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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This work was supported, in whole or in part, by the Bill & Melinda Gates Foundation [INV-009639 and INV-008441].
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 make 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 range 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”)

- Married, 20 to 30 y.o., 3 kids or less
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.

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

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

observed discontinuation

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

counterfactual discontinuation

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

$X_i$: vector of characteristics of $i^{th}$ woman

$Z_i$: facility indicator for the $i^{th}$ 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.

→ After weighting, across-facility variation in woman characteristics reduces substantially.
Results: Do standardized discontinuation rates vary across facilities?

- Standardized discontinuation rates 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
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 last month from 0 to .3 predicted a decrease in discontinuation of $-0.033$ (80% CI: $-0.54$, $-0.009$)
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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