Impact of performance-feedback on the quality of TB suspect evaluation:
An implementation science case study

TB GOAL study:

Tuberculosis **G**uideline **O**bservation and **A**dherence in **L**ow-income countries

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Implementation Science

- The **study of methods or strategies** to promote uptake of research findings into routine clinical practice

- NOT simply the validation of evidence-based practices or interventions in “real world” settings

- Contributes to an understanding of factors that help ensure similar outcomes in studies and in the “real world”

Background

- TB case detection rates are below targets
  - Incomplete reporting
  - Failure to access care
  - Missed opportunities for diagnosis

- International standards for TB evaluation*
  - Cough ≥2 weeks → TB suspect
  - All TB suspects → at least 2 sputum AFB exams
  - AFB smear-positive → receive TB treatment

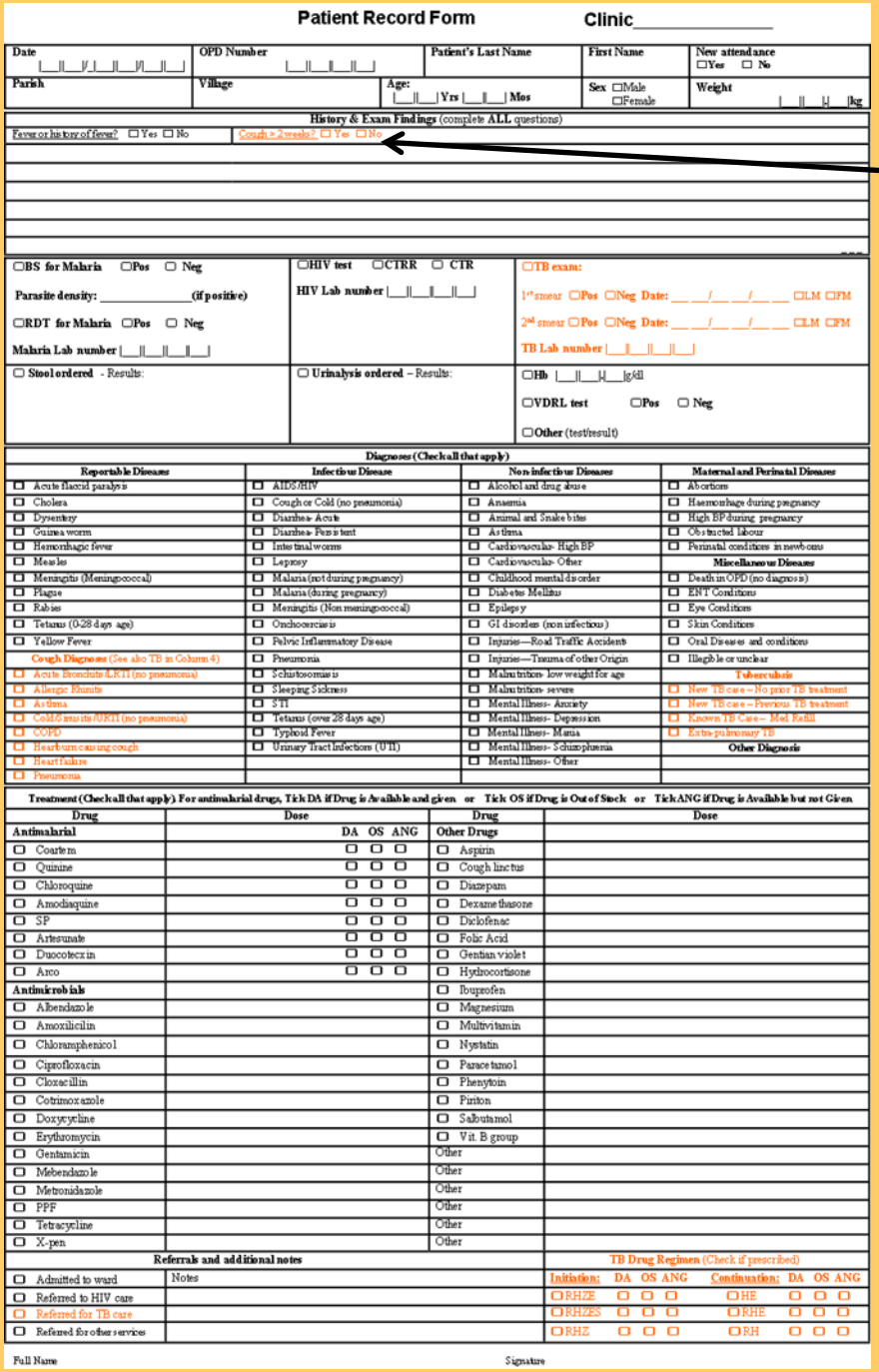
* International Standards for Tuberculosis Care

TB GOAL Study

- Aim 1: To assess the quality of TB suspect evaluation at government health centers in Uganda
- Aim 2: To determine barriers to TB suspect evaluation
- **Aim 3: To evaluate a theory-driven intervention to improve TB suspect evaluation**
- Overall hypothesis
  - Improving TB suspect evaluation will increase TB case detection at peripheral health centers in Uganda

Study Setting:
Uganda TB Surveillance Project

- Network of 6 government health centers
- Partners
  - Uganda Ministry of Health
  - Makerere University
- Electronic data collection (>100,000 patients/year)
- Web-interface to monitor indicators tied to ISTC



Patient Record Form

Clinic_____

Date	OPD Number	Patient's Last Name	First Name	New attendance
__/__/__				☐Yes ☐ No
Parish	**Village**	**Age:**	**Sex**	**Weight**
		__ Yrs __ Mos	☐Male ☐Female	___ kg

History & Exam Findings (complete **ALL** questions)

Fever or history of fever? ☐ Yes ☐ No | Cough > 2 weeks? ☐ Yes ☐ No

☐**BS for Malaria** ☐**Pos** ☐ **Neg** **Parasite density:** _____ **(if positive)** ☐**RDT for Malaria** ☐**Pos** ☐ **Neg** **Malaria Lab number** ____	☐**HIV test** ☐**CTRR** ☐ **CTR** **HIV Lab number** ____	☐**TB exam:** 1st smear ☐**Pos** ☐**Neg** **Date:** __/__/__ ☐LM ☐FM 2nd smear ☐**Pos** ☐**Neg** **Date:** __/__/__ ☐LM ☐FM **TB Lab number** ____
☐ **Stool ordered** - Results:	☐ **Urinalysis ordered** – Results:	☐**Hb** ___ g/dl ☐**VDRL test** ☐**Pos** ☐ **Neg** ☐**Other** (test/result)

Diagnoses (Check all that apply)

Reportable Diseases	Infectious Disease	Non-infectious Diseases	Maternal and Perinatal Diseases
☐ Acute flaccid paralysis	☐ AIDS/HIV	☐ Alcohol and drug abuse	☐ Abortions
☐ Cholera	☐ Cough or Cold (no pneumonia)	☐ Anaemia	☐ Haemorrhage during pregnancy
☐ Dysentery	☐ Diarrhea- Acute	☐ Animal and Snake bites	☐ High BP during pregnancy
☐ Guinea worm	☐ Diarrhea- Persistent	☐ Asthma	☐ Obstructed labour
☐ Hemorrhagic fever	☐ Intestinal worms	☐ Cardiovascular- High BP	☐ Perinatal conditions in newborns
☐ Measles	☐ Leprosy	☐ Cardiovascular- Other	**Miscellaneous Diseases**
☐ Meningitis (Meningococcal)	☐ Malaria (not during pregnancy)	☐ Childhood mental disorder	☐ Death in OPD (no diagnosis)
☐ Plague	☐ Malaria (during pregnancy)	☐ Diabetes Mellitus	☐ ENT Conditions
☐ Rabies	☐ Meningitis (Non meningococcal)	☐ Epilepsy	☐ Eye Conditions
☐ Tetanus (0-28 days age)	☐ Onchocerciasis	☐ GI disorders (non infectious)	☐ Skin Conditions
☐ Yellow Fever	☐ Pelvic Inflammatory Disease	☐ Injuries—Road Traffic Accidents	☐ Oral Diseases and conditions
Cough Diagnoses (See also TB in Column 4)	☐ Pneumonia	☐ Injuries—Trauma of other Origin	☐ Illegible or unclear
☐ Acute Bronchitis/LRTI (no pneumonia)	☐ Schistosomiasis	☐ Malnutrition- low weight for age	**Tuberculosis**
☐ Allergic Rhinitis	☐ Sleeping Sickness	☐ Malnutrition- severe	☐ New TB case – No prior TB treatment
☐ Asthma	☐ STI	☐ Mental Illness- Anxiety	☐ New TB case – Previous TB treatment
☐ Cold/Sinusitis/URTI (no pneumonia)	☐ Tetanus (over 28 days age)	☐ Mental Illness- Depression	☐ Known TB Case – Med Refill
☐ COPD	☐ Typhoid Fever	☐ Mental Illness- Mania	☐ Extra-pulmonary TB
☐ Heartburn causing cough	☐ Urinary Tract Infections (UTI)	☐ Mental Illness- Schizophrenia	**Other Diagnosis**
☐ Heart Failure		☐ Mental Illness- Other	
☐ Pneumonia			

Treatment (Check all that apply) For antimalarial drugs, Tick DA if Drug is Available and given or Tick OS if Drug is Out of Stock or Tick ANG if Drug is Available but not Given

Drug	Dose	DA	OS	ANG	Drug	Dose
Antimalarial					**Other Drugs**	
☐ Coartem		☐	☐	☐	☐ Aspirin	
☐ Quinine		☐	☐	☐	☐ Cough linctus	
☐ Chloroquine		☐	☐	☐	☐ Diazepam	
☐ Amodiaquine		☐	☐	☐	☐ Dexamethasone	
☐ SP		☐	☐	☐	☐ Diclofenac	
☐ Artesunate		☐	☐	☐	☐ Folic Acid	
☐ Duocotecxin		☐	☐	☐	☐ Gentian violet	
☐ Arco		☐	☐	☐	☐ Hydrocortisone	
Antimicrobials					☐ Ibuprofen	
☐ Albendazole					☐ Magnesium	
☐ Amoxilicilin					☐ Multivitamin	
☐ Chloramphenicol					☐ Nystatin	
☐ Ciprofloxacin					☐ Paracetamol	
☐ Cloxacillin					☐ Phenytoin	
☐ Cotrimoxazole					☐ Piriton	
☐ Doxycycline					☐ Salbutamol	
☐ Erythromycin					☐ Vit. B group	
☐ Gentamicin					Other	
☐ Mebendazole					Other	
☐ Metronidazole					Other	
☐ PPF					Other	
☐ Tetracycline					Other	
☐ X-pen					Other	

Referrals and additional notes

☐ Admitted to ward
☐ Referred to HIV care
☐ Referred for TB care
☐ Referred for other services

Notes

TB Drug Regimen (Check if prescribed)

Initiation:	DA	OS	ANG	Continuation:	DA	OS	ANG
☐ RHZE	☐	☐	☐	☐ HE	☐	☐	☐
☐ RHZES	☐	☐	☐	☐ RHE	☐	☐	☐
☐ RHZ	☐	☐	☐	☐ RH	☐	☐	☐

Full Name

Signature

← Patient demographics

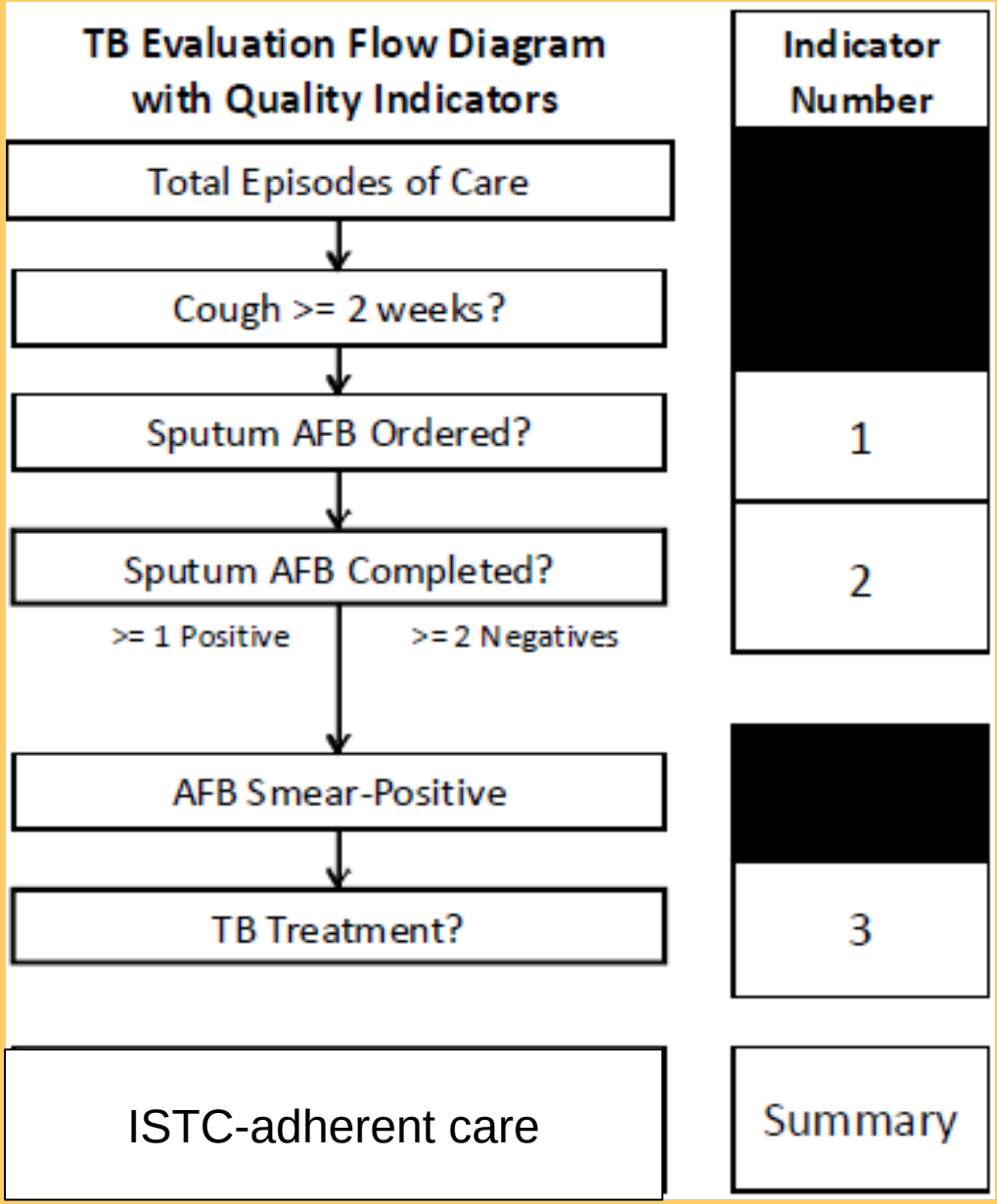
← Cough history

← TB exams

← TB diagnoses

← TB medications

ISTC Quality Indicators



Aim 1: “Define quality gap”

- Prospective study Jan-Dec 2009
- Descriptive analysis of ISTC quality indicators
  - Point estimates (95% CI), by quarter
  - Change over time
- Study population

Characteristic	N=62,909
Female, % (95% CI)	70 (69-71)
Age, median (IQR)	29 (21-40)

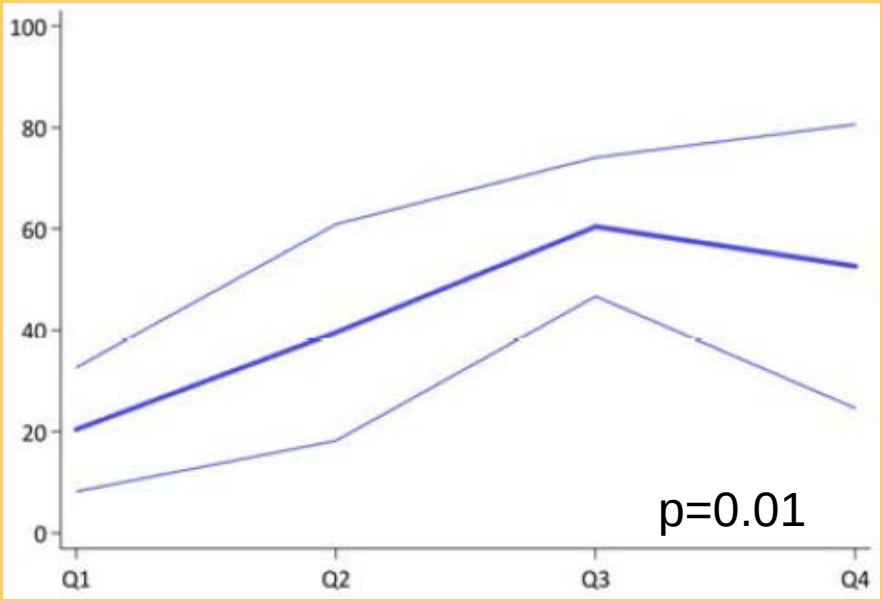
Davis et al. AJRCCM 2011

Aim 1: Baseline Data

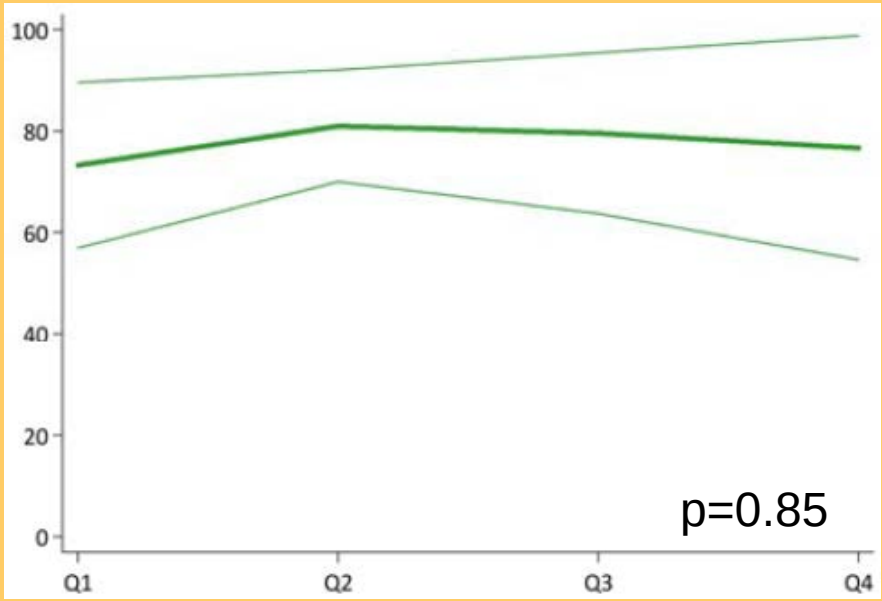
Q1 2009 (14,852 patients → 365 TB suspects)	
Standard 1: Referred for TB testing	21%
Standard 2: Completed TB testing (if referred)	71%
Standard 3: Treated for TB (if smear-positive)	73%
ISTC-adherent care	11%

Davis et al, AJRCCM, 2010.

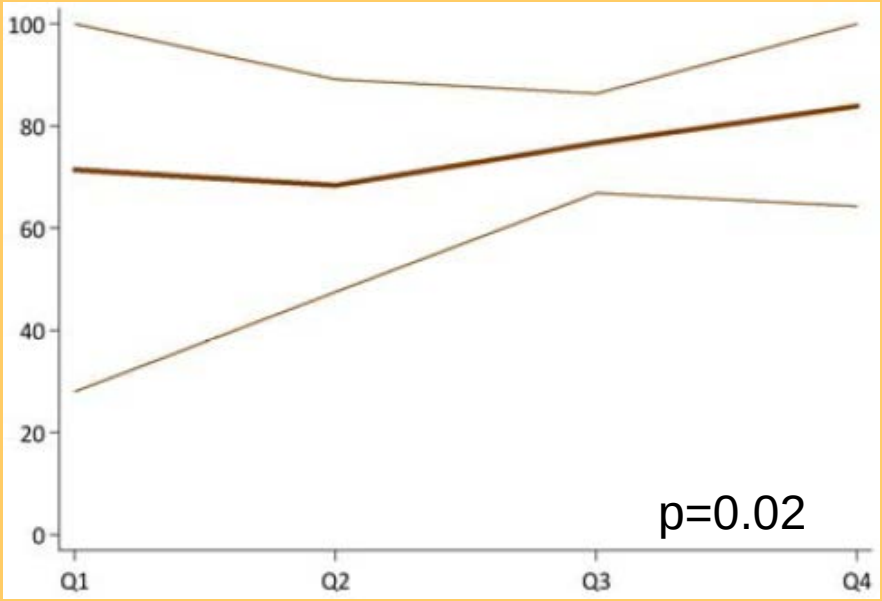
Indicator 1: Referred for TB exams



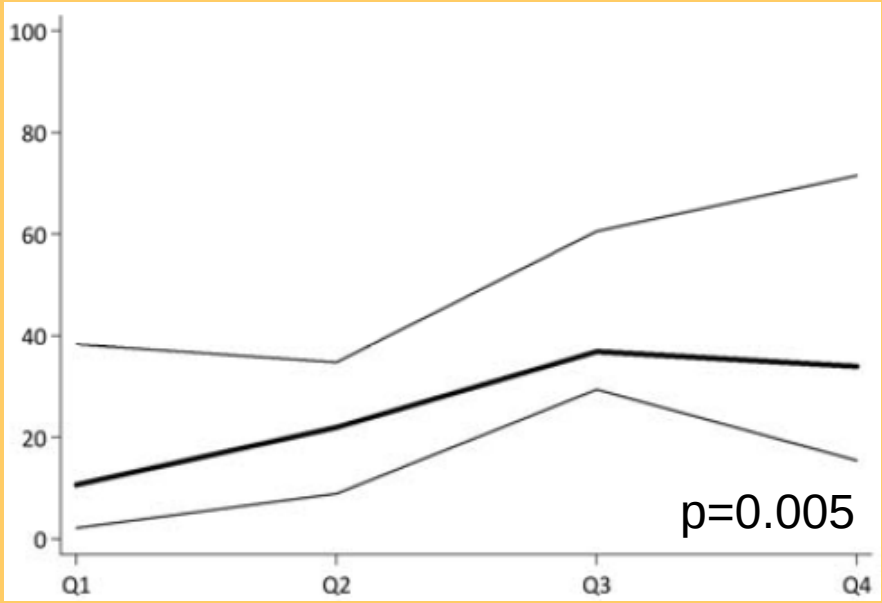
Indicator 2: Completed TB exams



Indicator 3: Treated if AFB-positive



Summary Indicator

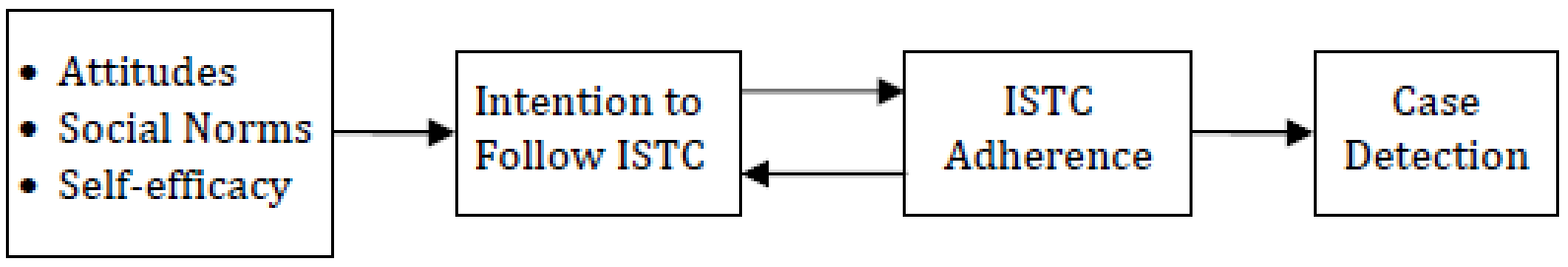


Aim 1: Summary

- Poor adherence to ISTC at baseline
- Modest improvements → 4-fold increase in TB case detection (7 to 25 cases/quarter)
- High yield of smear examination (13-21%)
- Strong need for strategies to improve TB suspect evaluation

Aim 2: “Understand quality gap”

- Conceptual Framework: Theory of Planned Behavior

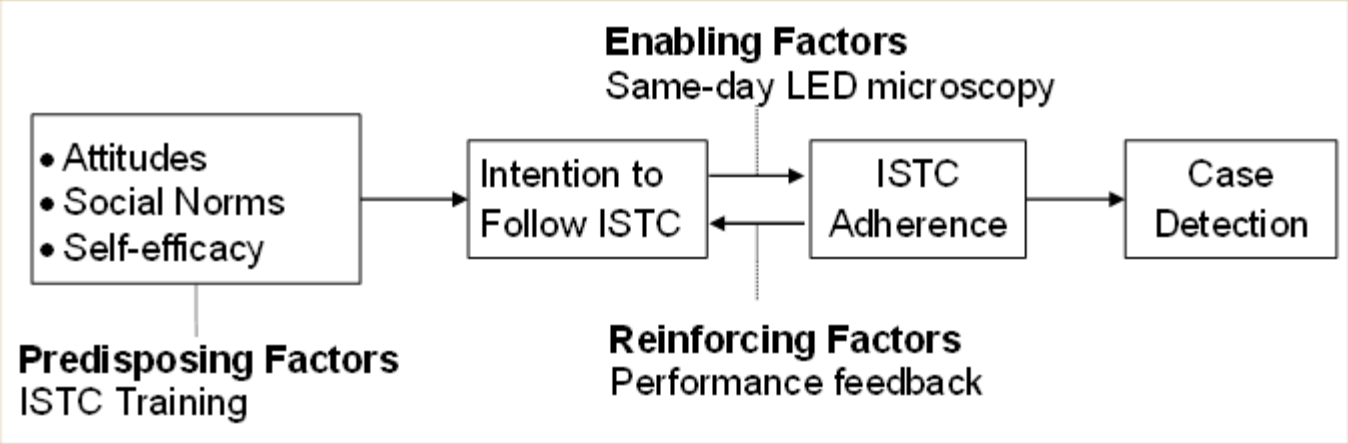


- Data collection
  - Key informant interviews (26 interviews completed)
  - Semi-structured surveys
  - Field Observation
- Analysis
  - Transcribe interviews, surveys, field notes
  - Apply standard coding scheme to identify recurring themes

Barriers to TB suspect evaluation

PRECEDE framework	Recurring themes
Predisposing factors	• Motivation of staff • Training of staff • Remoteness of patients from health services “Now here it is, again we have so many people who come from far, I don’t know when but if you check our register we are getting so many patients from far places.”
Enabling Factors	• Stock-outs of reagents, supplies, drugs • Workload faced by staff • Sample collection and evaluation “When they have a cough for more than 2 weeks they are sent to the lab. But the problem is they get the first sample and sometimes, actually most times they don’t bring the second sample.”
Reinforcing Factors	• Capacity for patient follow-up • Communication and coordination “Mmh actually at times we have met but aaaah we don’t meet, only that when we realise there is a problem that’s when we communicate and say why is this happening, then we try to rectify.”

Aim 3: “Improve quality gap”

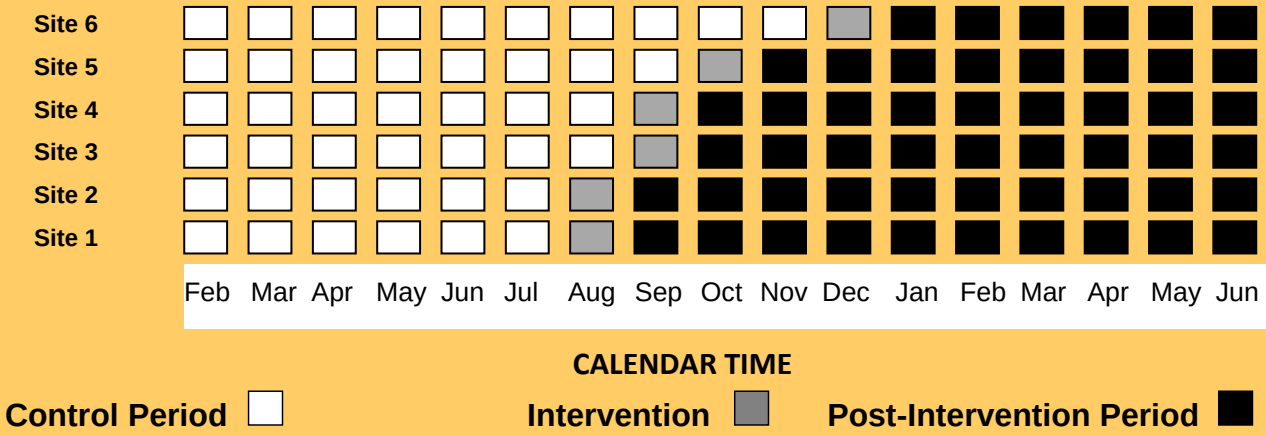


- ISTC training
- Same-day LED fluorescence microscopy*
  - Facilitate same-day TB evaluation and treatment
  - Reduce laboratory workload/patient waiting time
- Performance feedback
  - Facilitate training/continuous quality improvement

Cattamanchi et al, AJRCCM, 2011

Intervention evaluation

- Does a performance feedback program improve the quality of TB suspect evaluation at primary health centers in rural Uganda?
  - Design: Quasi-experimental (interrupted time series)
  - Sites selected to receive intervention in random order
  - Time Period: Feb 2010 – June 2011



Performance-feedback program

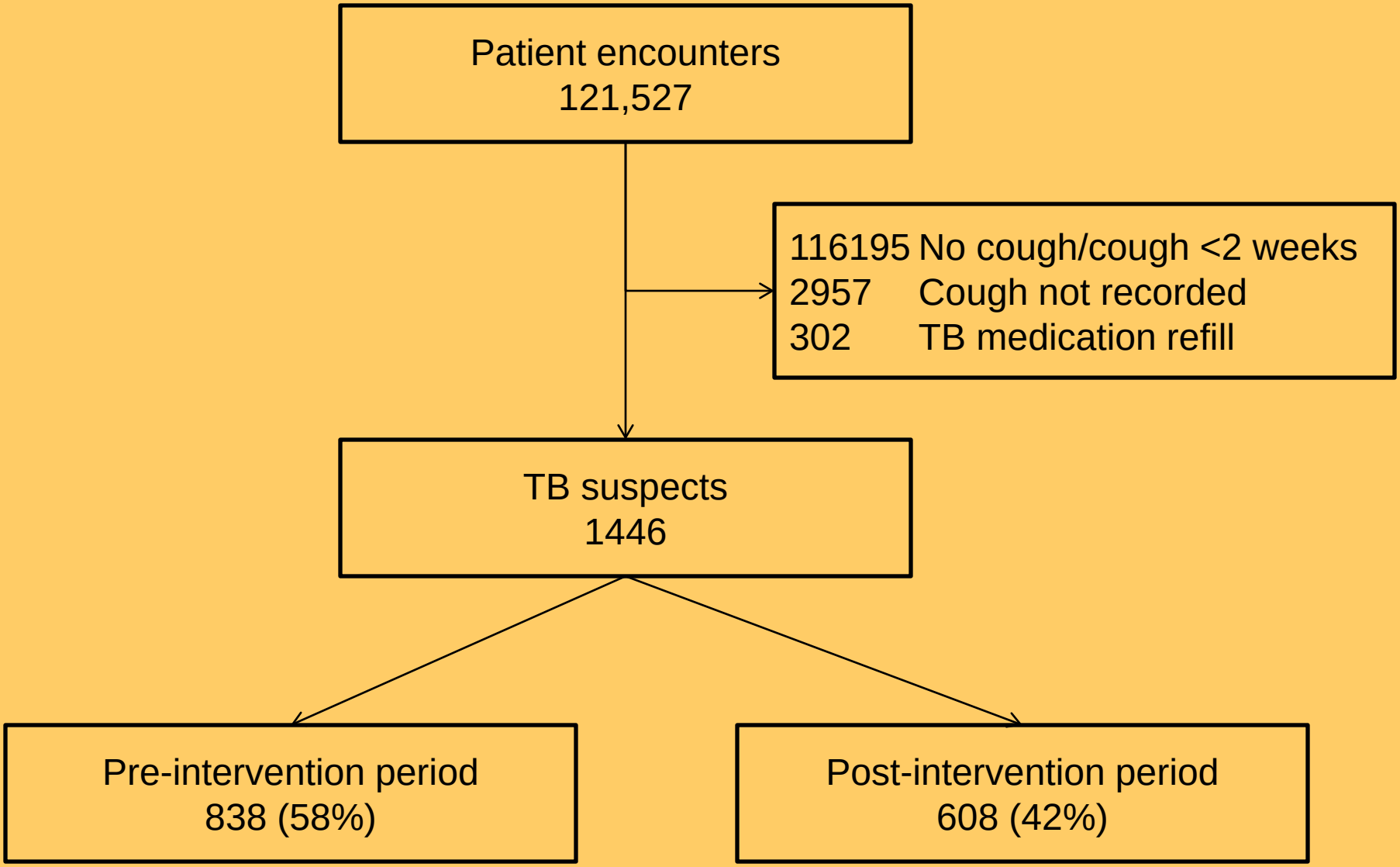
- Plan→Do→Study→Act Model

- Report card provided to each site monthly
  - PLAN: Identify plans to improve performance
  - DO: Implement plans
  - STUDY: Review updated report card
  - ACT: Refine or change performance improvement plans

Outcomes and analysis

- Primary/Secondary Outcomes
  - **Proportion receiving ISTC adherent care**
  - Proportion referred for TB testing
  - Proportion completing testing (if referred)
  - Proportion treated (if smear-positive)
  - Proportion confirmed as TB cases

- Analysis: Logistic regression models
  - Primary predictor: Intervention period (pre vs. post)
  - Co-variates
    - age, gender
    - Robust standard errors (to account for clustering by site)
    - Secular trends: time modeled as spline


Patient encounters
121,527
116195 No cough/cough <2 weeks
2957 Cough not recorded
302 TB medication refill
TB suspects
1446
Pre-intervention period
838 (58%)
Post-intervention period
608 (42%)

Results - 1

- Demographic characteristics

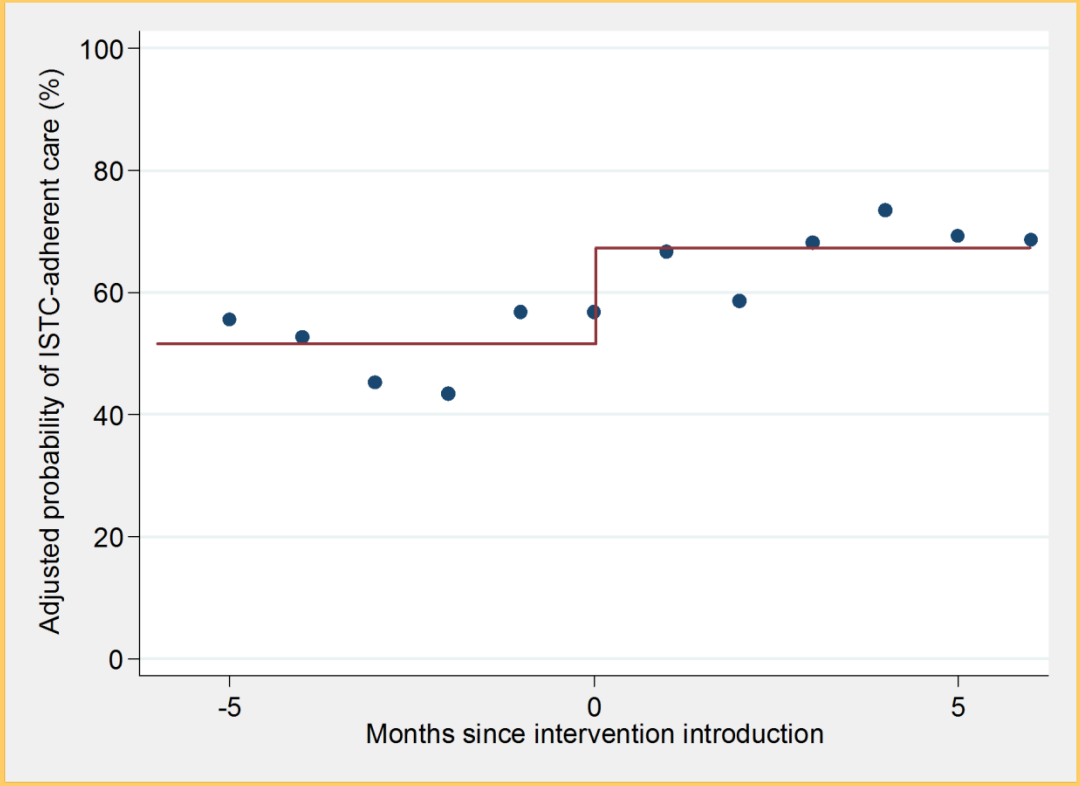
Characteristic	Pre-intervention N=838	Post-intervention N=608	p-value
Age (median, IQR)	38 (28 – 51)	38 (27 – 50)	0.72
Male gender	385 46%	303 50%	0.17

Results – Bivariate analysis

Indicator	Pre-intervention N=838	Post-intervention N=608	p-value
Received ISTC-adherent care	432/838 (52%)	410/608 (67%)	<0.001
Proportion referred for microscopy	601/838 (72%)	499/608 (82%)	<0.001
Proportion completing microscopy (if referred)	447/601 (74%)	420/499 (84%)	<0.001
Proportion treated (if AFB positive)	39/54 (72%)	59/69 (86%)	0.07
TB confirmed (AFB-positive)	54/838 (6%)	69/608 (11%)	0.001

Results – Primary outcome

Average Proportion		% Difference	OR	P-value
Pre-intervention	Post-intervention			
52 (37-66)	67 (50-85)	15.6 (8.2 – 23.1)	1.93 (1.33-2.79)	<0.001



Results – Secondary Outcomes

Quality Indicator	Adjusted proportion		% Difference	Adjusted OR	P-value
	Pre-intervention	Post-intervention			
Referred for microscopy	72 (59-85)	82 (64-100)	10.1 (-6.5 to +26.8)	1.79 (0.60-5.31)	0.29
Completed microscopy, if referred	74 (61-87)	84 (75-94)	9.6 (-7.8 to +27.0)	1.81 (0.62-5.29)	0.28
Treated, if AFB positive	72 (52-92)	85 (74-97)	13.1 (-3.8 to + 30.0)	2.29 (0.88-5.97)	0.09
TB confirmed	7 (4-9)	11 (7-15)	4.5 (1.1 – 7.9)	1.81 (1.22-2.68)	.003

Lessons learned

- Performance feedback is an effective tool to change clinician behavior in sub-Saharan Africa
- Additional interventions are needed to make the diagnostic process easier for patients
- Quality of the diagnostic process is as important as the quality of the diagnostic test
- Future directions
  - Enabling factor: same-day LED FM ongoing
  - Multi-country cluster randomized trial: Test feasibility, impact, and cost-effectiveness

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