# Module III: SAIA Series Cascade Analysis

Overview

- Definition of care cascades

- Rationale for cascade analysis

- Cascade analysis tools (CAT)

- Use of CAT in routine care

- Example Cascades and CATs

- CAT adaptation challenges and solutions

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Cascade Analysis

- **Cascades** have been used to characterize sequential steps within a complex health system and are used in diverse disease areas and across prevention, testing, and treatment

- A step may be either service (e.g. HIV testing) or behavior (e.g. adherence)

- HIV care cascades are the most well known in the global health literature

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Example
The HIV Testing & Treatment Cascade

The Treatment Cascade

Engagement in HIV Care

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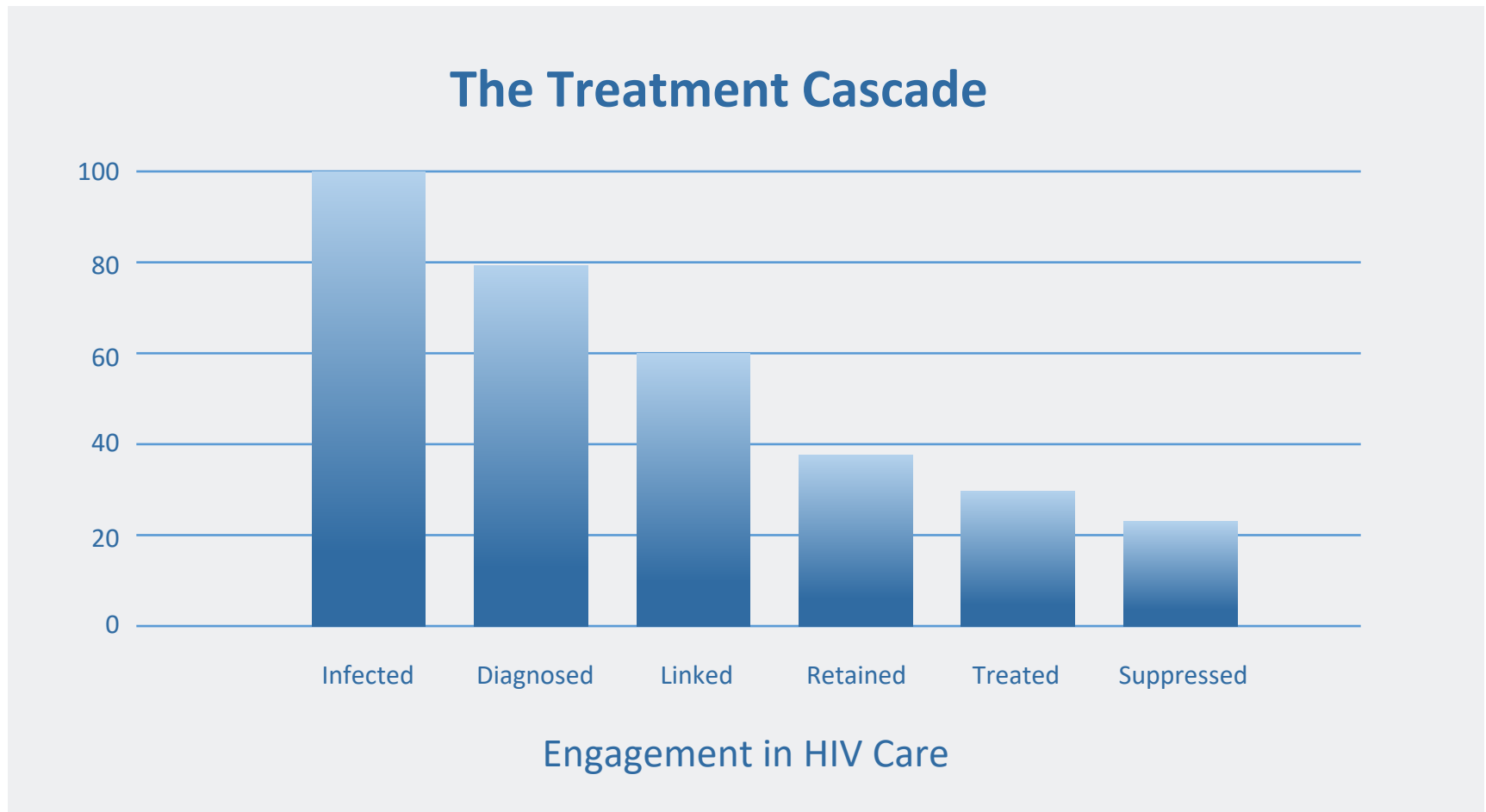
Rationale for Cascade Analysis

- Changes at individual cascade steps impact other steps

- Steps that appear to offer the largest gains may be constrained by downstream bottlenecks, minimizing their potential impact

- Drop off after initial engagement is avoidable and a quick win for optimization

- **Cascade analysis** is the use of routine data to visualize and quantify system performance, inefficiencies, and bottlenecks

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Cascade Analysis Tool (CAT)

- The **Cascade Analysis Tool (CAT)** we use in SAIA is a simple, Excel-based simulation model that identifies drop-offs and opportunities for improvement within a cascade

- Designed to inform health facility or district-level service management improvement processes

- CAT was first developed for the prevention of mother-to-child transmission of HIV care cascade, but the design has been used for a number of different services and geographic settings

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Pause for Group Activity

(as feasible)

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Brainstorm

- Imagine you are a health worker in a facility and a pregnant woman has arrived for care for the first time

- Let us discuss the possible steps from screening of HIV to infant diagnosis in a few steps

Example

PMTCT Cascade Analysis Tool Logic & Output (part 1)

Green cells represent routine data that are entered from PMTCT registers

White cells represent automatic calculations:

- The number (column A) and proportion (column B) completing that step,

- Number not completing, aka "drop off" (column C)

- Potential "cascade gain" if a given step were to perform optimally (column D)

ANC -> PPO		Total	%	Drop off	Extra completing through step 4 if drop off eliminated
	Health facility catchment area	100,000			
	% pregnant	5%			
	Number of months	6			
	Target population	2,500			
Step 1	1st ANC visits	2,250	90%	250	**23**
Step 2	HIV test at 1st ANC visit	2,000	89%	250	**25**
	HIV+ women identified at 1st ANC visit	500	25%		
	Previously identified HIV+	0			
	Identified HIV+ at later ANC visit	0			
	Total HIV+ women	500			
Step 3	HIV+ women who start ART or PPO	450	90%	50	**11**
Step 4	Newborns of HIV+ women receiving PPO	100	22%	350	**350**

Example

Kenyan PMTCT Cascade Analysis Tool Logic & Output (part 2)

Green cells represent routine data that are entered from PMTCT registers

White cells represent automatic calculations:

- The number (column A) and proportion (column B) completing that step,
- Number not completing, aka "drop off" (column C)
- Potential "cascade gain" if a given step were to perform optimally (column D)

| At-Risk Child Consult - > ART	Total	%	Drop off	Extra completing through step 9 if drop off eliminated
Step 5 — 1st HEI visits	290	78%	80	7
Step 6 — Babies in HEI care with PCR <8weeks	120	41%	170	30
Babies identified HIV+ in HEI care	24	20%		
Step 7 — HIV+ Babies in HEI care starting ART by 20 weeks of birth	21	88%	3	3
Step 8 — Babies in HEI care with PCR by 6 months	220	76%	70	9
New count of babies identified HIV+	50	23%		
Step 9 — HIV+ Babies in HEI care starting ART by 6 months	27	54%	23	23

Cascade Analysis Tool (CAT)

- Cascade gain enumerates those who would successfully complete the full cascade if a given step is performed perfectly, without any changes to the remaining steps

- CAT is well suited to care models where:

    Steps occur sequentially

    The system's goal is to reach 100% completion on at least one step

    Each step is binary, completed or not

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Use of CAT in routine care settings

- Using routine data has great potential to inform data-driven optimization of healthcare delivery

- CAT allows healthcare workers to use routine data to diagnose inefficiencies

- Paired with effective improvement strategies, CAT helps inform decision making and guide iterative improvements in complex health facility systems

Routine data is available, comprehensive and broadly collected!

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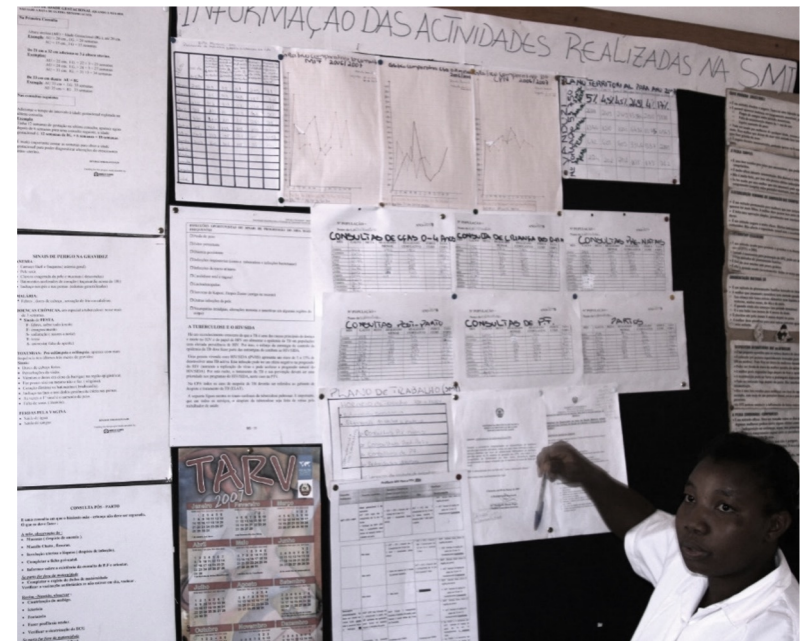
Use of CAT in routine care settings

- Inputs are count data from health care workers (HCW) activities

- Outputs are computer generated proportions of uptake/completion and potential "cascade gain"

- Goal is to view an entire SYSTEM and PRIORITIZE areas where changes could have the BIGGEST impact

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Steps for developing a CAT

1. Select your care cascade of choice
2. Bring together relevant stakeholders with knowledge of frontline patient flow
3. Identify sequential, conditional steps patients need to take
4. Determine if routine data is available for these steps (either facility level or patient level data)
5. Where data sources are not available, determine if proxy indicators may be feasible/available

   a. Ex. Proxy of return for medications at 6 mos is proxy for quality treatment & care counseling provided

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Pause for Sharing in Pairs

(as feasible)

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CAT adapations

- CAT was first developed for the HIV testing and treatment and prevention of mother-to-child transmission care cascades (PCAT)

- We now have many CAT adaptations

  1. CCAT -Adaptation to the Cervical Cancer screening cascade in Kenya

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     Systems Analysis & Improvement Approach
     Cervical Cancer

  2. HCAT - Integration of hypertension services into HIV care in Mozambique

     SAIA-HTN
     Systems Analysis & Improvement Approach
     Hypertension

  3. MHCAT -Optimizing task-shared outpatient mental health care for schizophrenia in Mozambique

     SAIA-MH
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     Mental Health

  4. FPCAT -Integration of HIV testing into family planning services in Kenya

     SAIA-FP
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     Family Planning

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Example: **Hypertension Care Cascade**

Estimated HTN prevalence — 38.9%

HTN status awareness — 14.5%

Treatment among aware — 50.1%

Controlled among treated — 44.5%

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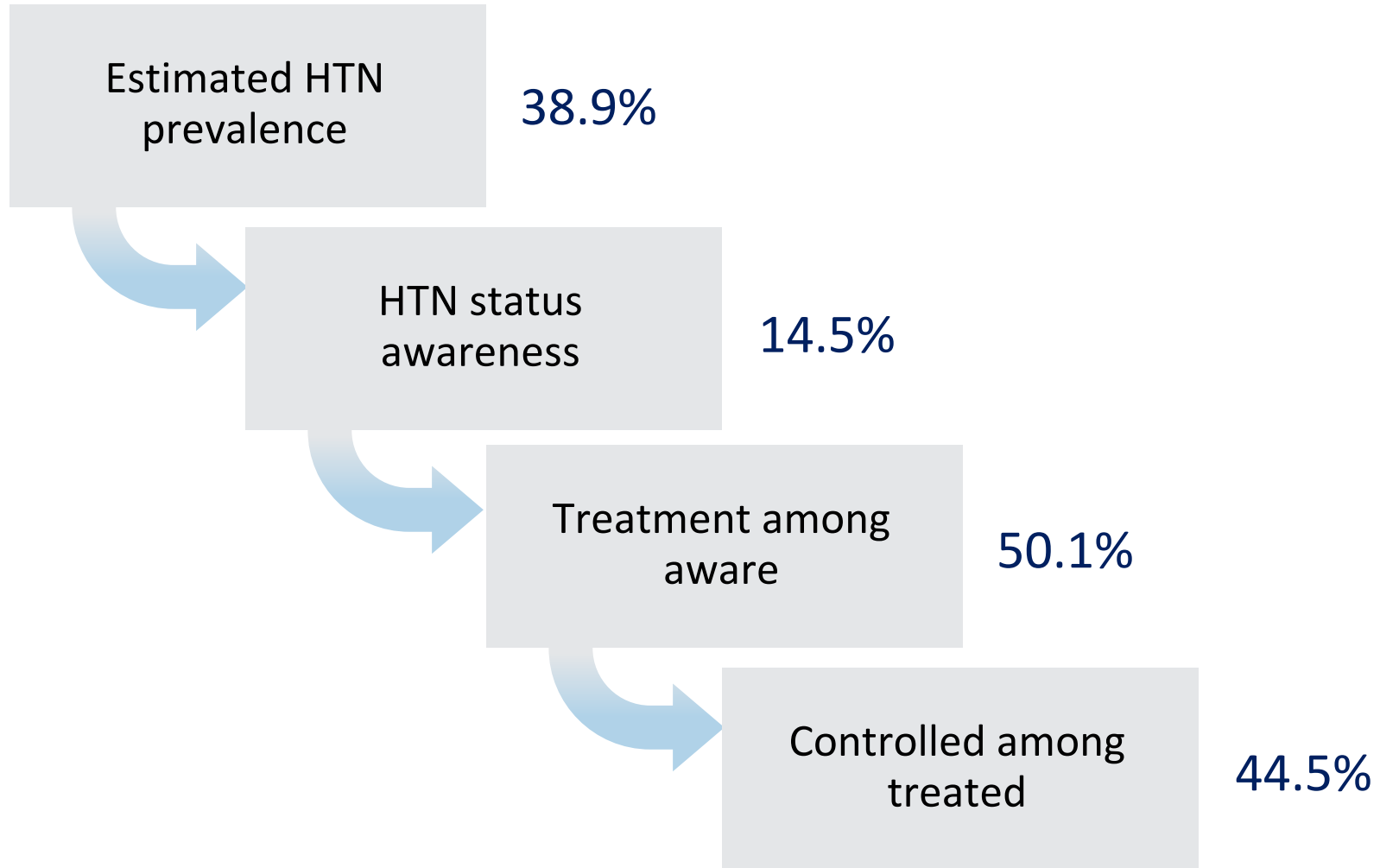
Hypertension CAT

HTN Care Cascade		Total	%	Drop-Off	# of additional HIV patients treated for HTN and controlled (until step 6) if there were no drop off at this step
	# Months	1			
	Target Popn	25,000			
	# of HIV-infected Individuals	2,875			
Step 1	Outpatient Consults - HIV+ Adult Patients	325	11%	2,550	50
Step 2	BP measured at Outpatient Consults for HIV+ Adult Patients	256	79%	69	2
Step 3a	HIV+ Patients eligible for HTN medications for the first time	37	14%		
Step 3b	HIV+ Patients already diagnosed HTN	17	7%		
	Total Eligible (Steps 3a & 3b)	54	21%		
Step 4a	HIV+ Patients with HTN medication prescription (new)	26	70%		
Step 4b	HIV+ Patients with HTN medication prescription (refill)	12	71%		
	Total prescribed (Steps 4a & 4b)	38	70%	16	3
Step 5	HIV Patients who picked up HTN medications last month	6	50%	6	2
Step 6	HIV Patients (on HTN treatment) with controlled BP	2	33%	4	4

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Cascade Analysis Tools (CATs)

- All versions of CAT built in Excel® (one (PCAT) has been adapted as an Android app, available via Google Playstore @ *PCAT – Mozambique* and *PCAT – Kenya*)

- All have been adapted and refined for health worker and manager use in LMICs and/or in HICs serving marginalized populations

- All allow users to input routinely collected data to assess drop off along the care cascade ***as well as*** identify priority areas for improvement *via* an optimization function that estimates potential increase in flow through the entire cascade while holding all other steps constant for each cascade step

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Cascade Analysis Empowers HCW

Thinking in care cascades empowers health workers to identify systems-level gaps and solutions

Cascade driven decision-making is responsive to gaps and iterative in improving PHC processes

- Identifies where, along the steps of the continuum of care, services fail to engage and retain clients in screening, treatment, and preventive services

- Determines the magnitude of losses/gaps along the continuum

- Prioritizes steps for improvement through optimization analysis

- Identifies performance drivers (e.g. challenges at the level of policy, health systems, community engagement, patient-level)

- Engages stakeholders in the analysis and improvement process

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Summary

- CAT allows for prompt feedback to HCW, increases autonomy, and enables managers to allocate resources and time in an equitable manner

- CAT is an effective, feasible, and acceptable implementation strategy to prioritize areas most requiring improvement within complex health systems

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Acknowledgements

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