Effects of Public Health Insurance in Nepal

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Motivation

Nepal's National Health Insurance Program

Data and Empirical Strategy

Results

Motivation

- Well-functioning health care is an essential step in the path of economic development

- Out-of-pocket health expenditure are significant in LMICs with households often at risk of financial hardship [Chetty and Looney (2006)]

- Health insurance in LMICS have dual objective of insulating patients from financial hardship and improving health outcomes [Dupas and Jain (2024)]

- No consensus on the impact of health insurance on variety of important outcomes [Das and Do (2023), Fitzpatrick and Thornton (2019), and Huang and Liu (2023)]

Selected Evidence

Study	Country	Insurance Provider	Time Period	Research Method	OOPE Impact	Risk of Catas. Exp.	Healthcare Utilization
Karan et al. (2017)	India	Gov	2008-12	DD	n.s.	n.s.	N/A
Fan et al. (2012)	India	State	2007-08	DD	n.s.	n.s.	N/A
Powell-Jackson et al. (2014)	Ghana	Community	2004	RCT	-30%***	N/A	+0.3 vis.**
King et al. (2009)	Mexico	Gov	2005-06	RCT	-16%	-1.9pp**	n.s.
Conti and Ginja (2023)	Mexico	Gov	2005-10	DD	N/A	N/A	hetero.
Levine et al. (2016)	Cambodia	NGO	2007-08	RCT	N/A	-1.8pp**	n.s.
Fink et al. (2013)	Burkina Faso	Community	2004-06	RCT	n.s.	-3.9pp**	n.s.
Malani et al. (2024)	India	Gov	2013-19	RCT	N/A	N/A	n.s.
Haushofer et al. (2020)	Kenya	Private	2011-13	RCT	n.s.	N/A	n.s.
Gruber et al. (2023)	China	Public	2004-10	DD	n.s.	N/A	+8.4pp**

Notes: ** indicates 95% significance, *** indicates 99% significance, n.s. = not significant

Source: The table is extracted from forthcoming chapter in The Handbook on Social Protection

This Paper

- This paper evaluates the government provided health insurance in Nepal exploiting the staggered rollout of the program using Difference-In-Differences (DID)
- Contributions:
  - $\rightarrow$ First paper to evaluate the health insurance program of Nepal
  - $\rightarrow$ Uses novel administrative monthly health data
  - $\rightarrow$ Provides comprehensive evidence on the impact of health insurance on healthcare utilization
  - $\rightarrow$ Uses group-time heterogeneity consistent estimator

Findings Preview

- Eligibility of health insurance increases the total clients served by health service providers. (14%)
- Visit to health service providers are driven by new clients
- The effect seems to be consistent for all age groups.

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National Health Insurance Program (NHIP) Overview

- Public health insurance program implemented by government as a part of universal health coverage initiative

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- Public health insurance program implemented by government as a part of universal health coverage initiative
- Primary objective: Prevent health-related poverty
- Secondary objective: Better health outcomes
- Implemented in different phases from 2016 to 2022
- Can also be used in private empanelled health service providers via referral

Coverage of NHIP program

Implementation Phase

Phase 1 Phase 2 Phase 3 Phase 4
Phase 5 Phase 6 Phase 7

Kathmandu
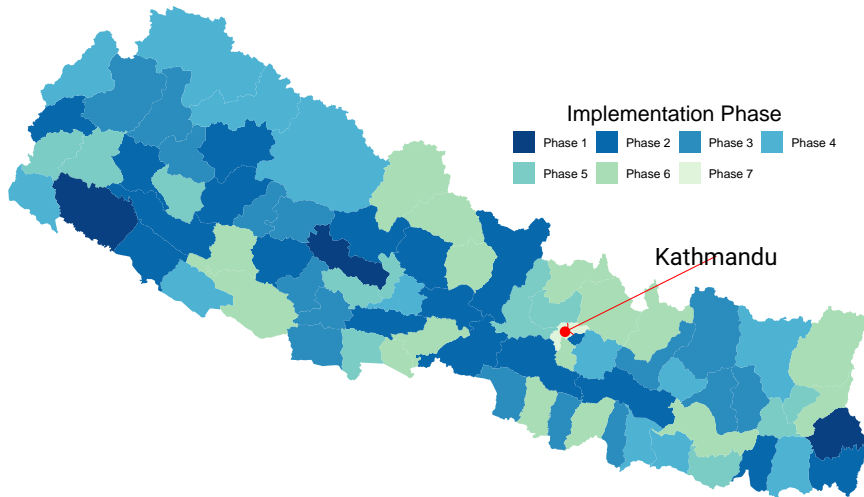
Source: Authors own calculations based on the data collected from annual reports, press released and notices.

NHIP Features

| Feature	Details
Insurance Premium	NPR 3,500 ($ 25.23, $ 103.45 PPP) for family of five
Additional member	NPR 700 ($ 5.05, $ 20.6 PPP) per person
Coverage cap	NPR 100,000 ($ 720.96, $ 2956 PPP) per household
Additional coverage	NPR 20,000 ($ 144.19, $592 PPP) for additional members
Special coverage	NPR 100,000 ($ 720.96) for terminal diseases
Services covered	Preventive, curative, inpatient, emergency, surgery, medicines, diagnostics, rehabilitation, health aid
Transport	Up to NPR 2,000 ($ 14.42, $ 60 PPP) for ambulance services

Source: [HIB (2023)]

Out-of-pocket expenditure per capita for Nepal was $ 117 PPP in 2021 [World Bank, (2024)]

NHIP Status by the end of 2022

Indicator	Values
Total enrolled	7,215,098
Total enrolled (% of Population)	24.7%
Total Household Enrolled	2,212,814
Percentage of Household Enrolled	33.19%
Total number of claims	7,558,433
Average Amount per Claim	NPR 1896 ($ 14)
Average Annual Claim per Insuree	NPR 8023 ($ 60)
Coverage	77 districts (100%)

Source: HIB (2023)

Rollout of NHIP
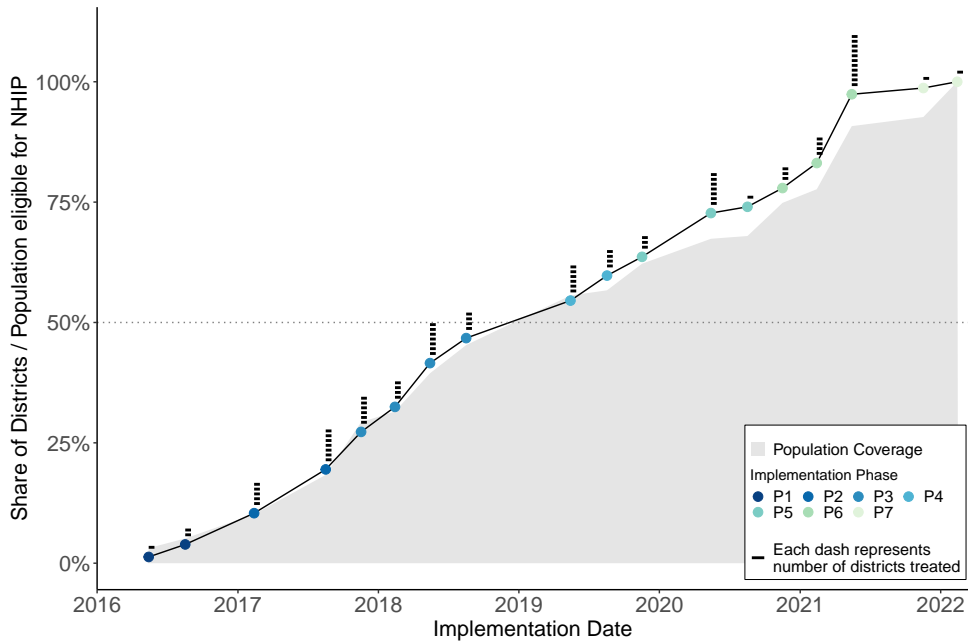
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Data

- NHIP Rollout
  - $\rightarrow$ Tracked the implementation through survey of annual health reports, notices, and press released from Health Insurance Board
- District Health Information System (DHIS2)
  - $\rightarrow$ DHIS collects monthly data on visits, use of health services, referrals, family planning services, morbidity, among others
  - $\rightarrow$ Preceding the implementation of NHIP, regular collection of data was mandated for all the districts
  - $\rightarrow$ Covers all of the empaneled health care institutions
  - $\rightarrow$ I use district level monthly data from 2014 - 2022
  - $\rightarrow$ First study to use this dataset at this granular level and for the study of health insurance

Empirical Strategy

- Identify the causal effect of health insurance on various outcomes.
- Simply comparing districts that implement health insurance to those who do not implement results in bias
- Exploit the gradual rollout of health insurance and use a Difference-In-Differences (DID) method for causal identification.
- Compare the evolution of outcomes for treated groups with groups not yet treated, controlling for district time invariant confounders and time-specific effects that impact all districts

Estimator

- Prior literature show that the popular two-way fixed effects (TWFE) estimators can be biased in a staggered setup [Borusyak, Jaravel, and Spiess (2024), Chaisemartin and D'Haultfœuille (2020), and Goodman-Bacon (2021)]

- Various estimators are available to deal with time/group heterogenity and deal with the negative weight problem

- The specific choice of estimator depends on research and data context

- I use Callaway and Sant'Anna (2021) (CS) estimator to estimate the intention-to-treat (ITT) effects of health insurance eligibility

Why CS Estimator?

- CS estimator works with relatively more intuitive set of control groups

- It imposes a relatively weaker parallel trends assumption

- More efficient when the outcome might be serially correlated like in my case [Roth et al. (2023)]

- Allows for a defined anticipation period

- Accommodates inclusion of covariates

- Doubly Robust estimator

CS Estimator

Potential Outcomes

$$\mathsf{Y}_{it} = \mathsf{Y}_{it}(0) + \sum_{g=9}^{\tau} (Y_{it}(g) - Y_{it}(0)) \cdot G_{ig} \tag{1}$$

CS Estimator

I estimate the average treatment on the treated (ATT) effects for group *g*, which is treated at time *t*.

$$\mathsf{ATT}_{gt} = \mathbb{E}_{gt}[Y_t(g) - Y_t(0) \mid G_g = 1] \tag{2}$$

In my estimation, *g* is defined as the cohort of units *i* (districts) that implement the treatment in the same period *t* (quarter-year).

Summary of ATT

I use "group" aggregation as the overall measure of ATT.

$$\theta_{sel}^0 = \sum_{g \in G} \theta_{sel}(g) P(G = g \mid G \leq \tau) \qquad (3)$$

where

$$\theta_{sel}(\tilde{g}) = \frac{1}{\tau - \tilde{g} + 1} \sum_{t=\tilde{g}}^{\tau} ATT(\tilde{g}, t) \qquad (4)$$

Dynamic ATTs

Dynamic ATTs are event study type estimates the show how the effects evolve over time.

$$\theta_{es}(e) = \sum_{g \in G} 1\{g + e \leq \tau\} P(G = g \mid G + e \leq \tau) \cdot ATT(g, g + e) \qquad (5)$$

$\theta_{es}(e)$ is the average effect for all the districts that are treated exactly *e* period, weighted by the probability that a district was eligible for health insurance in quarter *g*, conditional on being observed for *e* quarters after the treatment.

Parallel Trends Assumption

When there is a known $\delta \geq 0$, for each $g \in G$ and each $(s,t) \in \{9,\ldots,T\} \times \{9,\ldots,T\}$ such that $t \geq g - \delta$ and $t + \delta \leq s < g$,

$$\mathbb{E}[Y_t(0) - Y_{t-1}(0) \mid X, G_g = 1] = \mathbb{E}[Y_t(0) - Y_{t-1}(0) \mid X, D_s = 0, G_g = 0] \quad (6)$$

Here δ captures anticipation effects. Equation 6 imposes parallel trends assumption between group *g* and group not yet treated by time *t + δ*, meaning that in the absence of NHIP implementation, the difference in potential outcomes between health insurance eligible and not yet eligible districts would have evolved similarly.

Other Key Assumptions

- **Defined Anticipation:** CS estimator has limited anticipation assumption. It means that individuals do not change thier behaviour hust before the implementation of NHIP, or even if they do it is within a clearly defined period.
    - $\rightarrow$ In my case, there was a one quarter delay between the registration of health insurance and the implementation of health insurance
    - $\rightarrow$ So, I use 1 quarter anticipation period.

- **Irreversible Treatment:** It means that once the districts become eligible, they remain eligible throughout the study period.

Inference

- Estimation Method: Doubly Robust

- Anticipation: 1 quarter

- Standard Error: Clustered at district level with bootstrapping for 1000 iterations

- Simultaneous confidence bands

- Varying base period (Short Gap) for Dynamic ATTs

- Universal base period (Long Differences) for falsification via event study [Roth (2024)]

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Effects of NHIP on Health Visits

	Total Clients Served	Total New Clients Served	Total OPD Visits	Total New OPD Visits
Model:	(1)	(2)	(3)	(4)
Group Aggregation				
Is NHIP eligible = 1	0.1331***			
	(0.0234)	(0.0240)	(0.0307)	(0.0358)
Fit statistics				
Number of Cohorts	17	17	17	17
Number of Time Periods	30	30	30	30

Notes: All the outcomes are log-transformed

OPD : Out Patient Department

Signif. Codes: *** 99% ** 95% * 90% uniform confidence band does not include 0.

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Model:	(1)	(2)	(3)	(4)
Group Aggregation				
Is NHIP eligible = 1	0.1331***	0.1052***		
	(0.0234)	(0.0240)	(0.0307)	(0.0358)
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Number of Cohorts	17	17	17	17
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Model:	(1)	(2)	(3)	(4)
Group Aggregation				
Is NHIP eligible = 1	0.1331***	0.1052***	0.1281***	
	(0.0234)	(0.0240)	(0.0307)	(0.0358)
Fit statistics				
Number of Cohorts	17	17	17	17
Number of Time Periods	30	30	30	30

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Model:	(1)	(2)	(3)	(4)
Group Aggregation				
Is NHIP eligible = 1	0.1331***	0.1052***	0.1281***	0.1169***
	(0.0234)	(0.0240)	(0.0307)	(0.0358)
Fit statistics				
Number of Cohorts	17	17	17	17
Number of Time Periods	30	30	30	30

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Effects of NHIP on Health Visits by Age group

	Age 0-9	Age 10 to 19	Age 20 to 59	Age 60+
Model:	(1)	(2)	(3)	(4)
Group Aggregation				
Is NHIP eligible = 1	0.0917***	0.1461***	0.1420***	0.1812***
	(0.0245)	(0.0292)	(0.0241)	(0.0296)
Fit statistics				
Number of Cohorts	17	17	17	17
Number of Time Periods	30	30	30	30

Notes: All the outcomes are log-transformed

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Dynamic ATTs for Total Clients Served
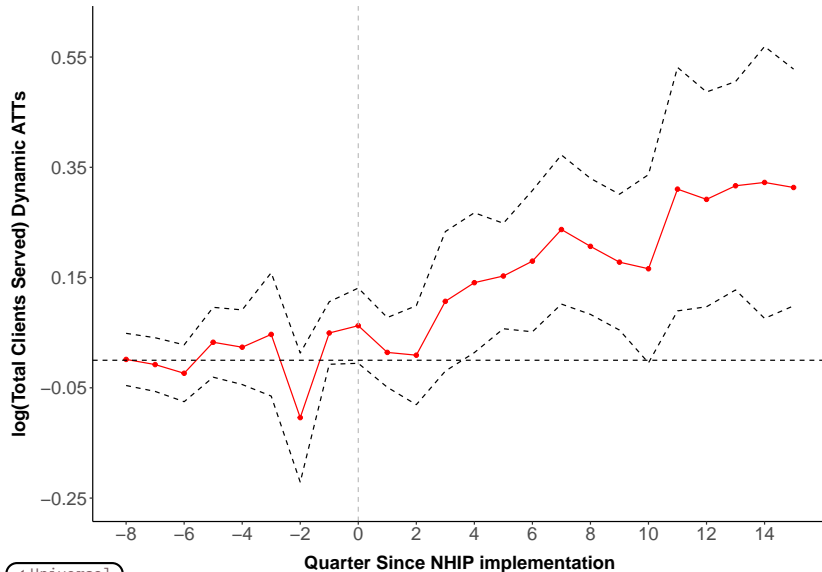
Flasification Exercise

- NHIP funded pregnancy-related delivery service

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For IPD cases
1. Discharge summary should include (patient details, number of days of admission in each department like – ICU, general ward, icu with ventilator etc, final diagnosis, OT notes, procedure notes, CT/MRI notes, etc.)
2. Claim should be done as per available packages.
NB. ALL the documents should be maintained at Health facility and provided to HIB upon request.
Note
1. All the social health security program conducted by MOHP, DOHS (Like safe motherhood, Family Planning, Free/ Essential drugs etc) can not be claimed at health insurance board although these services are provided to insuree
2. Health Insurance package does not covered the cost of cabin or private ward

Source: Extracted from price list released by HIB

Flasification Exercise

- NHIP funded pregnancy-related delivery service
- However, Safe Motherhood Program (SMP) was implemented in 2009 nationwide
- Providing incentives for institutional delivery via free transportation, incentivising antenatal care and providing institutional delivery services for free.
- It was eligible in any public health facility with a birthing facility for any mother and newborn who are a Nepali citizen.

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- However, Safe Motherhood Program (SMP) was implemented in 2009 nationwide
- Providing incentives for institutional delivery via free transportation, incentivising antenatal care and providing institutional delivery services for free.
- It was eligible in any public health facility with a birthing facility for any mother and newborn who are a Nepali citizen.
- SMP essentially eliminated any financial barriers that NHIP would have otherwise addressed in accessing these kind of services.

Effects of NHIP on Safe Motherhood Outcomes

	Share of Home Delivery	Share of Delivery Attended by SBA	MMR	Still Birth (per 100 birth)
Model:	(1)	(2)	(3)	(4)
Group Aggregation				
Is NHIP eligible = 1	-0.3403	1.5517	6.8191	1.6647
	(0.7386)	(0.8783)	(6.2901)	(1.7483)
Pre-Treatment Mean	7.16	89.17	12.27	17.11
Fit statistics				
Number of Cohorts	17	17	17	17
Number of Time Periods	30	30	30	30

Notes: SBA : Skilled Birth Attendant, MMR: Maternal Mortality Ratio

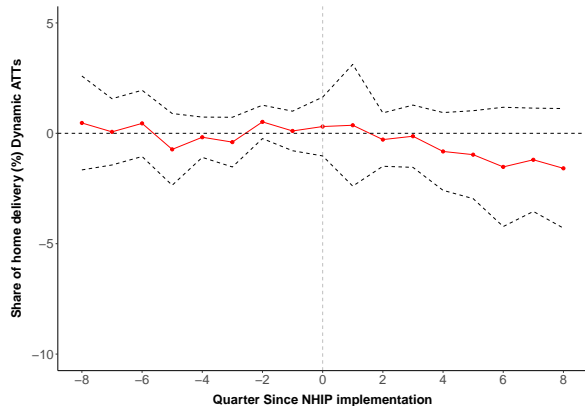Signif. Codes: *** 99% ** 95% * 90% uniform confidence band does not include 0.

Effects of NHIP on Safe Motherhood Outcomes

| Model:	Share of Home Delivery (1)	Share of Delivery Attended by SBA (2)	MMR (3)	Still Birth (per 100 birth) (4)
Simple Aggregation				
Is NHIP eligible = 1	-1.0325	1.5733	12.4370	0.6529
	(0.7063)	(1.0995)	(7.6634)	(1.6171)
Pre-Treatment Mean	7.16	89.17	12.27	17.11
Fit statistics				
Number of Cohorts	17	17	17	17
Number of Time Periods	30	30	30	30

Notes: SBA : Skilled Birth Attendant, MMR: Maternal Mortality Ratio

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Effects of NHIP on Safe Motherhood Outcomes

Model:	Share of Home Delivery (1)	Share of Delivery Attended by SBA (2)	MMR (3)	Still Birth (per 100 birth) (4)
Calendar Aggregation				
Is NHIP eligible = 1	-0.5074	0.9444	7.8861	0.4202
	(0.6344)	(0.9356)	(5.4218)	(1.4762)
Pre-Treatment Mean	7.16	89.17	12.27	17.11
Fit statistics				
Number of Cohorts	17	17	17	17
Number of Time Periods	30	30	30	30

Notes: SBA : Skilled Birth Attendant, MMR: Maternal Mortality Ratio

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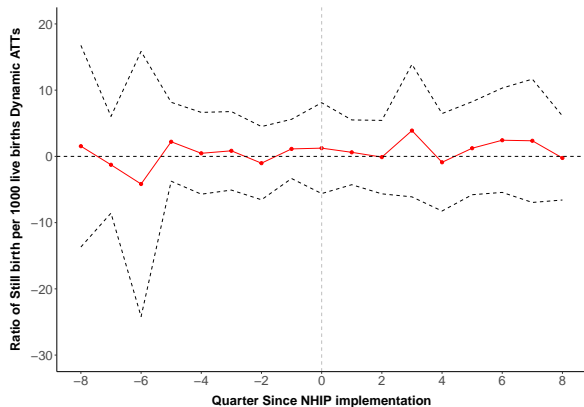# Dynamic ATTs for Safe Motherhood outcomes (1/2)

(a) Share of home delivery
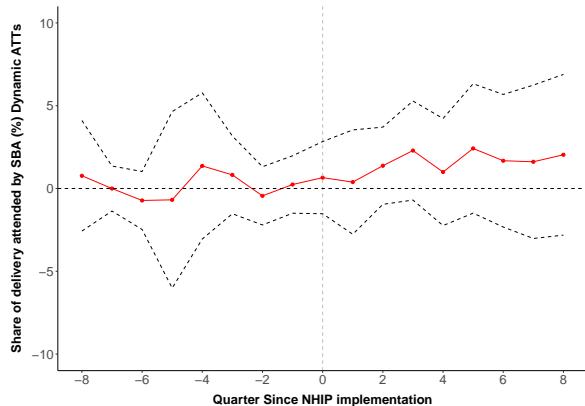
(b) Share of delivery attended by SBA

Dynamic ATTs for Safe Motherhood outcomes (2/2)
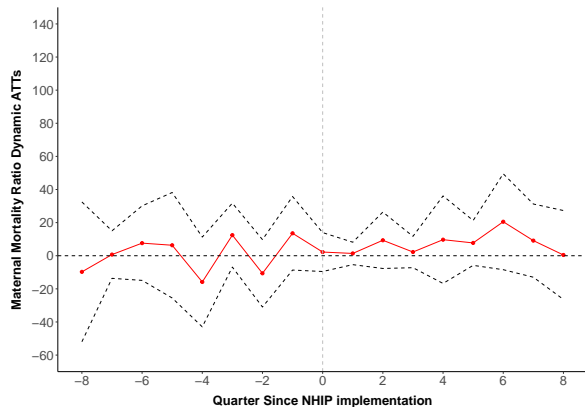
(c) Maternal Mortality Ratio

(d) Ratio of Still Birth

Bottom Line

- Eligibility of health insurance increased visits to health service providers by 14%
- Health visits increased for outpatient services in similar levels
- Visits increased for new clients
- Visits increased throughout the difference age groups

Next Steps

- Heterogeneity by Gender

- Heterogeneity by Caste

- Effects on seeking higher quality of care

- Analysing usage metrics (Labs, Surgery, Family Planning)

- Descriptive Evidence on Out-of-pocket Expenditure (DHS)

Thank You for Listening!

Any Questions?

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Group Aggregation				
Is NHIP eligible = 1	39.7522***	17.5118 *	38.0590***	28.6267***
	(7.3389)	(9.2275)	(7.2238)	(5.6907)
Pre-Treatment Mean	267.71	222.04	239.28	199.67
Fit statistics				
Number of Cohorts	17	17	17	17
Number of Time Periods	30	30	30	30

Notes: All the outcomes are per 1000 population

Signif. Codes: *** 99% ** 95% * 90% uniform confidence band does not include 0.

Dynamic ATTs for Total Clients Served per 1000 population
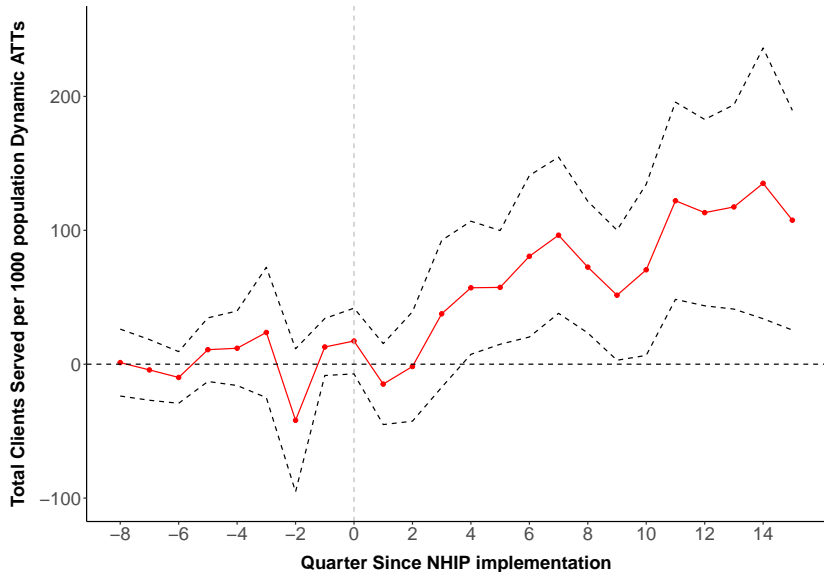
Dynamic ATTs using Universal Period