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HIV RECENCY SURVEILLANCE IMPROVES PREP UPTAKE: EVALUATION WITH SYNTHETIC CONTROLS

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BACKGROUND

- **To what extent has Eswatini's HIV-1 Recent Infection Surveillance program impacted PrEP enrollment at the facility-level?**

Eswatini's HIV-1 Recent Infection Surveillance (EHRIS) program, implemented since 2019, identifies trends in recent and long-term HIV infections. EHRIS flags hotspots (HIV testing centers with ≥4 monthly recent infections) for public health responses focused on re-emphasizing fidelity to existing national policies that support index testing for contacts of all HIV-positive cases and linkage to PrEP services for contacts of index cases testing HIV-negative.

As part of routine program monitoring and evaluation activities, we endeavored to assess whether these public health responses in these hotspot intervention facilities affected monthly PrEP enrollment, or number of persons enrolled in PrEP, using the synthetic control method (SCM).

METHODS

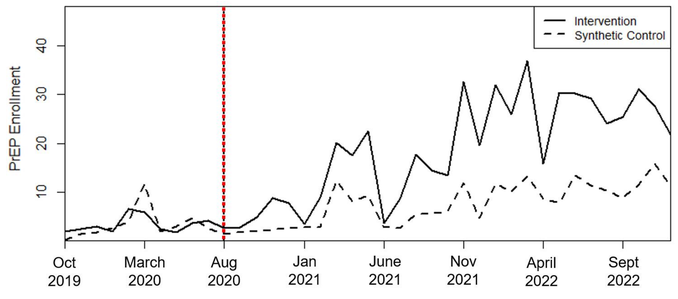
- **Difference-in-difference analysis with synthetic controls**
- **9 intervention, 93 potential non-intervention facilities**
- **Facility-level data from October 2019 to December 2022**
- **"In-time" placebo testing**

We used Oct. 2019-Dec. 2022 data to conduct a difference-in-difference analysis with SCM to compare trends in PrEP enrollment between intervention (n=9), averaged, and non-intervention facilities (n=93) pre- and post-intervention. SCM is a data-driven technique that manufactures a weighted synthetic control from a pool of possible controls to best approximate pre-treatment trends observed in the intervention unit(s). Pre-intervention PrEP enrollment was the only predictor in the model. The intervention point was August 2020.

To ensure the synthetic control did not create differences unrelated to the intervention, we completed an "in-time" placebo test, using March 2021 as our pseudo intervention point. This test should show no differences between the intervention and synthetic control.

Analyses were completed in R with the "synth" and "augsynth" packages.

Figure 1. Trends in PrEP enrollment between intervention and synthetic control



EHRIS-informed interventions resulted in **increased and sustained PrEP enrollment** in intervention facilities in Eswatini.

Figure 2. Gap plot for PrEP enrollment between intervention and synthetic control

**The solid line indicates the difference between the intervention unit and the synthetic control, with the gray shading indicating the 95% confidence interval.*

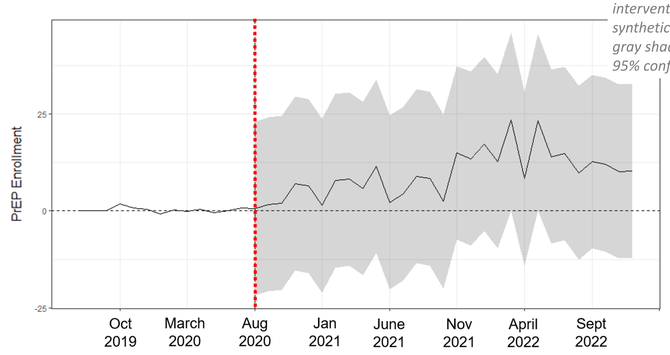
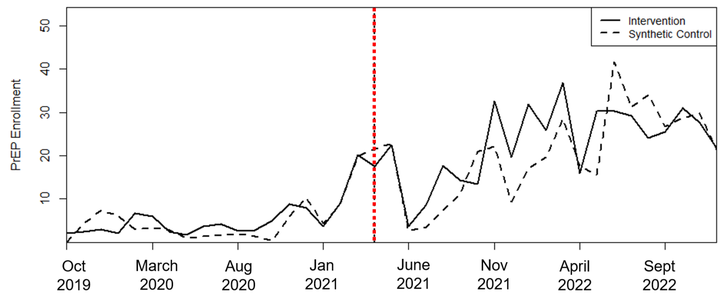


Figure 3. "In-time" placebo test: trends in PrEP enrollment with a false intervention time point



RESULTS

- **Average treatment effect of 9.53 (p=0.066) additional PrEP enrollees in the intervention facilities**
- **Findings supported by "in-time" placebo test**

Similar pre-intervention trends were observed in the intervention clinics and the synthetic control (Figure 1). The average treatment effect for the post-intervention period was 9.53 (p=0.066) additional PrEP enrollees per month, from an average of 9.50 per month in the synthetic control to 16.9 in the intervention (Figure 2).

Six months post intervention, PrEP enrollment increased in both groups but increased more in intervention facilities; this was sustained during the rest of the study period. Between April-December 2022, intervention clinics averaged roughly twice the monthly PrEP enrollment of the synthetic control.

Decreases in June 2021 in both arms occurred during a period of political unrest (Figure 1).

The mean squared prediction error for the model was 5.1, demonstrating what could be considered poor predictive accuracy of the model for program data.

The "in-time" placebo test showed no difference in outcome trends unrelated to the intervention (Figure 3).

CONCLUSIONS

- **EHRIS-informed interventions increased PrEP uptake, though not significantly**
- **Statistical significance vs. programmatic significance**
- **Programmatic data and the synthetic control method are well-suited to each other**

EHRIS-informed interventions resulted in increased and sustained PrEP enrollment in intervention facilities in Eswatini compared to the synthetic control. Recency data strengthened linkages to PrEP services among HIV negative contacts and increased PrEP uptake.

Although the results of this analysis were not significant at p≤0.05, if causal, they do have meaningful programmatic implications. For example, an additional 9.53 persons on PrEP each month, per the 9 intervention facilities, means an additional 1,029 persons on PrEP per year.

This analysis highlights the importance of contextual information in understanding the nuances of your results, as illustrated by the June 2021 decreases for both the intervention and synthetic control facilities during in-country anti-monarchy protests.

Furthermore, SCM should be considered for future analyses with routinely collected program data as program data is often sparse (i.e., few indicators) but longitudinally collected.

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