DEPARTMENT OF GLOBAL HEALTH
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SAIA-SCALE
Micro-costing a government-led program

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Systems Analysis and Improvement Approach (SAIA)

Systems engineering is a methodical, disciplined approach for the design, realization, technical management, operations, and retirement of a system.

It is a way of looking at the "big picture" when making technical decisions.

-NASA System Engineering Handbook (2007)

SAIA is a package of systems engineering tools including

- Cascade analysis
- Flow mapping
- Continuous quality improvement (CQI)

Well suited to prevention of mother-to-child transmission (PMTCT) process improvements

PMTCT Cascade

Antenatal care
- ANC attendance
- HIV counseling & testing
- CD4 testing
- Provision of ARV prophylaxis/cART to mother

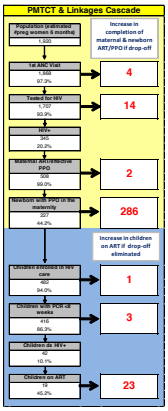
Birth
- Safe delivery
- Provision of prophylaxis to infant
- Education on safe infant feeding and care

Postpartum care
- Viral load testing
- Safe infant feeding
- Infant follow up care and HIV testing
- Family planning
- Linkages to long-term HIV care and treatment

SAIA Step 1

Describe pMTCT performance and identify priority areas for improvement

- Use of the **pMTCT Cascade Analysis Tool (PCAT)** to provide a 'systems view' of the sequential, linked pMTCT cascade steps



SAIA Step 2

Process mapping to identify modifiable facility-level bottlenecks

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SAIA Step 3-5

Continuous Quality Improvement

- Define & implement facility-specific workflow adaptations
- Monitor changes in performance; initiate additional iterations
- Repeat analysis and improvement cycle

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SAIA 3-Country Study (2013-2015)

- **~Efficacy trial**
- Cluster RCT conducted in Côte d'Ivoire, Kenya and Mozambique
- Tested impact of SAIA on the PMTCT cascade
- Intervention implemented by HAI study nurses
- Resulted in improvements in
  - **ART uptake** (13.3% vs. 4.1% increase)
  - **Early infant diagnosis** (11.6% vs. 0.7% increase)

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SAIA-Scale Study (2017-2021)

Overall objective

- **~Effectiveness trial**
- Evaluate a district government-led, at-scale programming approach to the SAIA intervention

Study setting: Manica Province, Central Mozambique

- Total population: ~2 million
- 15.3% adult HIV prevalence
- 12 districts; 9-13 total health facilities per district
- Three highest-volume health facilities per district to be included in the intervention

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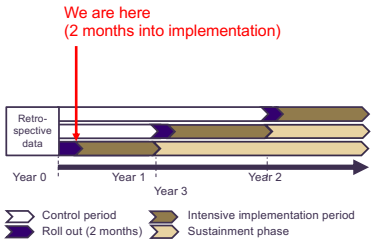
SAIA-Scale Study design

- Stepped wedge
  - 3 x 12 month waves
  - 4 districts per wave
- **Implemented** by MCH district nurses
- **Mentored** by HAI study nurses in the intensive phase



SAIA-SCALE SPECIFIC AIMS & METHODS

Aim 1: RE-AIM

- **Develop an effective district-based dissemination and implementation strategy for the SAIA intervention (SAIA-SCALE), using the RE-AIM model to evaluate the program's**

R	**Reach:** Health facilities and population reached
E	**Effectiveness:** PMTCT process, HIV infections averted, viral suppression
A	**Adoption:** Proportion and determinants of districts and facilities adopting the intervention
I	**Implementation:** Successes, failures, process evaluation
M	**Maintenance:** Districts and facilities sustaining the intervention at 12, 24, 36 months

Aim 2: Cost-effectiveness

- **Using activity-based micro-costing and mathematical models of HIV transmission, estimate the budget and program impact from the payer perspective to scale-up the SAIA intervention compared to the standard of care.**

Aim 2 detailed objectives

- **Projected cost and ICER for different scale-up scenarios**, e.g:
  - Nationwide
  - High-prevalence provinces only
  - Largest health facilities only

SAIA-SCALE COSTING METHODS

Costing methods

1. **Micro-costing**
   - Results can be disaggregated
2. **Bottom-up, activity-based**
   - Based on project activities
   - More accurate and comprehensive
   - However, more time-consuming and complex

Activity-based cost analysis

1. Cost analysis framework development
   - List broad program **activities** (e.g. supervision of health facilities)
   - List **components** of each activity that incur costs (e.g. supervisors' time)
   - Review and refine together with program implementers
   - Brainstorm **data collection methods** to quantify each component
2. Data collection
   - **Extract data from existing sources** as much as possible (e.g. public records of government salaries)
   - **Measure** as many remaining cost components as possible (e.g. person-time)
   - **Estimate** remaining variables (e.g. travel time, distances)
3. Multiply cost components by unit costs

Main SAIA-SCALE implementation activities

1. Training district supervisors
2. Supervision visits to health facilities
3. Micro-interventions within health facilities

Main cost-incurring components of this activity:

a. Person-time
b. Transportation

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Supervision visits to health facilities

- Description:
  - District MCH supervisors visit health facilities
  - Guide health facility staff through PCAT, flow mapping, and CQI
  - Monitor progress
- Data collection: Tablet-based survey, filled by district MCH supervisors
- Status: underway (2 months into 36-month implementation period)

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Snapshot of cost analysis framework

ACTIVITY	COST COMPONENT	DATA TYPE	DATA SOURCE
Supervision visits to health facilities	***Costable units***		
	Metadata (date, location, etc.)	Measured	REDCap Form2B
	Number of district supervisors (health facility visitors)	Measured	REDCap Form2B
	Health facility staff visited	Measured	REDCap Form2B
	Duration supervision visit	Measured	REDCap Form2B
	Transportation type and origin	Measured	REDCap Form2B
	Drive time or distance for supervisors	Estimated	Google Earth, interviews with district supervisors

Form 2B, Facility visit survey

Data collected
Date
Time
GPS coordinates
Enumerator
District
Health facility visited
Arrival time
Departure time
Transportation type
Transportation origin
Health facility visitors (organization, job position)
Staff visited (by level)
Activities description
Any other notes

Form 2B: screen-capture from REDCap

District supervisors' tablet setup

- Intuitive layout
- Guides alongside apps
- Remove excess apps
- Direct communication for troubleshooting
- Data collection *and* implementation tools

Results:

- 70 REDCap surveys submitted
- Detailed picture of implementation

Distrito	Unidade Sanitária	Preenchedor(a)	Datas das visitas											
			Abril			Maio			Junho	Julho	Agosto	Setemb	Outubr	Novemb	Dezemb
Chimoio	CS de Vila Nova	HAI - Mery	4/10	4/11		5/14									
		Distrito - Delfina	4/10	4/11	4/23	5/14									
	CS de Nhamoanha	HAI - Mery	4/12	4/13		5/15									
		Distrito - Delfina	4/12	4/13		5/15									
		Distrito - Sitembile			4/26										
	CS 7 de Abril	HAI - Mery	4/17	4/18		5/17									
		Distrito - Delfina	4/17	4/18											
		Distrito - Sitembile			4/30	5/17									
Gondola	Hospital Distrital de Gondola	HAI - Melita	4/10	4/11		5/14	5/15								
		Distrito - Belmira	4/10	4/11		5/14									
		Distrito - Argentina			4/23										
	CS de Inchope	HAI - Melita	4/12	4/13											
		Distrito - Belmira	4/12	4/13		5/15									
		Distrito - Argentina			4/26										
	CS das Amatongas	HAI - Melita	4/17	4/18		5/17									
		Distrito - Argentina	4/17	4/18	4/30										
		Distrito - Belmira				5/17									
Macate	CS Macate Sede	HAI - Melita	4/19	4/20											
		Distrito - Arcilia	4/19	4/20											
	CS de Marera	HAI - Melita	4/24	4/25											
		Distrito - Arcilia	4/24	4/25		5/9									
	CS de Zembe	HAI - Melita				5/3	5/4								
		Distrito - Ana Laila				5/3	5/4								
Manica	Hospital Distrital de Manica	HAI - Mery	4/29	4/20											
		Distrito - Herminia	4/19	4/20											
		Distrito - Elsa				5/2									
	CS de Messica	HAI - Mery	4/24	4/25											
		Distrito - Elsa	4/24	4/25											
		Distrito - Herminia				5/8									
	CS de Machipanda	HAI - Mery				5/3	5/4								
		Distrito - Elsa				5/3	5/4	5/16							

Discussion

- What has worked well
  - Simple forms
  - Lots of piloting (and Keshet patiently revising tools)
  - Integrating forms into implementation
    - HAI uses REDCap data to track implementation
    - Per-diems for district supervisors are contingent on submitting REDCap data
- What hasn't worked well
  - Poor internet connections in some districts
  - REDCap translations incomplete
  - REDCap longitudinal forms too complicated for our purposes

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Thank you

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EXTRA SLIDES: RE-AIM DETAILS

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RE-AIM: Reach

R • Proportion of health facilities and population in Manica province reached

Target	Data source
32% of health facilities	Reports from study personnel
80% of mother-infant pairs	Health management information systems data

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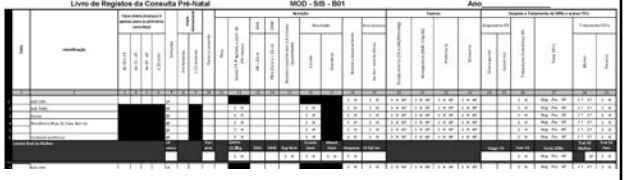
RE-AIM: Effectiveness

E • Effect on PMTCT process measures and Option B+ effectiveness at the individual level



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RE-AIM: Effectiveness

E • Effect on PMTCT process measures and Option B+ effectiveness at the individual level

Outcome	Definition
Maternal viral load testing	#women tested within 30 days post-partum / #women on ART
Early infant diagnosis	#infants w. PCR by 8 weeks / #infants presenting to care by 8 weeks

- Linear mixed-effects models; clustering by district
- Excludes data from the roll-out phase

RE-AIM: Effectiveness

E • Effect on PMTCT process measures and Option B+ effectiveness at the individual level

Outcome	Definition
6-month retention in care	6-month refill pickup within 15 days
Facility delivery	Infant delivered in maternity ward
ART adherence	3- and 6-month medication possession ratio
Viral load suppression	<1000 copies/mL within 30 days post-partum
MTCT	Positive PCR by 6 months post-partum

- Mixed-effects models; clustering by facility and district
- **Potential effect modifiers:** patient volume, provider training, distance from the district office
- **Potential adjustment variables:** calendar year, gestational age, timing of HIV diagnosis
- **Sensitivity analyses**: test for time trend, quantify impact of mis-entered data

RE-AIM: Adoption

A • Proportion and determinants of districts and facilities adopting the intervention

Target	Definition
95% of targeted facilities	Districts and facilities that attend training and initiate analysis and improvement cycles

- **Determinants of adoption:**
  - Organizational Readiness for Change assessment scale
    - Prior to the intensive phase in each facility
    - 8 frontline staff / managers per facility
    - 8 managers per district

RE-AIM: Implementation

I • Core elements and determinants of implementation successes and failures

- **Consolidated Framework for Implementation Research**
  - 18 focus group discussions (district managers,facility managers, frontline PMTCT nurses)
  - 84 in-depth interviews (frontline health workers, MCH supervisors)
    - End of each implementation wave
- Differential improvement by core components
  - Structural characteristics
  - Contextual factors
  - Implementation process

RE-AIM: Maintenance

M • Proportion of districts sustaining the intervention as designed at 12, 24 and 36 months

Outcome	Data source
Proportion of districts and facilities continuing to implement SAIA-SCALE with monthly meetings and CQI cycles **Target:** >90% and 12 months >80% at 24 months >65% at 36 months	Study staff reports
District and staff perspectives on determinants of sustained implementation	Focus group discussions and in-depth interviews