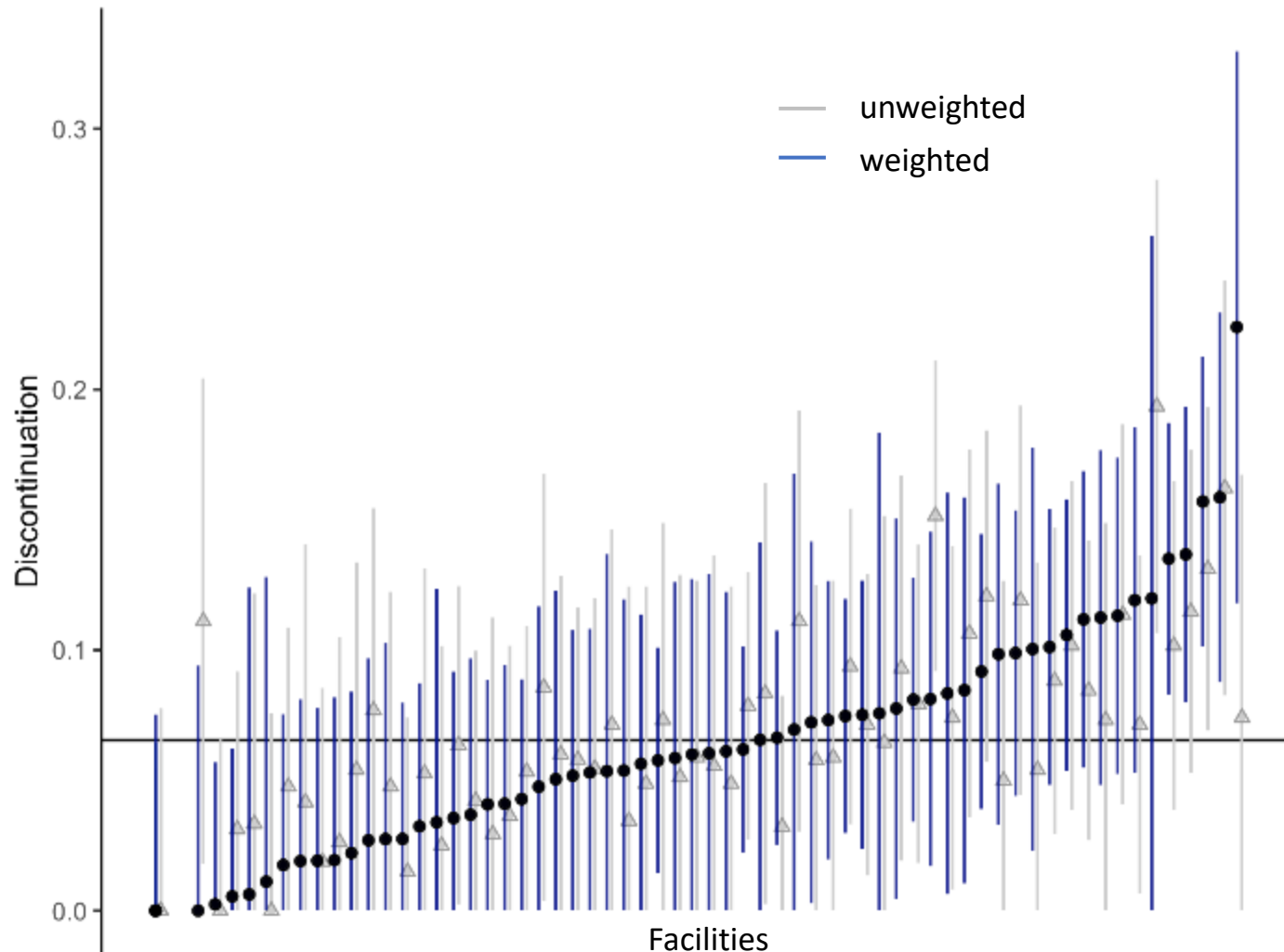
$$\hat{\mu}_j^* = \sum_{Z_i=j} \hat{w}_i Y_i \, ,$$

estimated counterfactual discontinuation

Results: Did weighting decrease covariate imbalance across facilities?
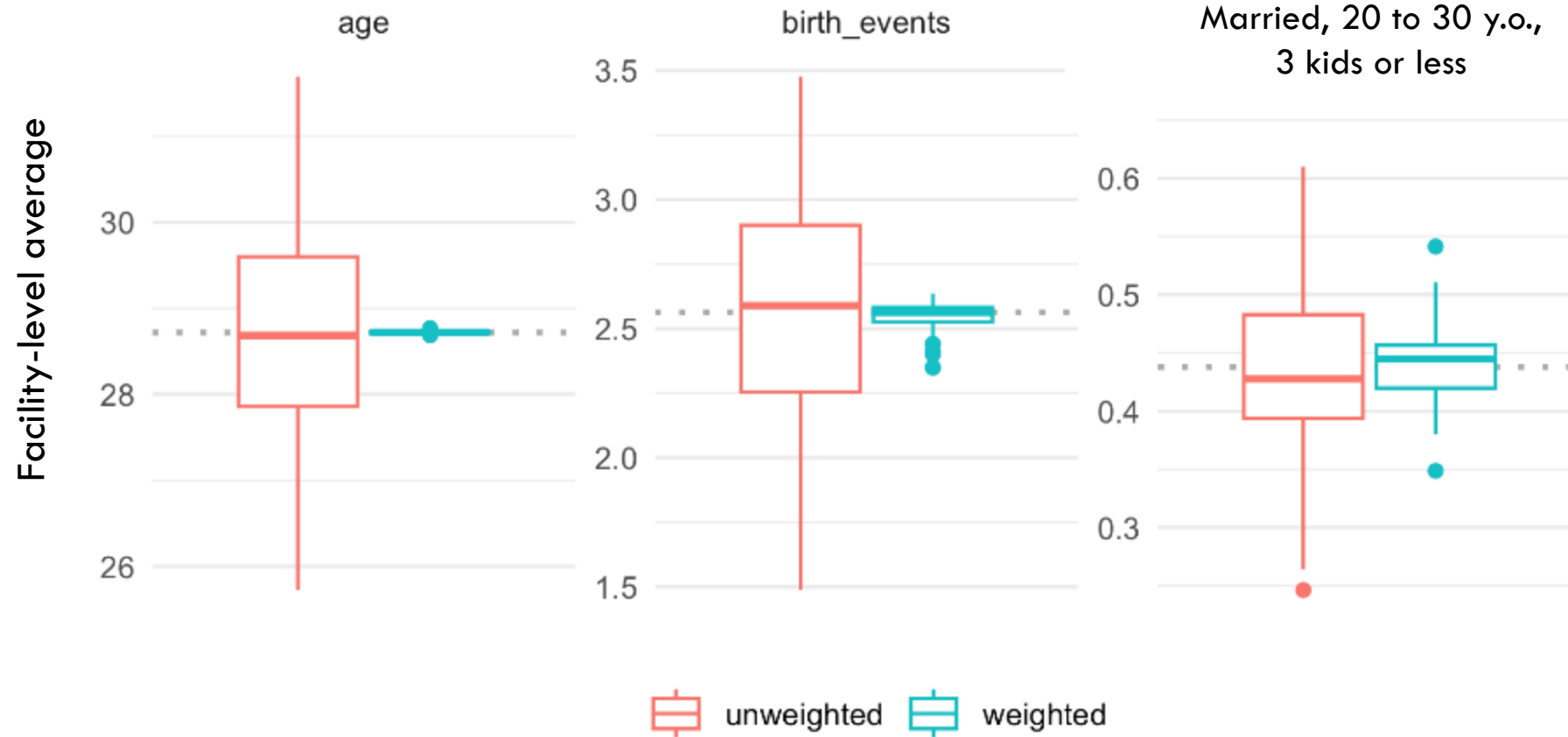
→ After weighting, across-facility variation in woman characteristics reduces substantially

Results: Do standardized discontinuation rates vary across facilities?

- Standardized discontinuation vary across facilities but CIs overlap
- The Q-statistic is used in meta-analysis to detect "true" heterogeneity
  - If there is not true variation $Q \sim \chi^2_{J-1}$
- Q =113, p-value < .001
- Estimated standard deviation across facilities .027 [95%CI: .018-.038]

2nd question: what facility-level characteristics are predictive of these differences?

- Meta-regression of estimated standardized outcome on facility-level characteristics

- We used nonparametric regression to capture nonlinear relationships and interactions

- Bayesian Additive Regression Tree (BART): combination of many simple trees to create a strong model

$FP\ fee$

no   yes

5%

$Staff\ per\ visits < .2$

no   yes

10%   15%
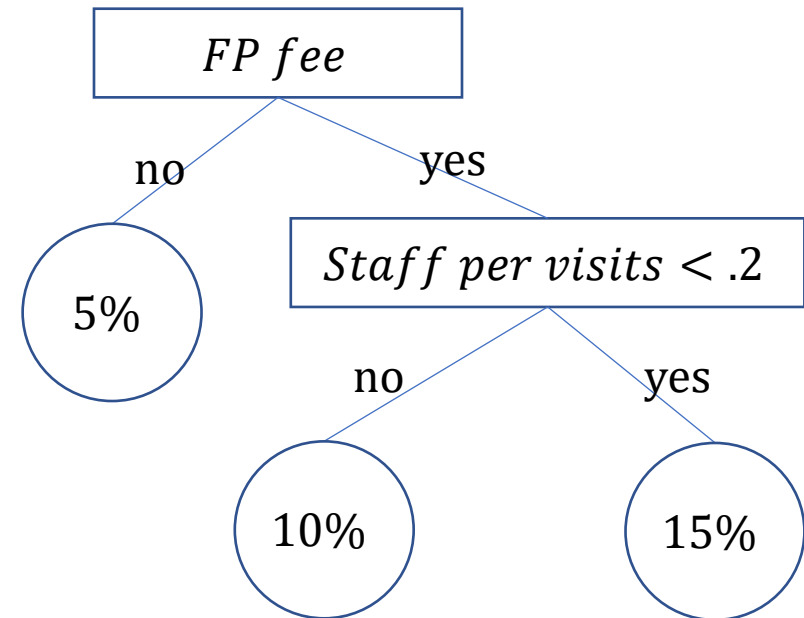
Example of tree identifying 3 groups with different expected discontinuity based on 2 facility-level characteristics

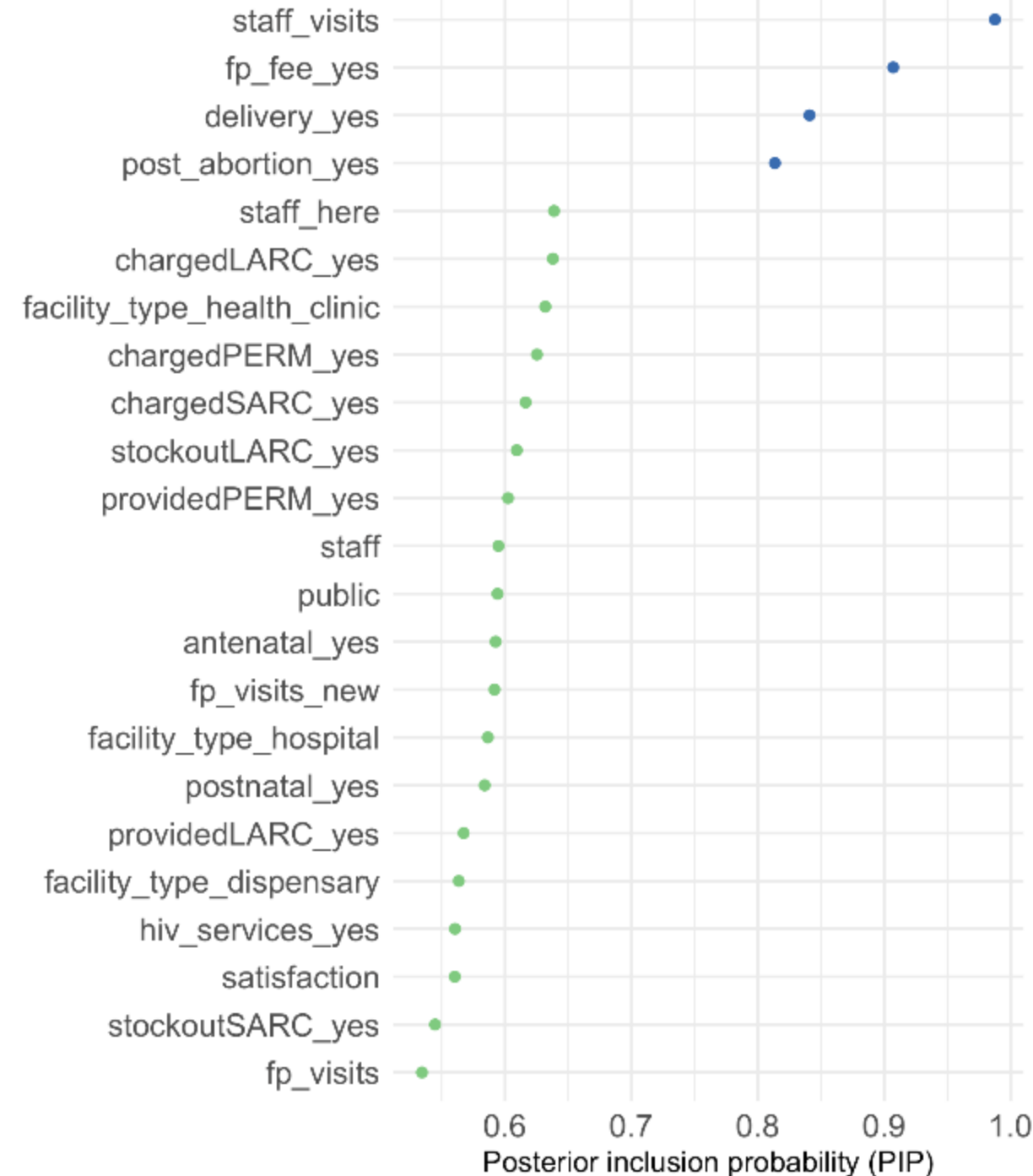# Preliminary results: identifying important characteristics

- Posterior inclusion probability (PIP): probability of using variable in the ensemble

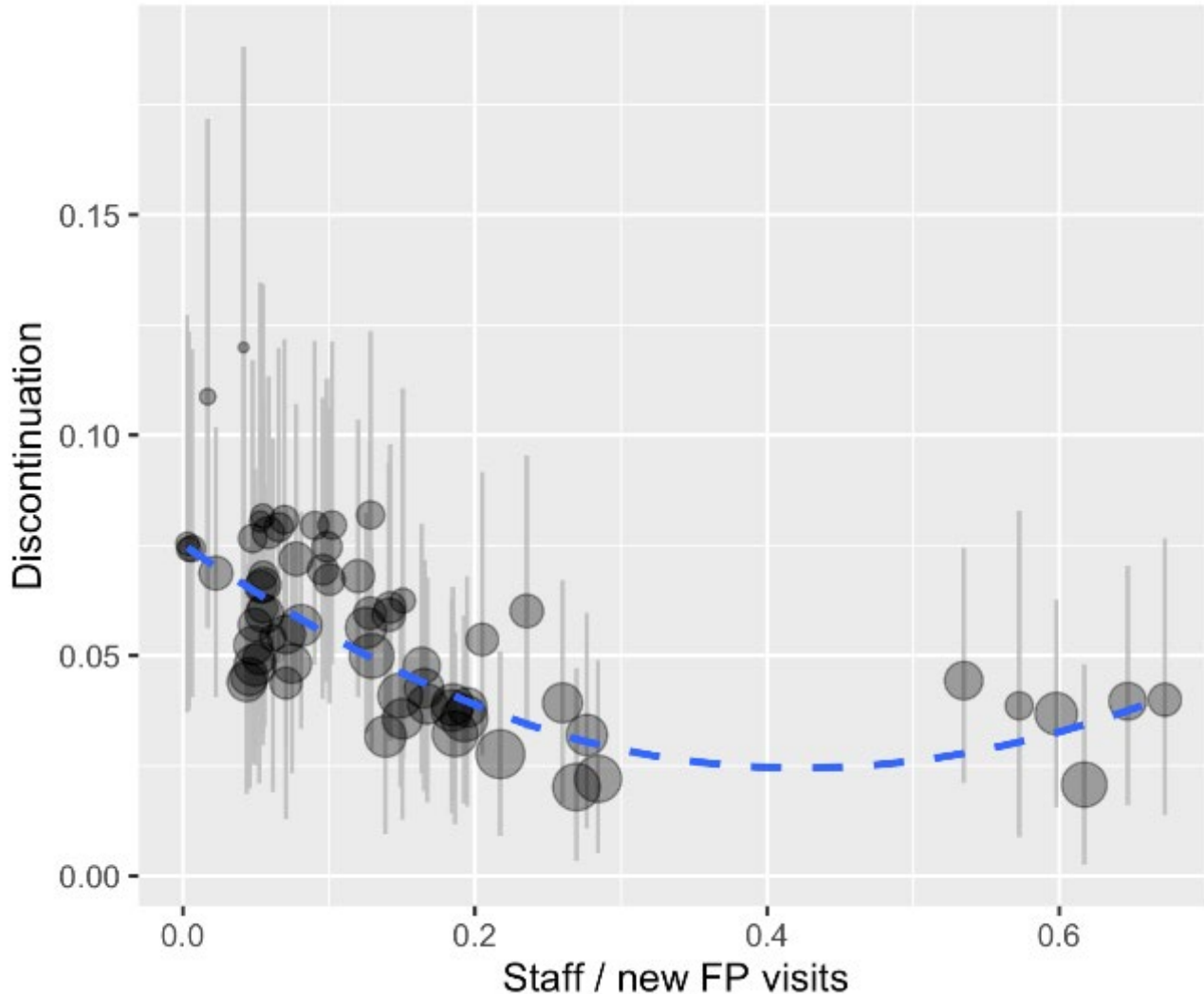- 4 predictors appeared to stand out with PIP > 80% (colored in blue)

Legend:

LARC: Long-Acting Reversible Contraception

SARC: Short-Acting Reversible Contraception
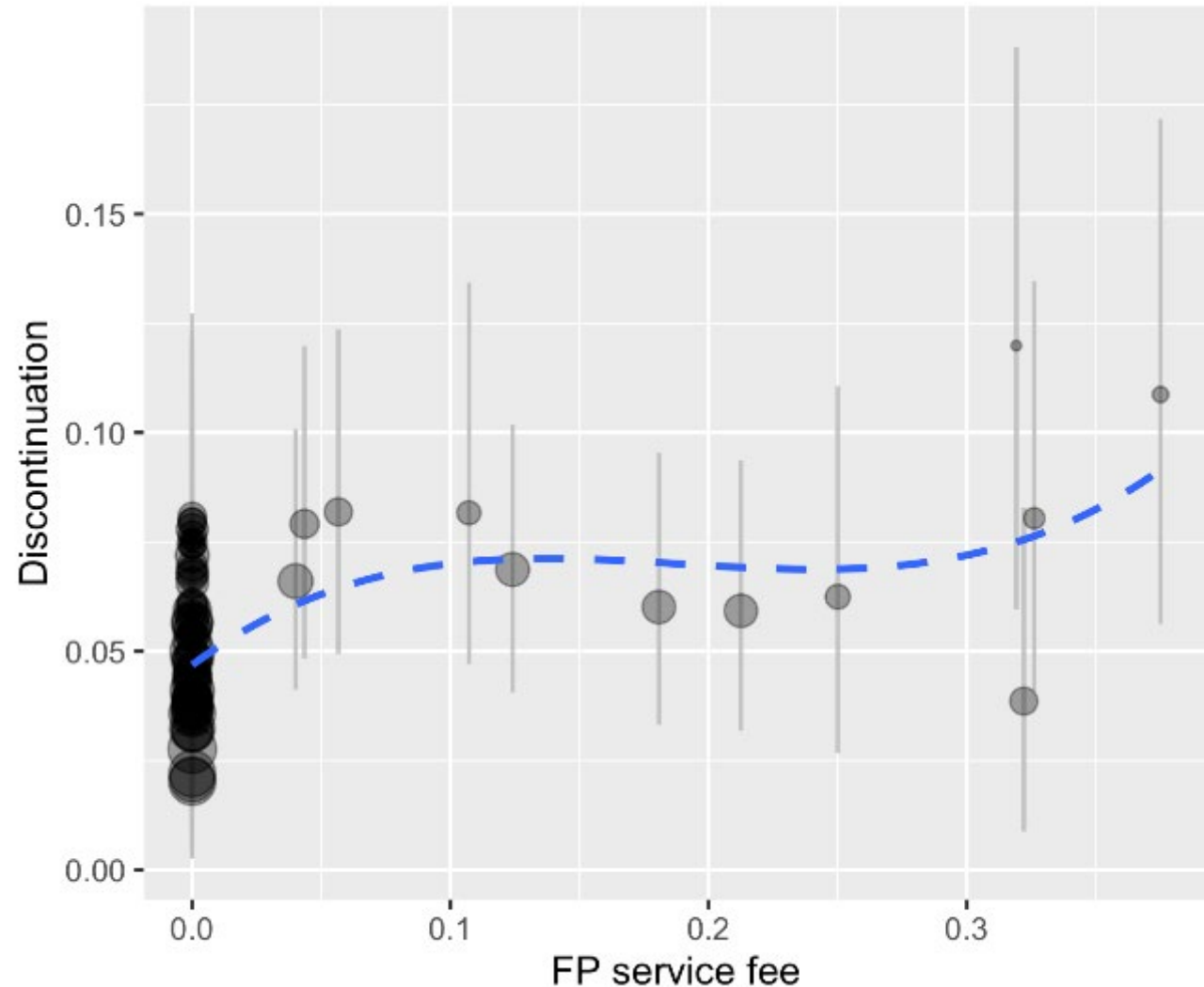
PERM: Permanent Contraception

Preliminary results: A low ratio of staff to visits predicted higher discontinuity


- Many facilities appeared to be "understaffed"

- An increase in the ratio of staff to new clients in the las month from 0 to .3 predicted a decrease in discontinuation of   -.033 (80%CI: -0.54, -.009)

Preliminary results: FP fee predicted increased discontinuity
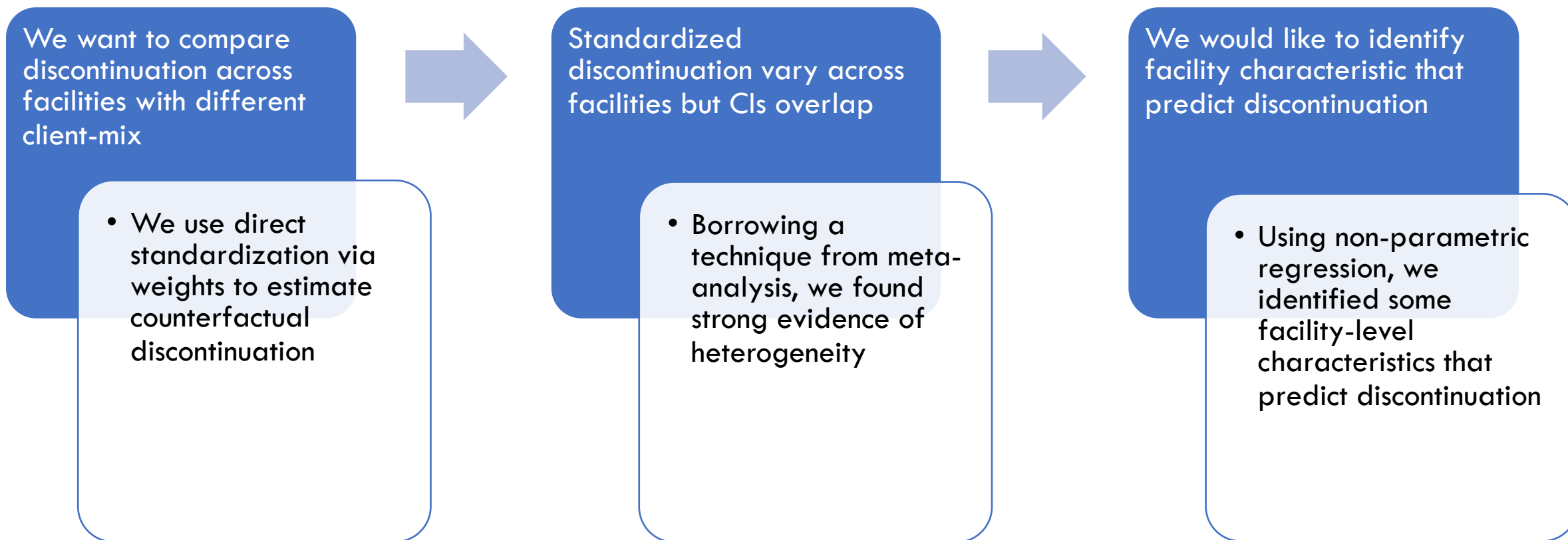

- Few facilities charge for FP services
- FP service fees predicted increase of discontinuation of .029 (80%CI: 0, .067)
  - Direction as expected
  - But modest and uncertain

Preliminary results: provision of certain services associated with higher discontinuity?
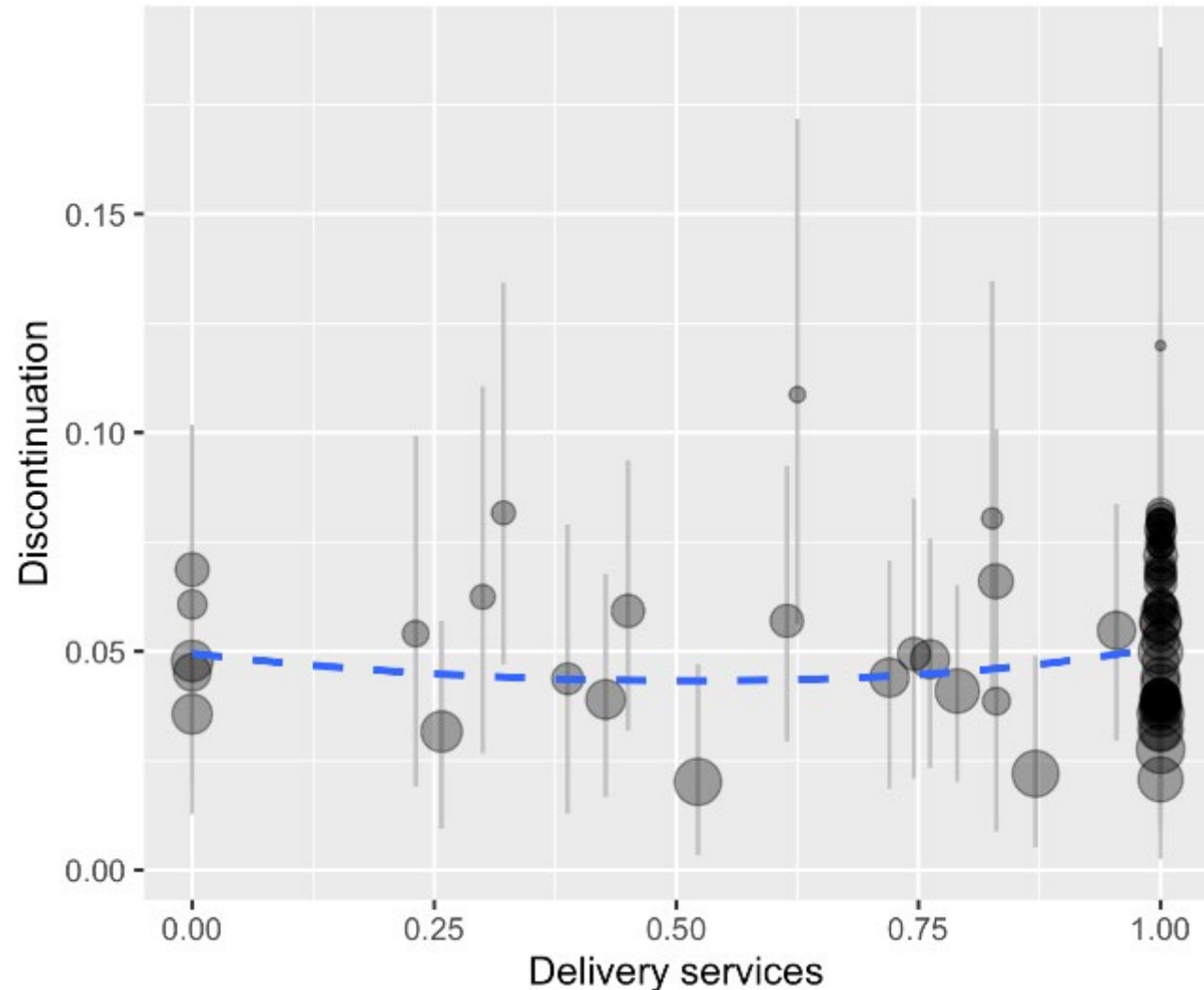
- Relationship of discontinuity with availability of delivery services is unclear

- Interactions with other variables?

Wrapping up

We want to compare discontinuation across facilities with different client-mix

- We use direct standardization via weights to estimate counterfactual discontinuation

Standardized discontinuation vary across facilities but CIs overlap

- Borrowing a technique from meta-analysis, we found strong evidence of heterogeneity

We would like to identify facility characteristic that predict discontinuation

- Using non-parametric regression, we identified some facility-level characteristics that predict discontinuation

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