

# The Effects of HIV Treatment on Uptake of Tuberculosis and Non-Communicable Disease Treatment by Household Members

Suzue Saito<sup>1,2</sup>, Andrea A. Howard<sup>1,2</sup>, Magdalena Cerda<sup>3</sup>, Frank Tanser<sup>4,5,6</sup>, Deenan Pillay<sup>4,6</sup>, Wafaa M. El-Sadr<sup>1,2</sup> and Till Baernighausen<sup>4,6,7,8</sup>

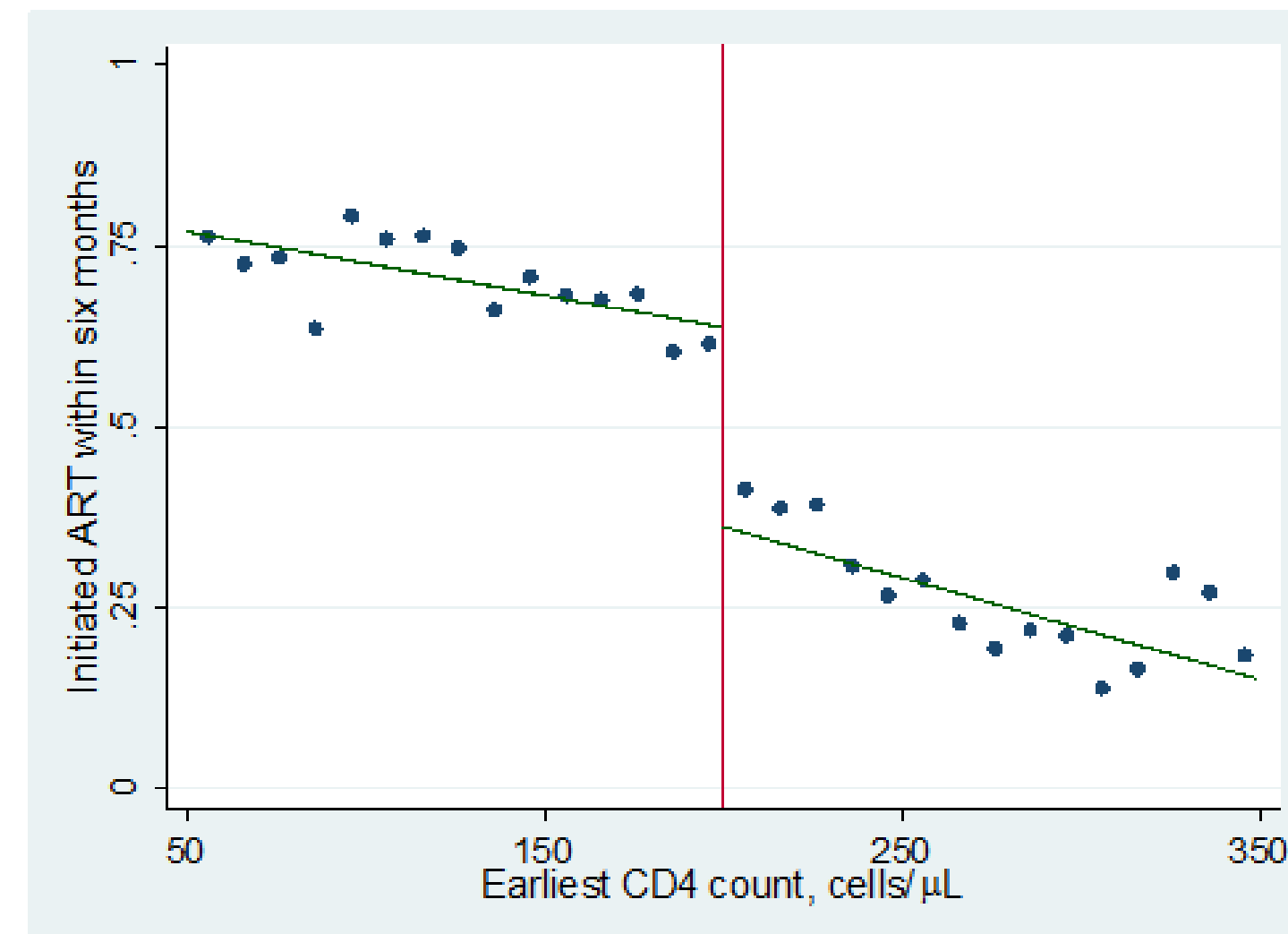
1. ICAP at Columbia University, New York, USA, 2. Department of Epidemiology, Mailman School of Public Health at Columbia University, New York, USA, 3. University of California, Davis, Department of Emergency Medicine, Davis, California, USA, 4. Africa Health Research Institute, Mtubatuba, South Africa, 5. University of KwaZulu-Natal, KZN, South Africa, 6. University College London, London, UK, 7. Harvard T.H. Chan School of Public Health, Boston, USA, 8. Institute of Public Health, Heidelberg University, Germany

## Background

- The global response to the HIV epidemic has substantially enhanced access to antiretroviral therapy (ART) through largely vertical programs.
- Whether these HIV treatment programs have strengthened the broader health system to achieve better outcomes for other conditions, i.e., tuberculosis (TB) and non-communicable disease (NCDs) is unclear.
- We conducted a quasi-experimental study in rural Kwazulu-Natal (KZN), South Africa, to determine whether exposure to health benefits from ART utilization by a person living with HIV (PLHIV) in the household affects uptake of TB, hypertension (HTN) and diabetes (DM) treatment by other household members with the latter conditions.

## Methods

- The study was conducted in the comprehensive population cohort supported by the Africa Health Research Institute (AHRI) in KZN.
- We linked PLHIV engaged in HIV care between 2008 and 2013 to their cohabitating household members aged  $\geq 15$  years who were captured at least once in the annual General Health Questionnaire Surveys.
- We implemented regression discontinuity quasi-experiments fitting Weibull and Cox survival models to establish the causal effect of ART utilization on uptake of TB, HTN, and DM treatment among household members.
- CD4+ cell count at enrollment in care is a continuously measured variable with a threshold value used to determine ART initiation.
- Because there is some random noise in CD4+ cell count measurements, PLHIV near the threshold value (i.e., just above or below over 200 cells/ $\mu$ L) can be considered exchangeable in both observable and unobservable characteristics.
- We inferred that the difference in outcomes between household members living with PLHIV just above versus just below the threshold was the causal effect of treatment on uptake of TB, HTN, and DM treatment among household members..
- We ran unadjusted models and models adjusting for age and sex, restricting the analysis to a narrow CD4+ cell count range around the regression discontinuity threshold.



**Figure 1: The probability that a PLHIV initiates ART significantly increases at the CD4+ cell count threshold of 200 cells/ $\mu$ L, indicating tight correlation between the assignment variable, CD4+ cell count and exposure of interest, ART initiation, thus, allowing estimation of causal effect of ART initiation and treatment uptake for TB, HTN, and DM.**

## Results

- There were 4867 PLHIV enrolled in care living with 17,253 household members  $\geq 15$  years in 4212 unique homesteads between 2008-2014.
- Cohabiting household members had a median household ART utilization exposure of 1.7 years (IQR: 0.6-3.2).
- 3.0% (95.6% of those with TB), 11.4% (86.0% of those with HTN) and 3.1% (83% of those with DM) of cohabitating household members reported that they were currently being treated for TB, HTN, or DM, respectively.
- Household ART utilization increased treatment for DM (HR 1.90: 95% CI 1.07-3.40) but not for TB (HR 1.12: 95% CI 0.71-2.03) or HTN (HR 1.31: 95% CI 0.97-1.77) (Figure 2, Table 1).

## Conclusion

- Household exposure to public-sector HIV treatment programs substantially increased uptake of DM treatment but not HTN and TB treatment among household members.
- Future research needs to establish the mechanisms leading to these effects and how HIV treatment programs can be better leveraged to improve access to treatment for other chronic conditions among populations in sub-Saharan Africa.

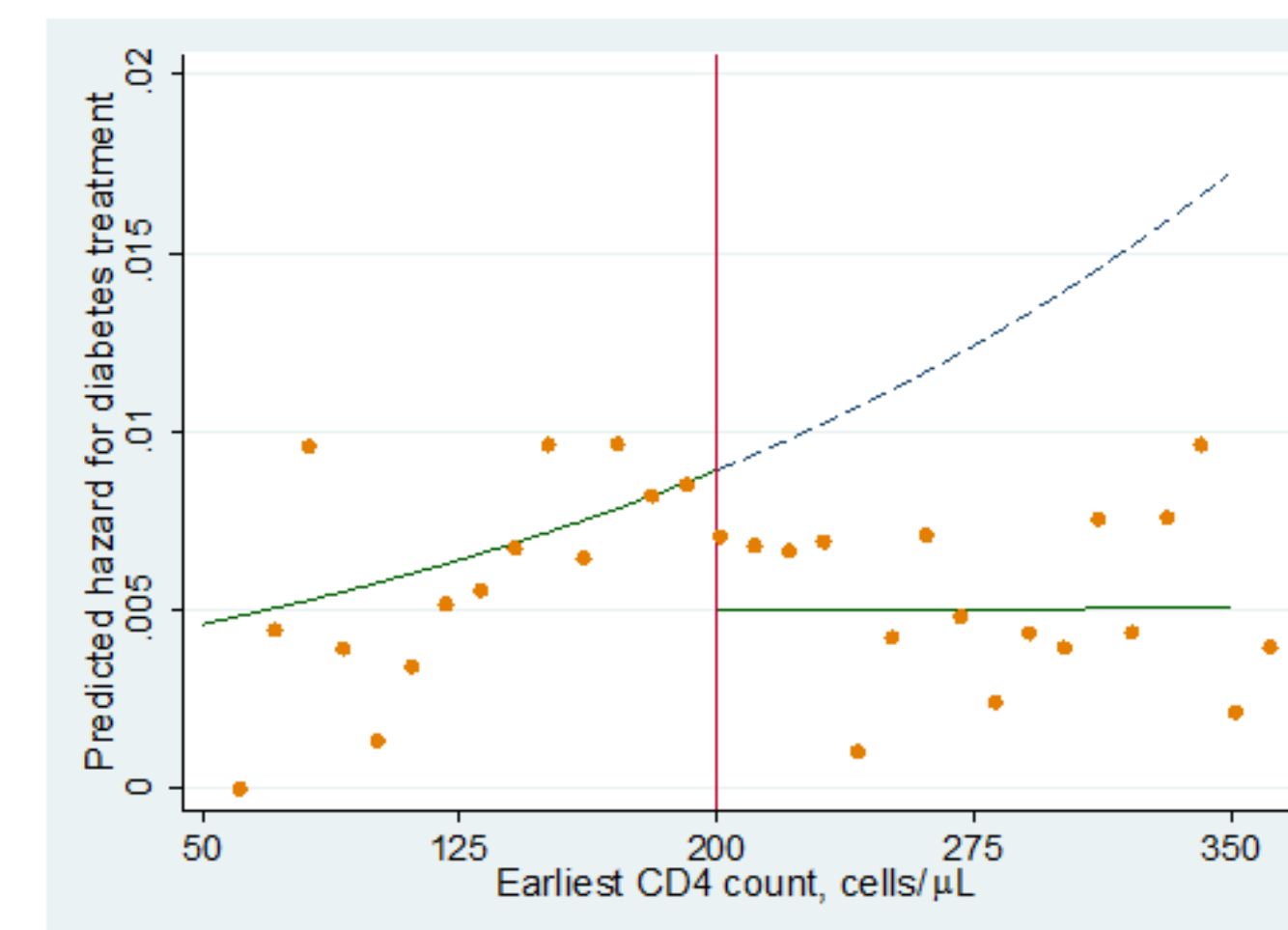
## Acknowledgements

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**Figure 2: The probability of household members with DM reporting being treated for DM is significantly higher for those with a PLHIV in the household eligible for ART compared to those just above the eligibility CD4+ threshold for ART initiation.**



**Table 1: Effects of ART on uptake of DM, HTN and TB treatment by cohabitating household members\***

1.1 Diabetes treatment								
Exposed	Unexposed	HR** (Weibull)	95% CI	P	HR (Cox)	95% CI	P	
<i>Treatment per 100 person years</i>								
2.7	1.6	1.79	0.995, 1.001	0.05	1.79	0.999, 3.205	0.05	
		1.90	1.066, 3.401	0.03	1.90	1.065, 3.396	0.03	
1.2 Hypertension treatment								
Exposed	Unexposed	HR (Weibull)	95% CI	P	HR (Cox)	95% CI	P	
<i>Treatment per 100 person years</i>								
14.3	13.5	1.19	0.881, 1.613	0.26	1.19	0.881, 1.614	0.25	
		1.31	0.968, 1.763	0.08	1.31	0.970, 1.766	0.08	
1.3 TB treatment								
Exposed	Unexposed	HR (Weibull)	95% CI	P	HR (Cox)	95% CI	P	
<i>Treatment per 100 person years</i>								
2.8	2.3	1.18	0.699, 2.016	0.53	1.19	0.700, 2.011	0.53	
		1.20	0.707, 2.026	0.50	1.20	0.709, 2.034	0.50	

\* Restricted to CD4+ cell count range of 50-350 cells/ $\mu$ L

\*\* Hazard ratio