

Evidence on the impact of POC testing for addressing pediatric HIV



JENNIFER COHN, EGPAF
JILIAN A. SACKS, CHAI

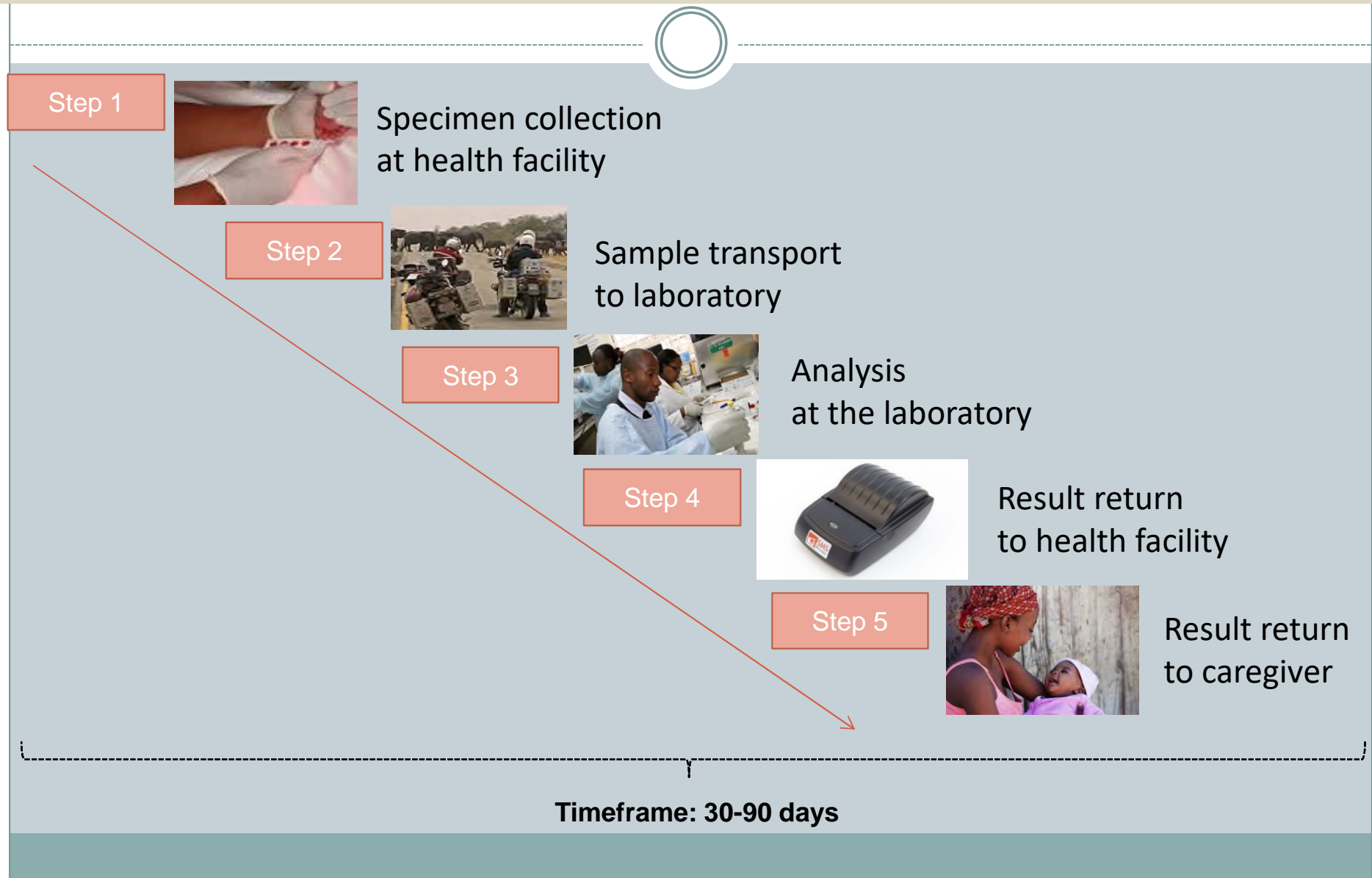
AIDS2018 Satellite Session:
Key Considerations and Implementation Tools for Introducing New HIV Point-of-Care
Diagnostic Technologies into National Health Programs
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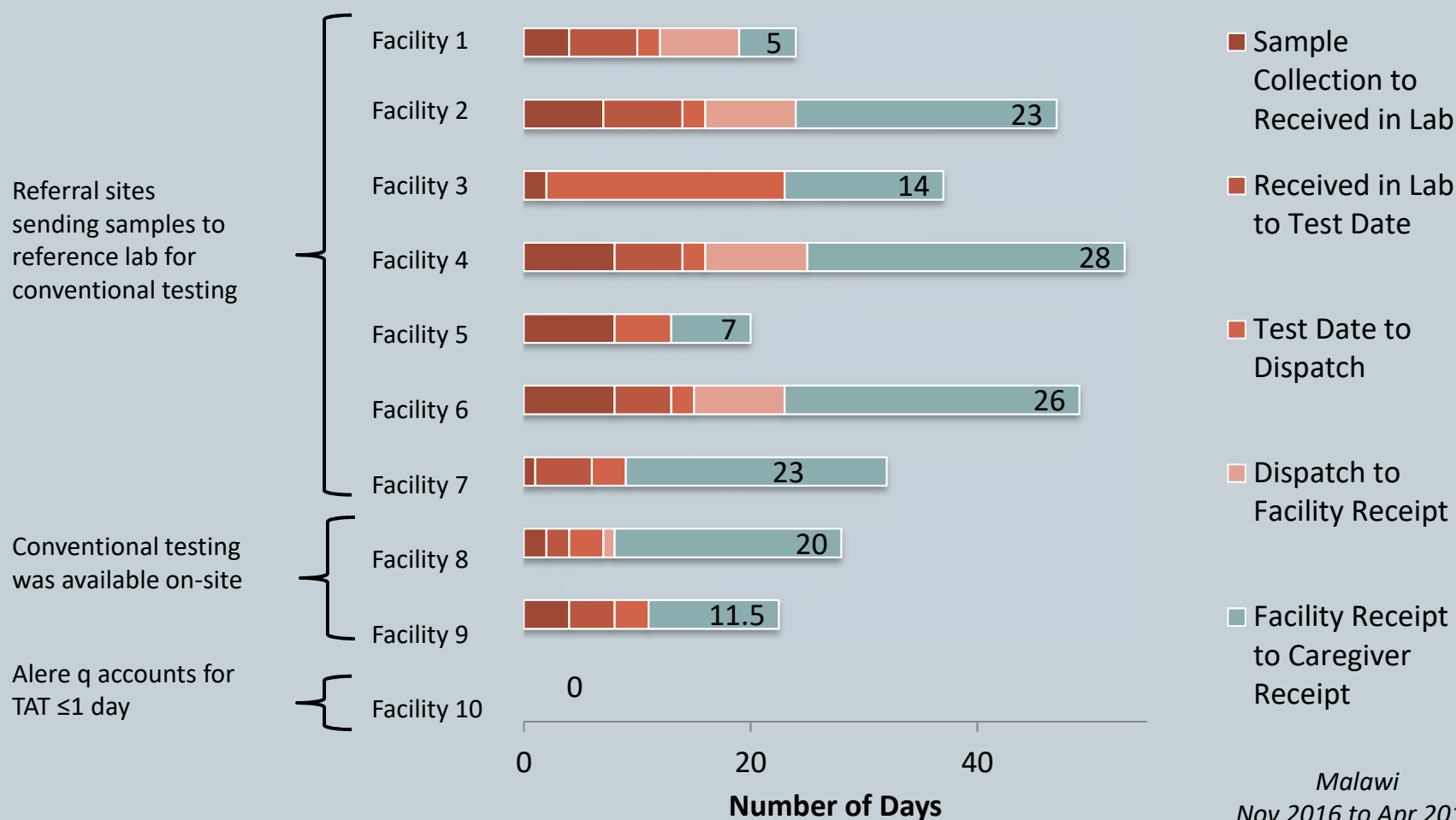
Elizabeth Glaser
Pediatric AIDS
Foundation



With laboratory-based EID testing, the number of steps from sample collection to return of results to caregiver and clinical action lead to persistent delays and a high proportion of lost results.



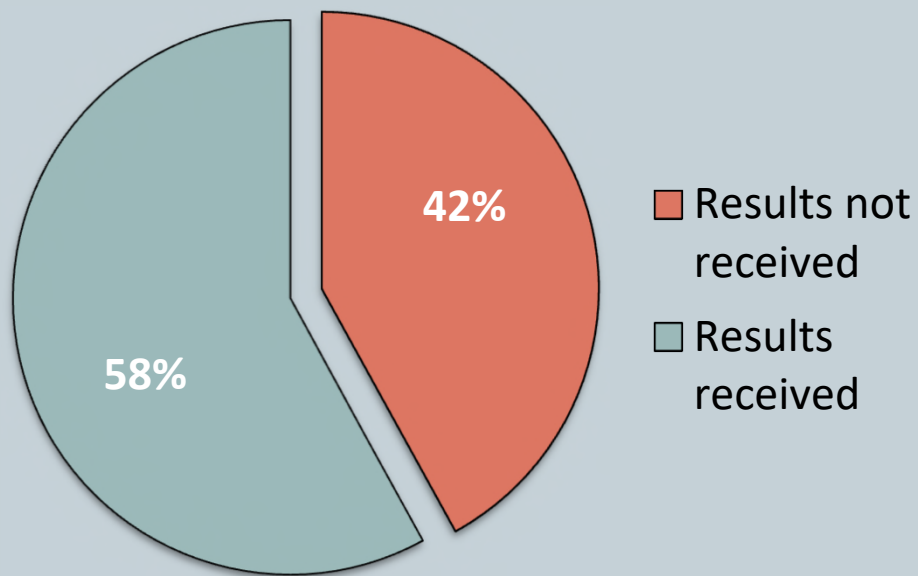
Long turnaround times from specimen collection to result receipt at the clinic, and an even longer time for results return to caregivers, contributes to high loss-to-follow-up.



TAT = Turnaround Time

With centralized lab-based testing, many test results are never received by the mother-baby pair.

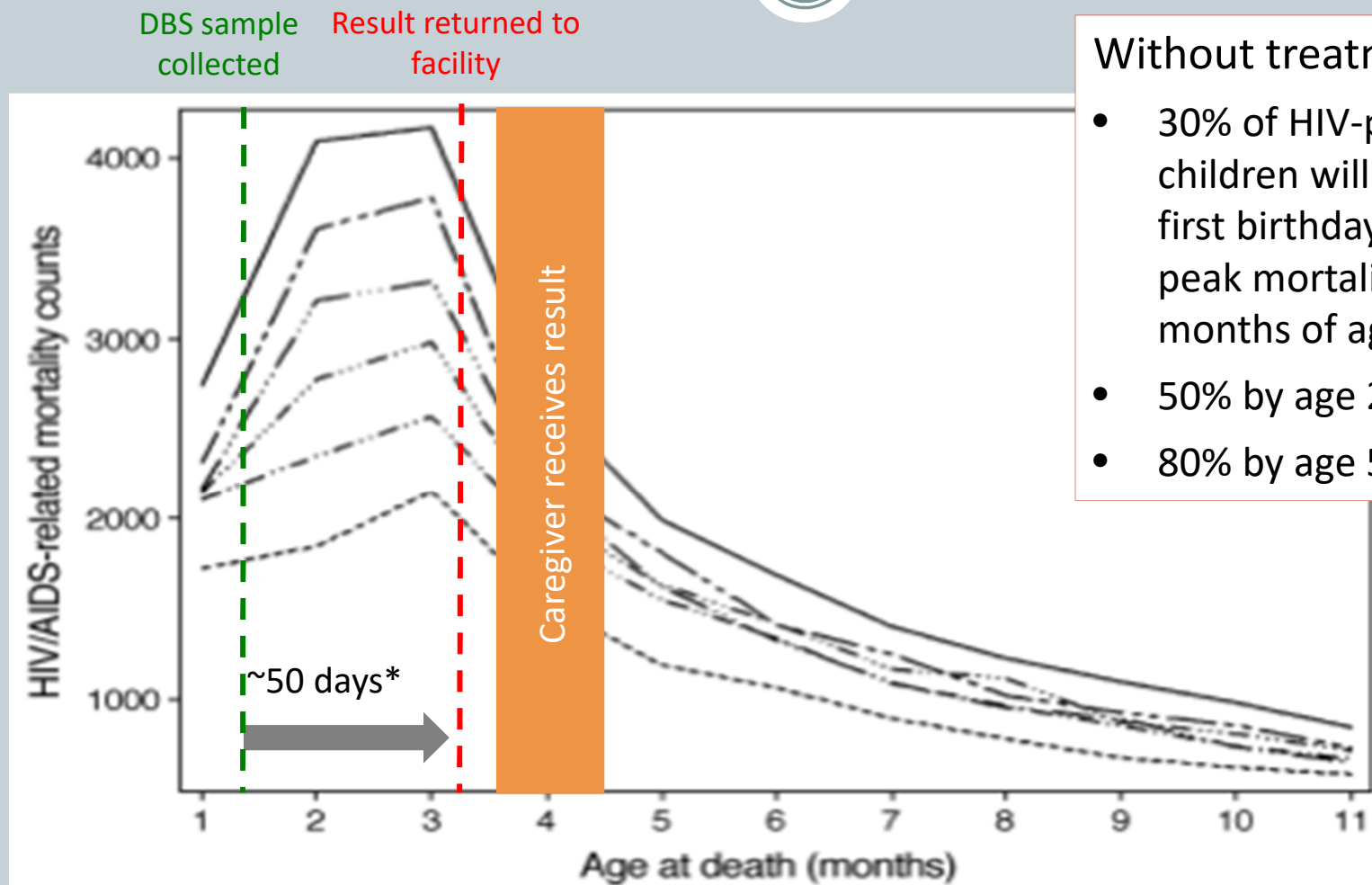
Based on a weighted average of nine studies and monitoring and evaluation (M&E) data, 42% of **EID** test results are not received by the patient¹



- Wasted reagents
- Wasted HR time
- Unnecessary repeat testing
- Infants LTFU before receiving results
- Poor linkage between testing and care and treatment
- High infant mortality

¹ See final slide for list of references

If untreated, infants infected with HIV in-utero or perinatally experience high mortality, which peaks from 2 to 3 months of age. Most lab-based EID test results are returned to patients after peak mortality.



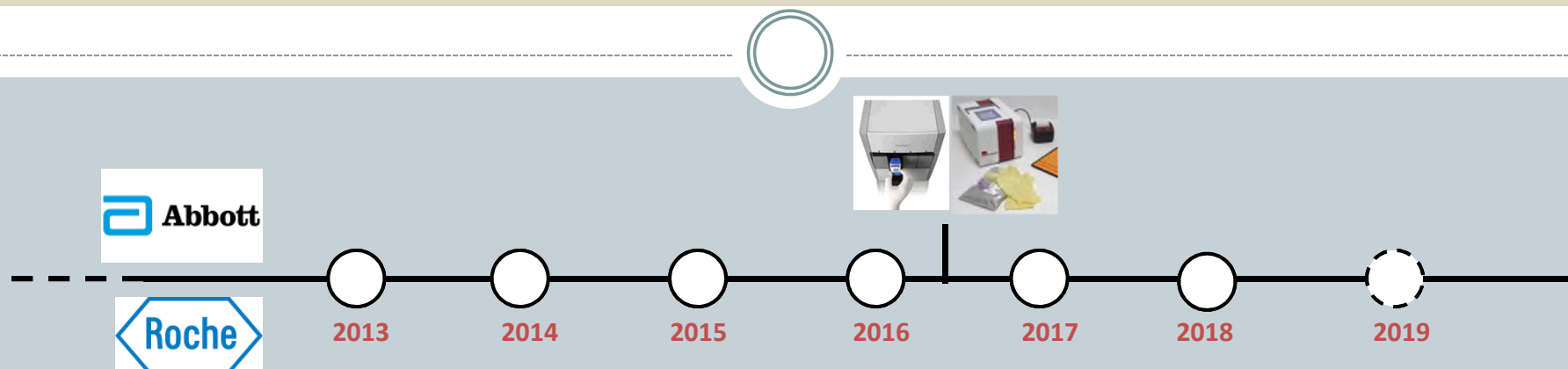
Without treatment:

- 30% of HIV-positive children will die by their first birthday (with a peak mortality at 2 to 3 months of age)
- 50% by age 2
- 80% by age 5

Source: Bourne AIDS 2009

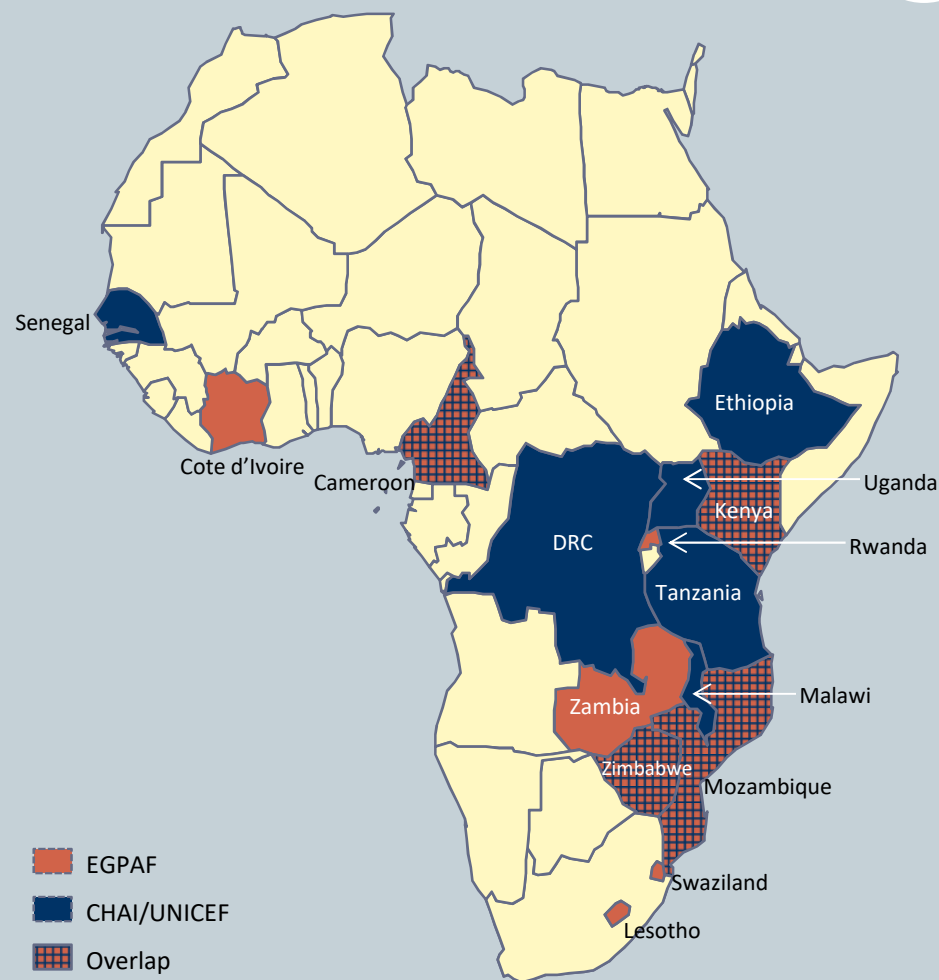
* Vojnov L et al JAIDS 2017

Two POC EID devices have shown to have high diagnostic accuracy and achieved WHO Prequalification in 2016



Assay	Evaluator	Sample type	Sensitivity (95% CI)	Specificity (95% CI)
M-PIMA	WHO PQ CDC/NHLS	WB	98.67% (95.27-99.84)	100.00% (97.59-100.00)
	EID Consortium	WB	99.00% (96.45-99.88)	99.97% (99.83-100.00)
Xpert	WHO PQ CDC/NHLS	WB	98.86% (93.83-99.97)	100.00% (97.55-100.00)
	EID Consortium	WB	96.79% (92.68-98.95)	99.91%(99.76-99.97)
	WHO PQ CDC/NHLS	DBS	99.34% (96.40-100.00)	100.00%(97.60-100.00)

The goals of the Unitaids-supported CHAI/UNICEF and EGPAF projects are to speed clinical decision making, increase the number of HIV-exposed infants whose HIV status is known and facilitate early initiation on treatment.



Purpose:

Ensure that at-risk infants have timely access to HIV testing and treatment through the incorporation of POC testing into national EID networks

Scale:

- 15 countries – 4 overlapping
- 5 years
 - EGPAF 2015-2019
 - CHAI/UNICEF 2016 – 2020
- \$157 million

Published studies and routine M&E data demonstrate that POC testing can diagnose more HIV-positive infants faster, and can significantly reduce the turnaround time from specimen collection to initiation of treatment for HIV-positive infants.

Study Use

Country	Setting	Device/ Sample	# of sites	n (infants)	% result return to caregiver		TAT result return	% ART initiation		TAT ART Initiation
					≤ 30 [#] days	Same day		≤ 60 days	Same day	
Mozambique (Maputo, Sofala)	Randomized controlled trial (cRCT)	Alere q/ Whole blood	SOC - 8	1,876	0.32%	0%	125	12.8%	NA	127
			POC - 8	2,034	98.7%	98.2%	0	89.7%		0
Malawi	Observa- tional pre/post	Alere q/ Whole blood	7 pre POC	963	18.1%	0%	56	41.9%	43.8%	38
			7 post POC	789	100%	99.5%	0	91.1%	70.7%	0

M&E – Routine Use

Nine countries (Dec 2016 – March 2018)*	M&E	Alere q/ Whole blood & Xpert/ Whole blood	SOC – 102	2,867	19.7%	0%	55	41.3%	0%	50
			POC – 339	25,102	98.3%	67%	0	91.7%	65%	0

[#]Mozambique SOC: 7.2% within 60 days; Malawi pre: 41% within 60 days

NA = not available

*Cameroon, Côte D'Ivoire, Kenya, Lesotho, Mozambique, Rwanda, Swaziland, Zambia, Zimbabwe (EGPAF)

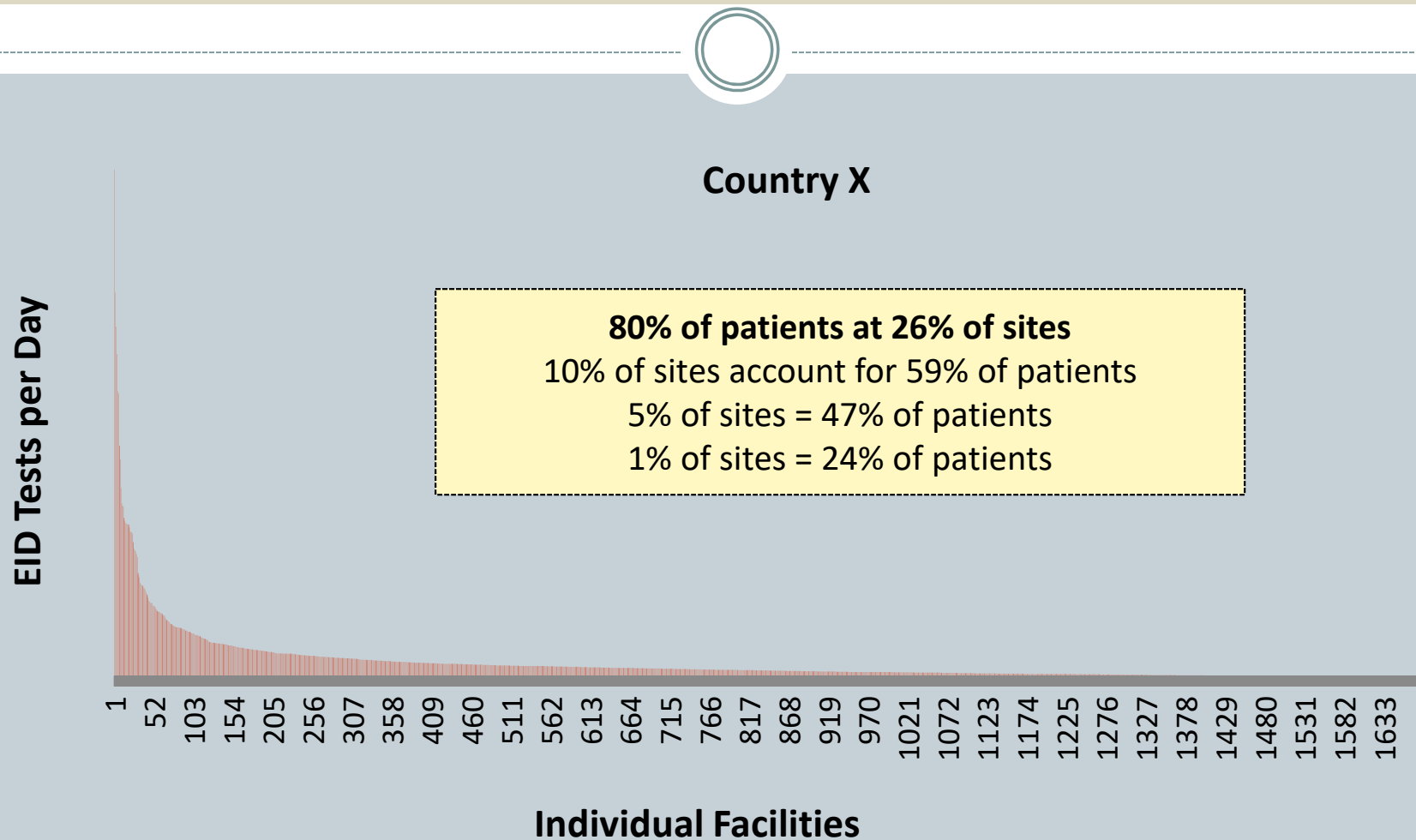
SOC = Standard of Care (Conventional, lab-based testing) POC = Point-of-Care testing

POC testing overcomes inherent challenges related to conventional EID to provide significant public health benefits for HIV-infected infants



- Referral-based **conventional EID faces inherent delays** due to the need to batch samples for transport and analysis
- **Two WHO Pre-qualified POC EID technologies are available** that can provide same day results high levels of diagnostic accuracy
- In study settings and routine use, POC EID has been shown to:
 - *Reduce TAT to <1 day*
 - *Increase ART initiation rates*
 - *Reduce time to ART initiation*
- **POC EID facilitates treatment initiation before the peak mortality window**

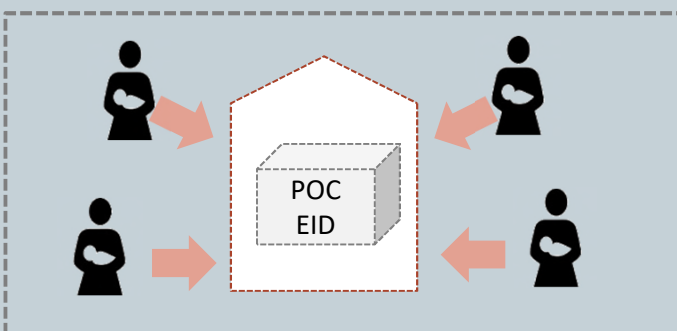
Despite the decentralization of PMTCT services, the majority (>50%) of HEIs are concentrated at a small number of sites (between 67 - 188 sites per country), allowing a high-yield placement strategy



A combination of POC testing strategies can be used to: increase access to testing, expand case finding, decrease result TAT, and optimize platform utilization.

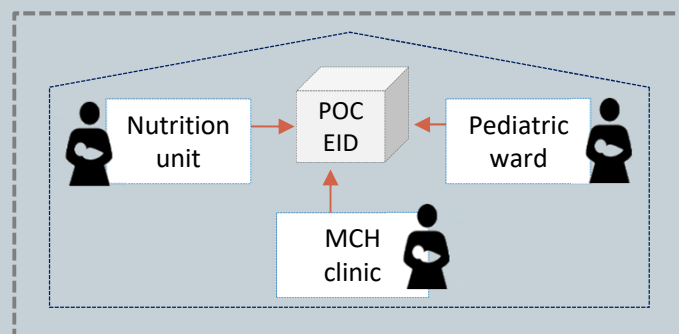
Stand-Alone Sites

Receive samples directly from clients and perform POC EID tests on site



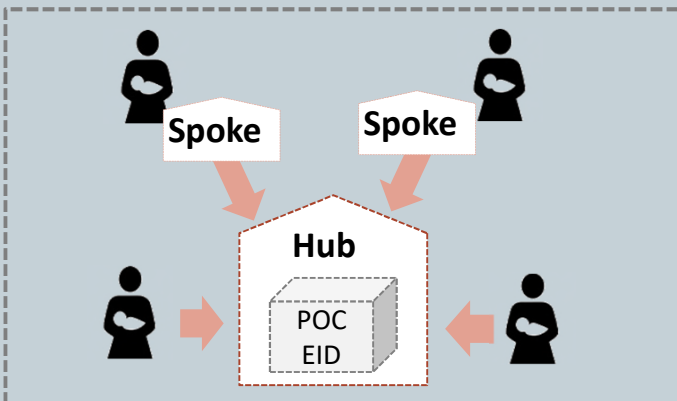
Multiple-Entry-Point Sites

Stand-alone or hub testing sites receive samples from different units or wards within the same health facility



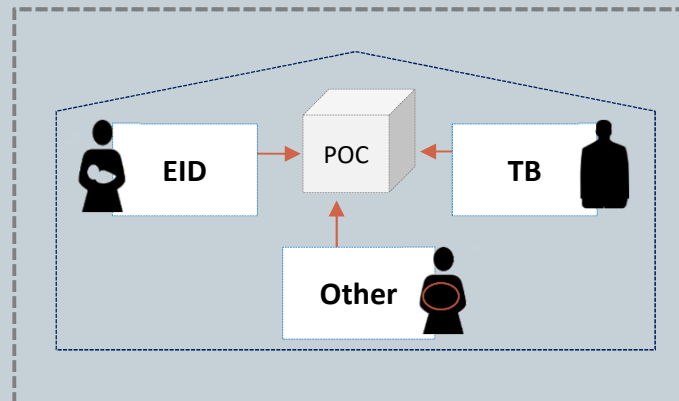
Hub-and-Spoke Networks

Hub sites provide testing for patients at that site and for spoke sites. Nearby spoke sites send samples to the hub sites for testing



Integrated Testing Sites

Process different types of POC tests (e.g. EID, TB, other)



Short-haul, hub-and-spoke networks using POC EID show comparable performance for results returned and treatment initiation rates; while spokes experienced slightly slower turnaround times.



Key Outcomes (Dec 2016 – Dec 2017)	Testing Sites (106 sites, n = 13,070)	Spoke Sites (233 sites, n = 5,155)
Results received by caregiver within 30 days	99.4%	95.5%
Median TAT from blood sample collection to result returned to caregiver	0 days (IQR: 0-0)	2 days (IQR: 1-7)
Percent of HIV-infected infants started on ART within 60 days of blood sample collection	91.9%	94.4%
Median TAT from blood sample collection to initiation of ART for HIV-infected infants	0 days (IQR: 0-1)	3 days (IQR: 1-5)

Integration is a feasible strategy to maximize POC testing efficiency; provision of testing across multiple entry points can increase case finding.



- **Challenge: Low testing volumes** may make it unaffordable to use POC devices

- **Solutions:**

1. Integration: use existing platforms and test across multiple diseases to increase volumes

- ✦ Preliminary data across 23 facilities in Malawi and Zimbabwe have demonstrated:
 - Implementing HIV testing on GeneXpert devices currently used for TB testing **does not increase the TAT to results received for TB patients**
 - **HIV** testing on devices used for TB testing **is operationally feasible** and achieves **similar patient outcomes** as HIV testing at stand-alone sites
 - With appropriate facility selection, there **is sufficient capacity** on installed devices to run TB and HIV testing (perhaps other test types too)

2. Multiple entry points:

- ✦ M&E Data across 8 countries demonstrated **30% of all HIV positive infants** found were identified outside PMTCT
- ✦ Study in Uganda offered routine testing across 6 entry points and **68% of HIV positive infants** were found outside PMTCT; positivity rates at inpatient and nutrition found to be the same or greater than at PMTCT [*Kiyaga C et al. JIAS 2018*]

Cost per result returned to caregiver is the same or lower for POC EID compared to conventional EID, despite higher individual test price.

- Price of diagnostic technologies is a key consideration for national programs, implementers, and funders.
- Total cost of ownership includes: reagents, controls and other consumables, costs of equipment, logistics, basic training, and service and maintenance

	Conventional	POC (current throughput)	POC (optimal throughput)
Total cost of ownership*	\$24.25 (\$17.50-31.00)	\$37.20 (\$31.95-42.47)	\$26.75 (\$21.00-32.50)
Cost per result returned in 30 days (range)	\$131.02 USD (\$96.26-\$165.76)	\$37.89 USD (\$32.54-\$43.25)	\$27.24 USD (\$21.39-\$33.10)
Cost per result returned in 3 months (range)	\$38.89 USD (\$28.57-\$49.21)	\$37.51 USD (\$32.21-\$42.81)	\$26.97 USD (\$21.17-\$32.76)

*Based on The Global Fund's total cost of ownership estimates for both conventional and POC EID testing, reported in the April 2017 *HIV Viral Load and EID Selection and Procurement Information Tool*, and adjusted for the return of test result rates for conventional and point-of-care (pre- and post-intervention).

Analysis of the pilot and M&E results indicate that POC EID was less expensive than conventional testing per HIV+ infant identified and placed on treatment.

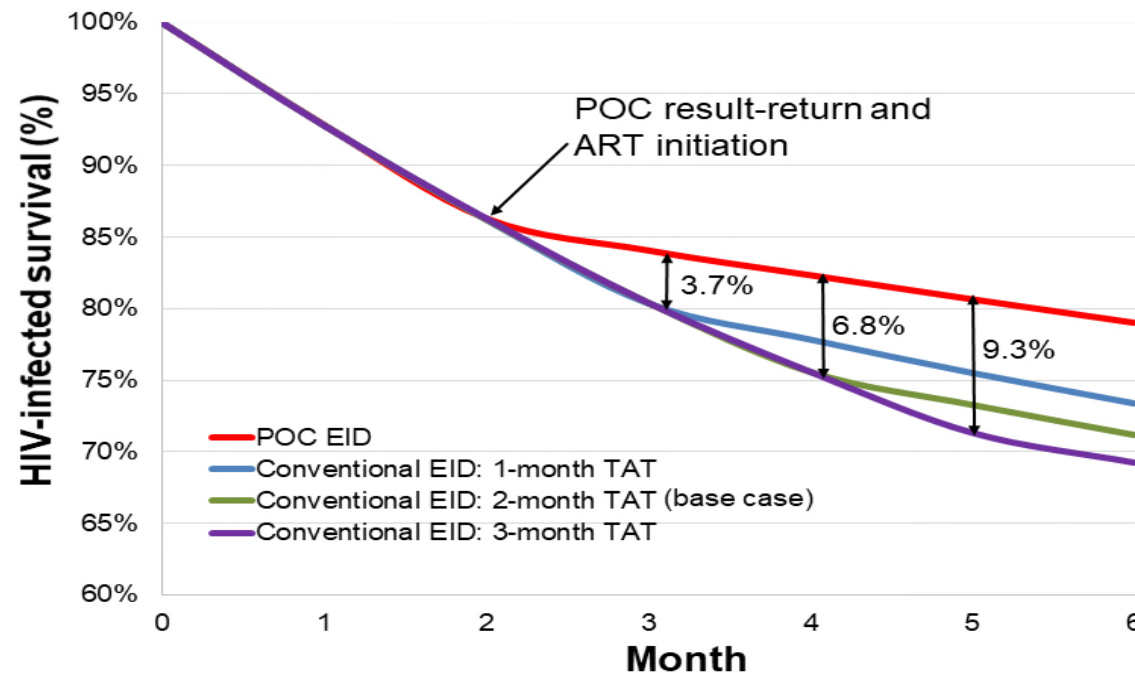
Cost per infant initiated on ART

- Examining the cost per infant initiated on treatment from two implementation pilot studies reveals that POC EID was, in both studies, less expensive than conventional EID testing.
- This effect was largely the result of lower initiation rates in the SOC arm, compared with the POC arm of the study, however HIV positivity rates were also higher in the POC arm of the study

	Pilot #1		Pilot #2		M&E Data	
	POC	SOC	POC	SOC	POC	SOC
Eligible patients	2,034	1,876	789	963	15,748	2,792
Cost per test (30% POC utilization, 80% conv.)	\$38	\$25	\$38	\$25	\$38	\$25
Total cost	\$77,751	\$46,634	\$30,160	\$23,939	\$601,981	\$69,405
Results received by caregiver	2,026	1,231	789	388	15,553	2,194
Cost per result received by caregiver	\$38	\$38	\$38	\$62	\$39	\$32
HIV positive test results	174	64	45	31	605	97
Cost per HIV positive test result	\$447	\$729	\$670	\$772	\$995	\$716
Patients initiated on ART	164	49	41	16	535	66
Cost per patient initiated on ART	\$474	\$952	\$736	\$1,496	\$1,125	\$1,052

POC EID was found to improve infant survival by 6.8% and be cost-effective compared to conventional EID.

Cost-effectiveness pre-study modeling for Zimbabwe found POC EID improved survival by 6.8% in the first 3 months of life and was cost-effective compared to conventional EID



ICER vs conventional for year of life saved: \$630 USD

Pre-study model assumption=83% result returned (true result return is 59%) and ART initiation=72% (true ART initiation is 56%)

Consistent delivery of accurate and reliable test results requires strong supportive systems, including a quality assurance (QA/EQA) system, that address all aspects of testing.



Countries that have successfully implemented POC testing have built or strengthened systems and structures for:

- Criteria-based **site and product selection**, including site capacity assessments and upgrades
- **Training and certification** to ensure the competency of health facility staff and instrument operators
- Frequent **site monitoring, competency assessments and mentoring** using standardized tools and checklists
- Provision of standardized **training materials, testing algorithms, standard operating procedures, and job aids**
- Reliable and accurate **procurement, supply chain management, and waste disposal**
- **Connectivity** for instrument monitoring and results reporting
- **External quality assurance (EQA)**, such as proficiency testing

Summary



- **Early HIV testing, prompt return of test results, and rapid initiation of treatment** are critical for reducing morbidity and mortality among HIV-infected infants.
- Studies and routine **use of POC EID** have demonstrated that incorporating this innovative technology into laboratory networks **significantly improves testing, diagnosis and treatment initiation** in infants.
- Cost analyses and cost-effectiveness modeling have shown that the **total cost of POC is comparable to lab-based testing**; and that POC improves survival and is **cost-effective**.
- National ministries of health, donors, and other implementers should consider **introducing or expanding the use of POC EID** testing as a key tool in their efforts to **end pediatric AIDS**.

Thank you



Elizabeth Glaser
Pediatric AIDS
Foundation



References for conventional EID test return rate.



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