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# Effectiveness of an integrated chronic disease management model in improving patients' health outcomes in rural South Africa

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\*Soter Ameh

Francesc X. Gómez-Olivé

Eustasius Musenge

Kathleen Kahn

Kerstin Klipstein-Grobusch



# Outline

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- Policy implications

## INTEGRATED CHRONIC DISEASE MANAGEMENT

### Manual



# Background

- Chronic diseases expand beyond traditional NCDs to include HIV/AIDS
- In 2012, NCDs accounted for 38 million of the world's 57 million deaths
  - Three-quarter of these 38 million deaths occurred in LMICs
- Mortality due to NCDs estimated to increase to 55 million by 2030
  - Africa will have the greatest increase
- In 2012, HIV accounted for 1.5 million (2.7%) global deaths
  - Ranking the 6<sup>th</sup> global cause of death

# Background

- Dual disease burden in South Africa - stalled epidemiological transition
  - NCDs e.g. hypertension
  - Chronic communicable diseases (e.g. HIV and TB)
- NCDs accounted for 43% of all deaths in S/Africa in 2014
- HIV prevalence in S/Africa estimated at 10% in 2014
  - One of the highest in Africa

# Background

- Evidence of integrating HIV/AIDS, hypertension and diabetes services in Cambodia:
  - Increase in median CD4 count from 53 to 316 cells/mm<sup>3</sup> after 2 years
  - 68% of hypertension patients on regular therapy had controlled BP
  - 57% of diabetes patients had glycosylated haemoglobin ≤ 9%
  
- UNAIDS recommends integration of HIV/AIDS and NCD services to:
  - Leverage HIV programme for NCDs
  - Improve patients' health outcomes
  - Minimise HIV-related stigma
  - Improve the quality of chronic disease care
  
- The South African govt. implemented UNAIDS recommendation in 2011
  - One of the first of such efforts in Africa

# Background

- S/Africa's response to the dual burden of HIV/AIDS and NCDs
  - The National Department of Health introduced the ICDM model
  - Pilot of the model was initiated in July 2011 in three Provinces
- The ICDM model:
  - Component of PHC re-engineering; nurse-led
  - “One-stop-shop” for management of chronic diseases
  - Expected to enhance coherent services and improve patients' health outcomes



# Background

## Components of the ICDM model

### ■ Facility re-organisation:

- ❑ Supply of critical medicines and equipment
- ❑ Prepacking of medicines
- ❑ Referral
- ❑ Defaulter tracing
- ❑ Appointment system



### ■ Community-oriented chronic disease care

- ❑ Outreach team serves a catchment population
- ❑ Responsible for 6000 persons, 1500 households
- ❑ Target: manage 80% of chronic diseases
- ❑ Composition of the PHC outreach team
  - A professional nurse, three staff nurses and six CHWs



### ■ Health promotion and screening in the population



# Statement of the problem

- S/Africa's health care system has yet to adapt to the long-term continuity of chronic care
- Chronic disease care is fragmented within the public health system in S/Africa
- Poor management of NCDs
- Dearth of information on the changes in the patients' health outcomes





# Study justification

- Better understand how the ICDM model works
- Provide evidence of changes, if any, in the patients' health outcomes



# Research hypothesis/question

## Hypothesis:

Patients receiving treatment in the ICDM model pilot PHC facilities were more likely to have better health outcomes than those in the comparison facilities over the 24-time points (months) after initiation of the ICDM model

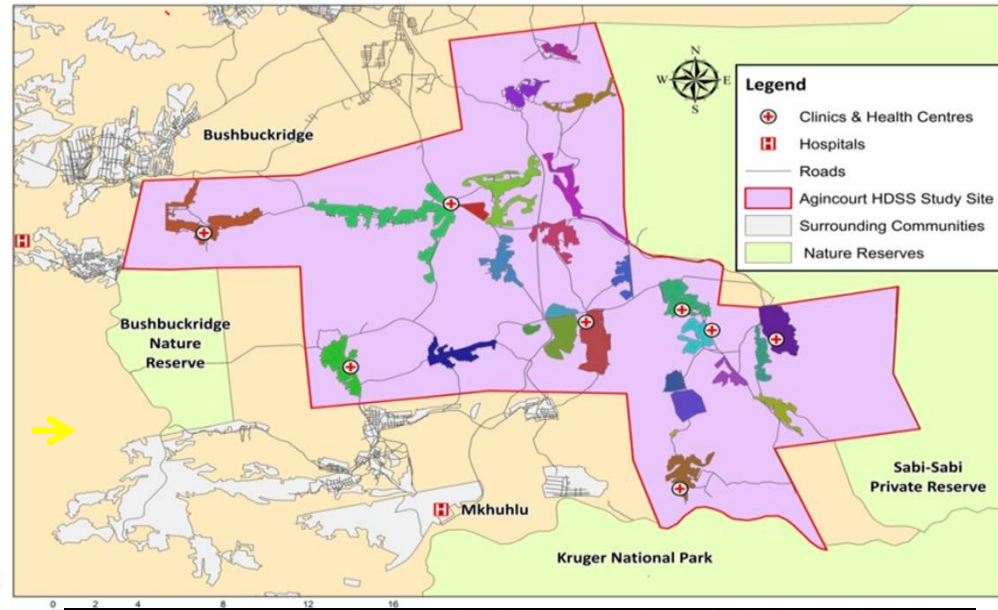
## Research question:

Is the ICDM model effective in improving key indicators of health outcomes, i.e. patients' CD4 count and blood pressure (BP)?





# Study setting



115,000 people; in 60,000 h/holds  
2 health Centers, 6 fixed clinics  
2 hospitals 25 – 60 km away



# Methodology

## Study setting


- Bushbuckridge sub-district (38 PHC facilities: 17 ICDM model pilot facilities)
  - Seven ICDM model pilot facilities in the Agincourt HDSS
  - Five comparison facilities outside Agincourt HDSS

Study design: Controlled interrupted time series - part of the broader mixed methods study

Study population: Patients on treatment for the markers of chronic diseases in the area


### HYPERTENSION

**Assess Advise Treat**



Control BP to prevent stroke/heart attack


**Advise**



Assess at least every 5 years


### HIV

**Assess**



Screen for TB

**Treat**



Start ART as soon as needed

### DIABETES

**Assess Advise Treat**



Control BP to prevent stroke/heart attack

**Assess Advise Treat**



Control glucose to save eyes, kidneys, feet

**Assess**



Screen for complications

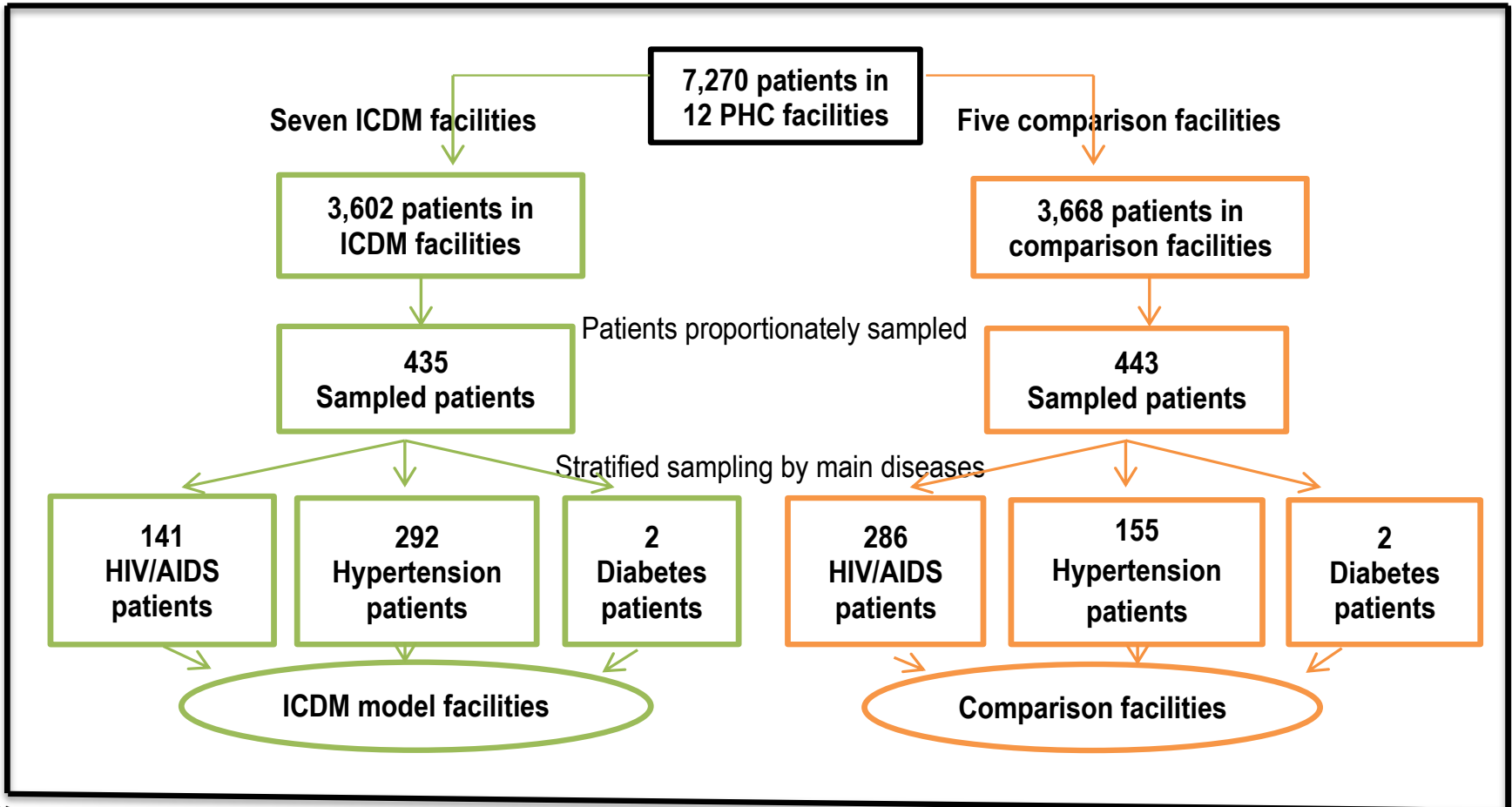
# Methodology

## ■ Sample size calculation

- Diggle's formula for repeated measures of dichotomous outcome in a longitudinal study
- Aimed to detect a 10% significant difference in the proportion of patients with controlled BP between the study groups ( $P_1 = 68\%$  in the Cambodian study)
- Assuming 0.9 correlations of repeated BP measurements
- 5% significance level for a one-sided hypothesis test ( $Z_{\alpha}=1.645$ )
- 90% power ( $Z_{\beta}=1.28$ )
- Minimum sample size of **435** in each study arm, after adjusting for 15% attrition

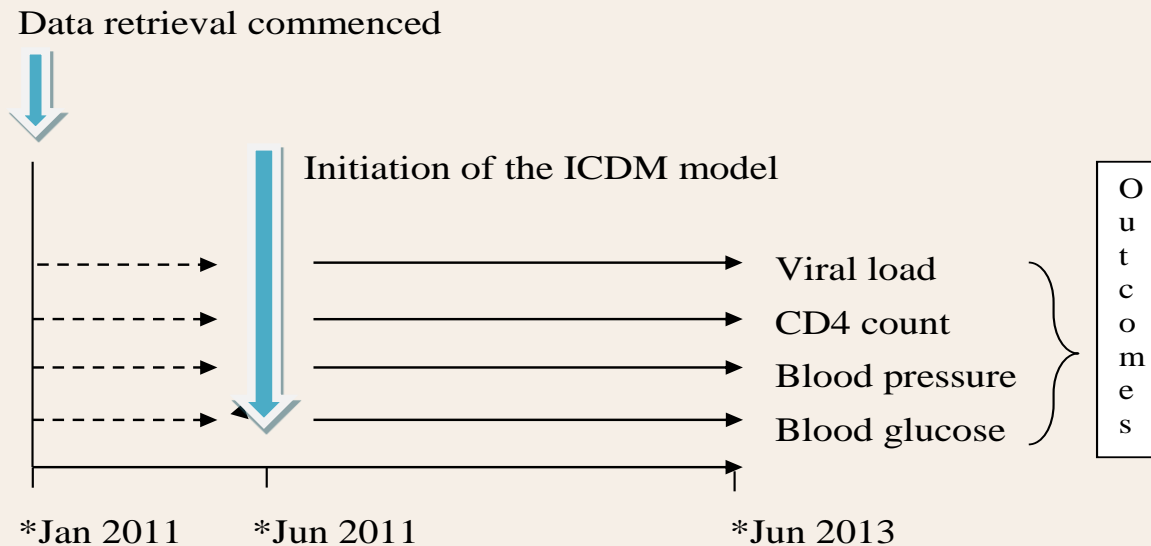
# Methodology

- Three-step sampling technique: Proportionate, stratified and systematic sampling



# Methodology

<b>Inclusion criteria</b>	<ul style="list-style-type: none"> <li>• <math>\geq 18</math> years</li> <li>• On treatment from January 2011</li> </ul>
<b>Exclusion criteria</b>	Transferred between the study groups during data collection
<b>Type of data</b>	Secondary data
<b>Data points</b>	Specified time periods: pre-ICDM (Jan-Jun 2011) and post-ICDM (Jul 2011-June 2013)



**Key:**

- > Period before initiation of the ICDM model
- > Period after initiation of the ICDM model

Figure 1: Time periods for data collection



# Methodology

## ■ Study variables

- Controlled BP: <140/90 mmHg
- Controlled CD4 count: >350 cells/mm<sup>3</sup>

## ■ Data analysis

- Stata 12.0 used for analysis
- Controlled segmented linear regression analysis
  - Changes in trend (slope) at pre- and post-intervention periods at 5% significance level

# Results

Table 1: Socio-demographic characteristics of the patients in the ICDM pilot and comparison facilities in the Bushbuckridge sub-district.

Variable	Study groups n (%)		Total (n = 878)	p-value of difference
	ICDM pilot facilities (n = 435)	Comparison facilities (n = 443)		
Age group (years)				
18-29	19 (4.4)	39 (8.8)	58 (6.6)	<0.001
30-39	60 (13.8)	119 (26.9)	179 (20.4)	
40-49	59 (13.6)	92 (20.8)	151 (17.2)	
50-59	84 (19.2)	85 (19.2)	169 (19.2)	
≥ 60	197 (45.3)	105 (23.7)	302 (34.4)	
Missing	16 (3.7)	3 (0.6)	19 (2.2)	
Gender				
Female	363 (83.4)	368 (83.1)	731 (83.3)	0.881
Male	72 (16.6)	75 (16.9)	147 (16.7)	
Education (completed years)				
No formal education	172 (39.6)	167 (37.7)	339 (38.6)	0.170
1-6	174 (40.0)	169 (38.1)	343 (39.1)	
> 6	71 (16.3)	73 (16.5)	144 (16.4)	
Missing	18 (4.1)	34 (7.7)	52 (5.9)	
Chronic disease status				
Hypertension	210 (48.3)	91 (20.5)	301 (34.3)	<0.001
HIV	141 (32.4)	282 (63.7)	423 (48.2)	
Diabetes	2 (0.5)	2 (0.5)	4 (0.5)	
Co-morbidities	82 (18.8)	68 (15.3)	150 (17.0)	

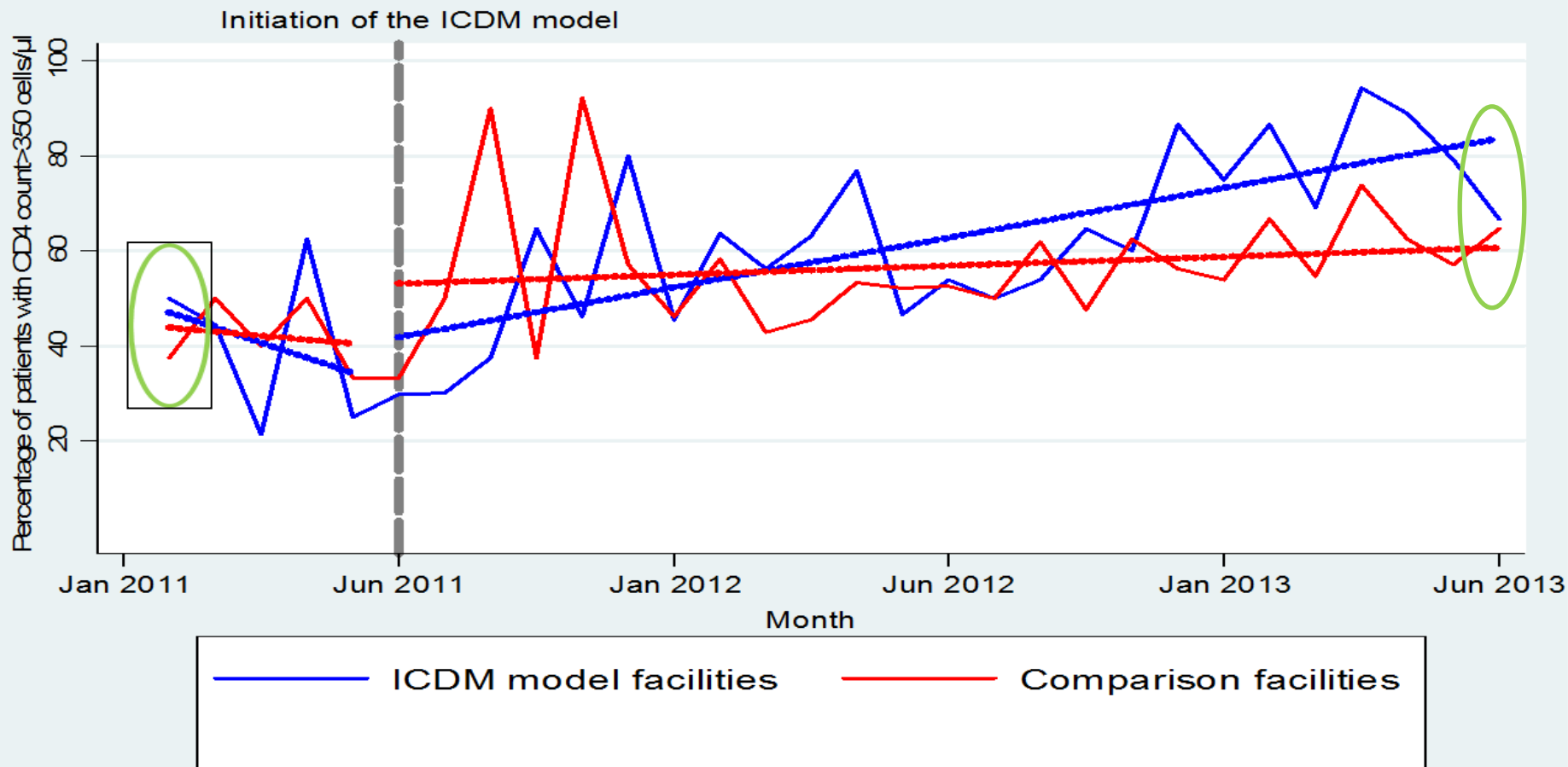


Figure 2: Monthly percentages of HIV/AIDS patients on medication with CD4 count > 350 cells/mm<sup>3</sup> before and after initiation of the ICDM model by study health facilities.

Facility	Pre-ICDM era			Post-ICDM era		
	Coefficient	p-value	95% CI	Coefficient	p-value	95% CI
Pilot	-3.19	0.457	-11.85 ; 5.47	1.76	<0.001	1.09 ; 2.43
Comparison	-0.84	0.838	-9.16 ; 7.48	0.37	0.258	-0.28 ; 1.02

### Initiation of the ICDM model

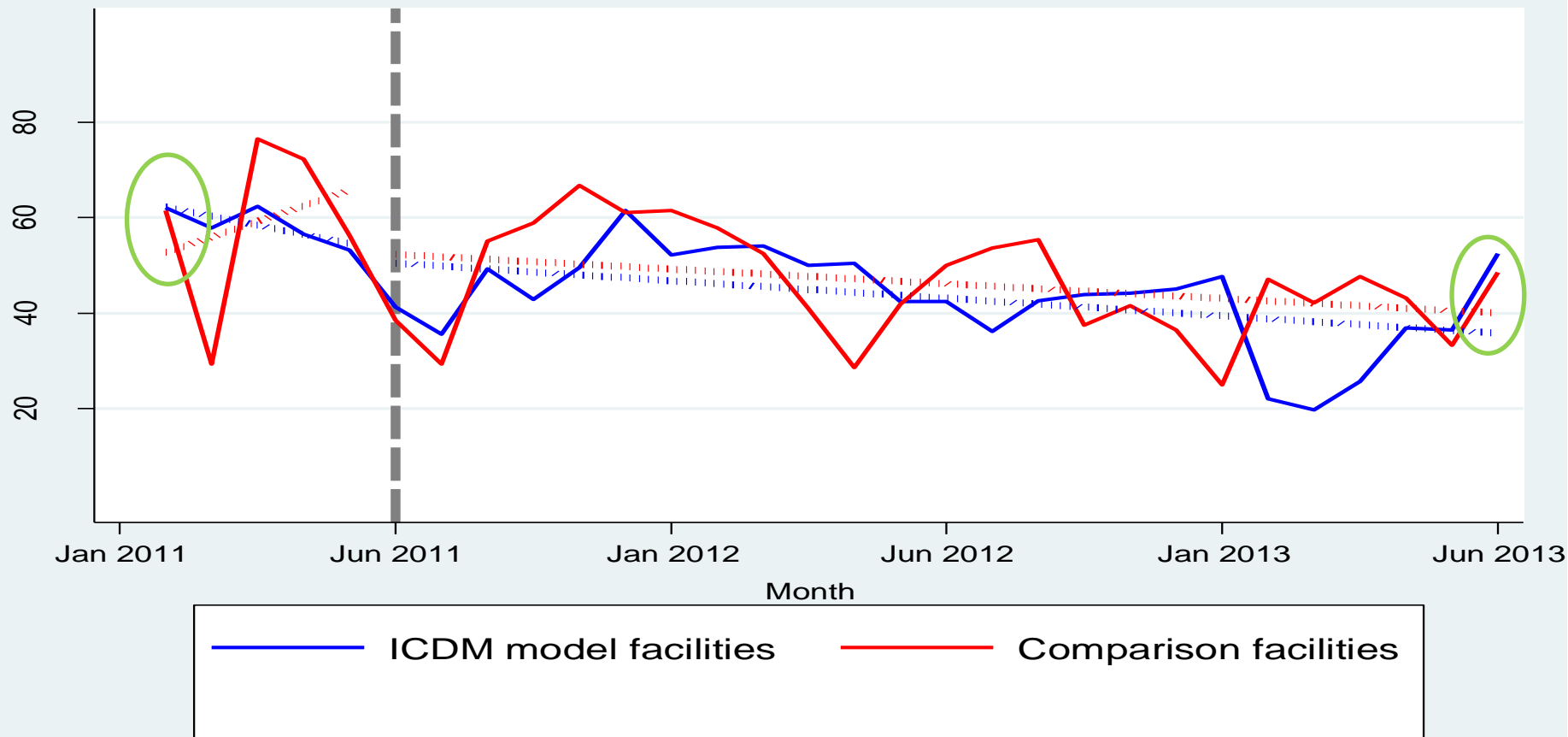


Figure 3: Monthly percentages of hypertensive patients on medication with controlled blood pressure before and after initiation of the ICDM model by study health facilities.

Facility	Pre-ICDM periods			Post-ICDM periods		
	Coefficient	p-value	95% CI	Coefficient	p-value	95% CI
Pilot	-1.91	0.480	-7.37 ; 3.55	-1.55	0.013	-0.97 ; 0.12
Comparison	3.25	0.401	-4.55 ; 11.05	-0.61	0.05	-1.21 ; 0.001

# Conclusions

- A novel evaluation of an ICDM model; one of the first of such efforts in Africa
- Findings do not typically conform with the pattern reported in Cambodia
  - The ICDM model appears to enhance the effect of the existing ART programme
  - However, no equivalent effect observed for the control of hypertension
- Poor BP control - unintended consequences of the ICDM model
  - Evidence from qualitative study
    - Work overload
    - Staff shortages
    - Stock-outs of antihypertensive drugs
    - Malfunctioning BP machines
- Study contributes to global debate on an integrated approach for chronic disease care

# Limitations

- Incompleteness/unavailability of health facility data
  - Missing laboratory results
  - Malfunctioning equipment
  - Nurses' errors
  
- Inability to achieve a minimum of eight data time points before ICDM model initiation
  - Use of household-based notebooks in the pre-ICDM model era

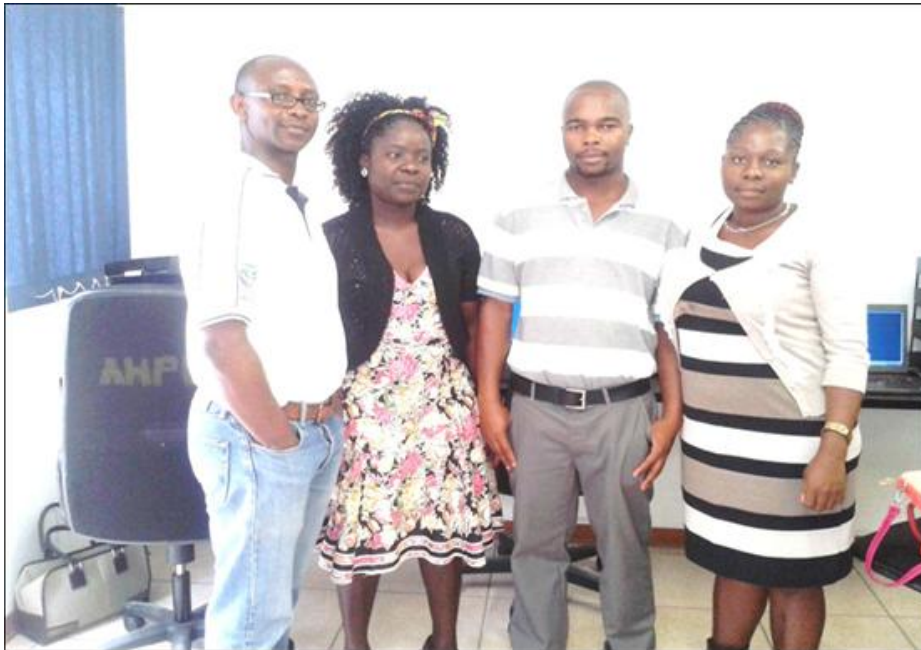
# Policy implications

- The ICDM model has yet to achieve its purpose
  - Leveraging HIV programme for NCDs
- Large scale evaluation study needed
- Lessons learned relevant for nation-wide scale up of the ICDM model
- Shared experiences in implementing integrated chronic care
  - Uganda, Kenya, Ethiopia and Swaziland



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Thank you for listening