

# Biomedical Agents for Prevention:

## HIV Viral Load Suppression as a Pathway to Epidemic Control

**Harriet Nuwagaba-Biribonwoha, MBChB, PHD**

Assistant Professor, Columbia University, Mailman School of Public Health

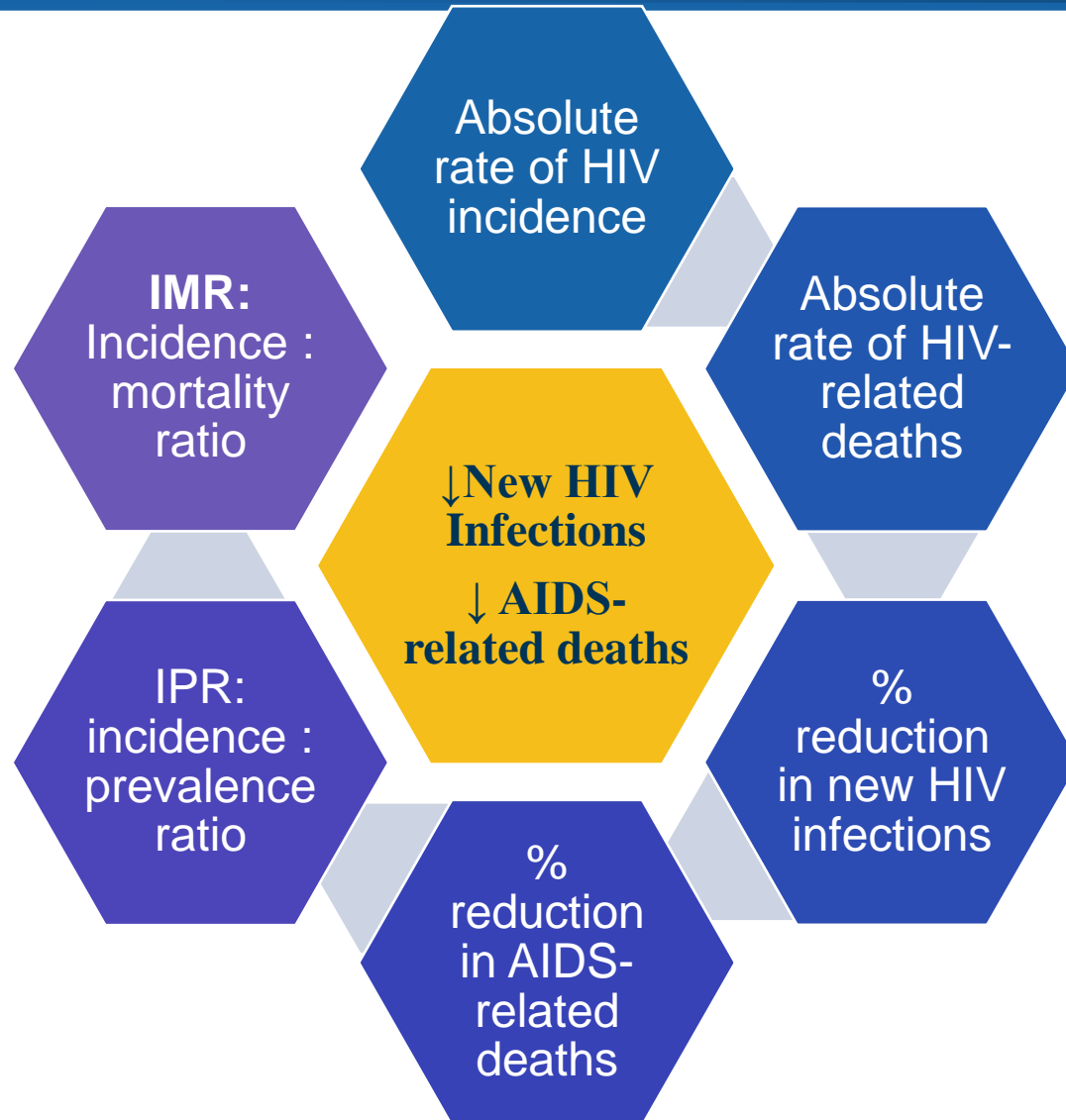
Research Director, ICAP at Columbia University, Eswatini

CRS Leader, Eswatini Prevention Center Clinical Research Site



- Defining HIV/AIDS Epidemic Control
- Viral load suppression as pathway to decrease in HIV incidence
- Future directions

# What is HIV/AIDS epidemic control?

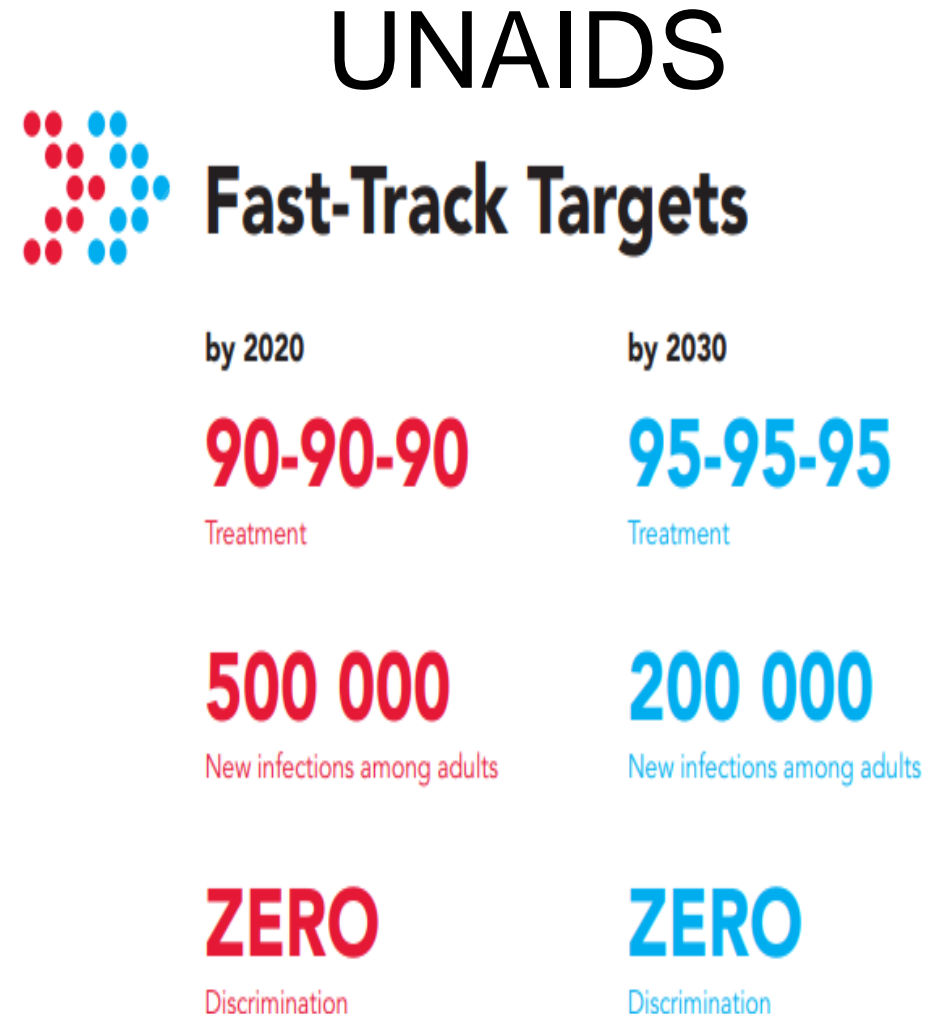


## Goal:

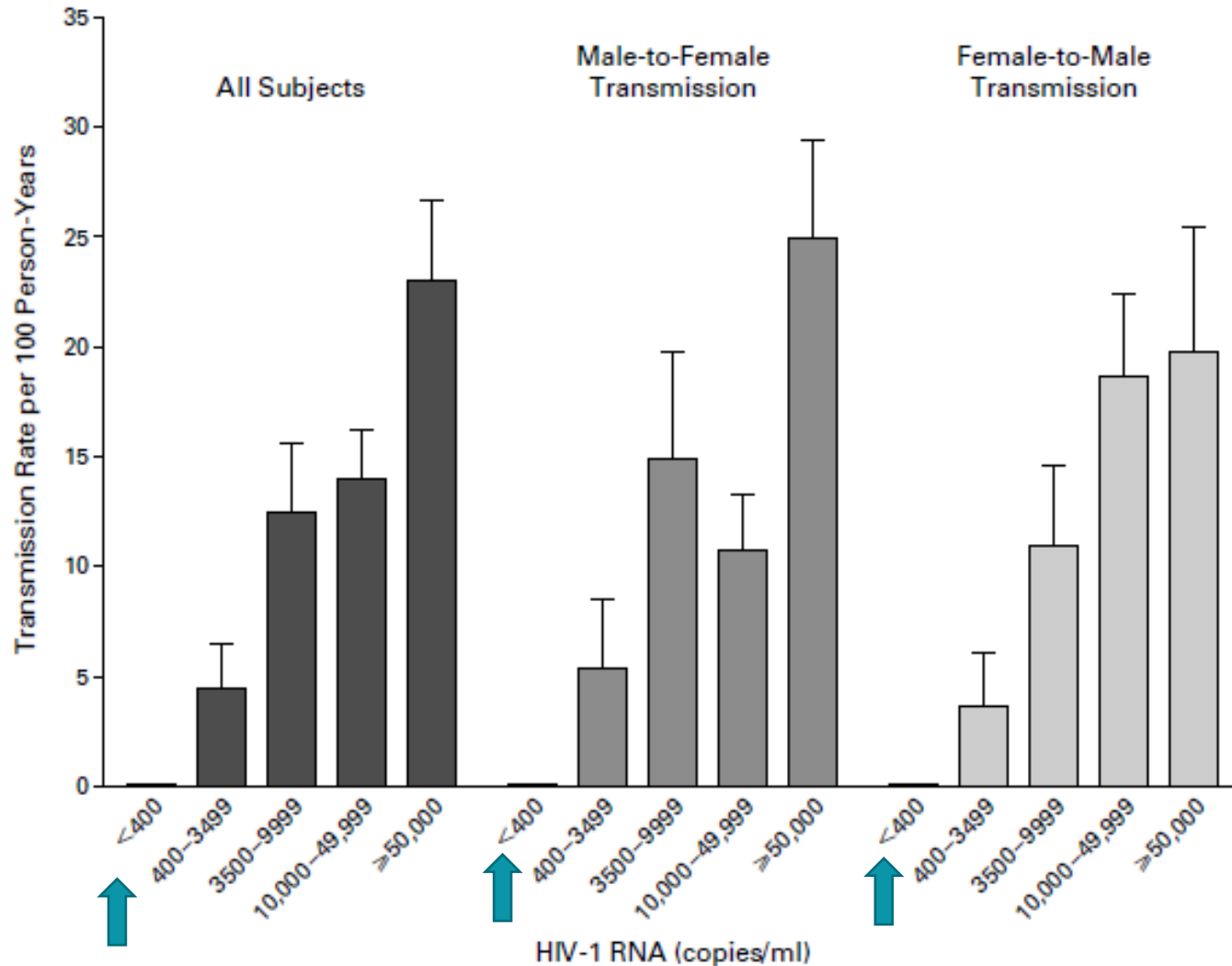
- Absolute rate of HIV incidence less than one per 10,000 adults per year
- 90% reduction in new HIV infections by 2030 from 2010 (UNAIDS)

# Population viral load suppression as pathway to epidemic control

- **Focus on reduction of new HIV infections by achieving 95:95:95 targets**
  - **First 95 (Diagnosed):** 95% of PLHIV know or are aware of their HIV+ status
  - **Second (On Treatment):** 95% of those aware of their PLHIV status are on antiretroviral therapy
  - **Third 95 (With VLS):** 95% of those on ART with viral load suppression

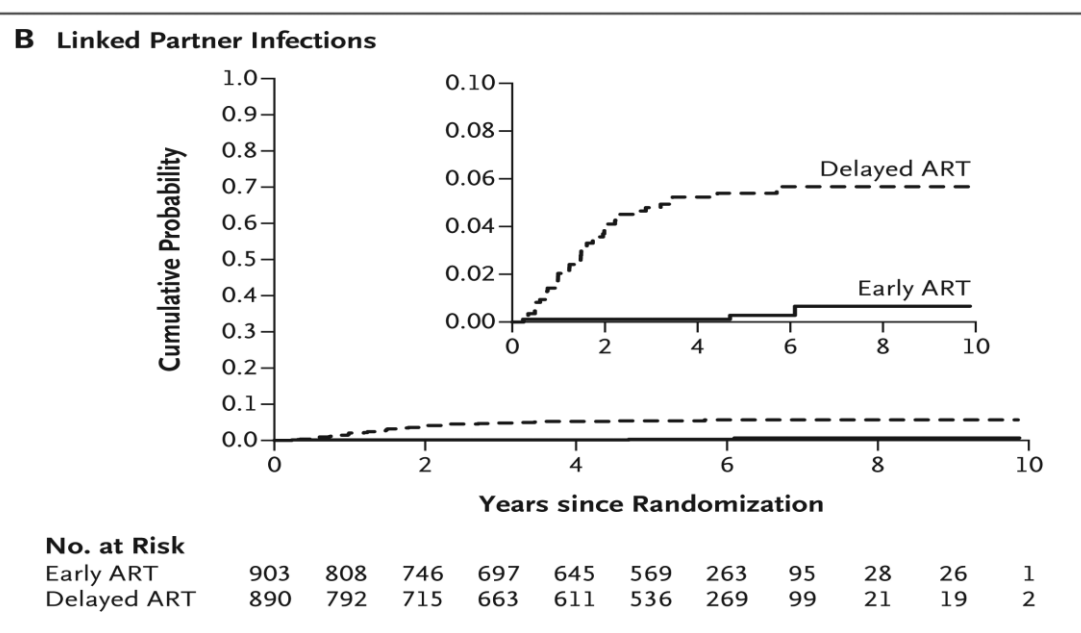


# Viral Load Level and HIV Sexual Transmission: Observational Evidence



- Zero transmissions from PLHIV with VL <1,500 copies/mL
- Dose-response between PLHIV VL and HIV transmission
- PLHIV VL >50,000cp/mL associated with x23 higher transmission rates

# Early ART with viral load suppression minimizes sexual transmission: Evidence from HPTN 052



## Linked partner infections

#	# of infections	Event rate/ 100 person years (95% CI)	Relative reduction with early ART
Early ART	<b>3</b>	0,07 (0,0-0,2)	↓ <b>93%</b>
Delayed ART	<b>43</b>	1,03 (0,74-1,38)	

- No linked infections when participants were stably virally suppressed.
- Linked were infections associated with high VL
- A substantial number of *unlinked* transmissions (36%): suggesting multiple sexual partners: *need to ensure diagnosis, treatment and VLS for all PLHIV.*

# ART, viral load suppression and sexual transmission: Evidence from Partners Study

- 1,593 couple-years of follow-up from 782 couples
- PLHIV were on ART
  - Few missed pills for 4+ days
  - 99% virally suppressed <200 copies/mL
- Zero within couple transmissions through condomless sex

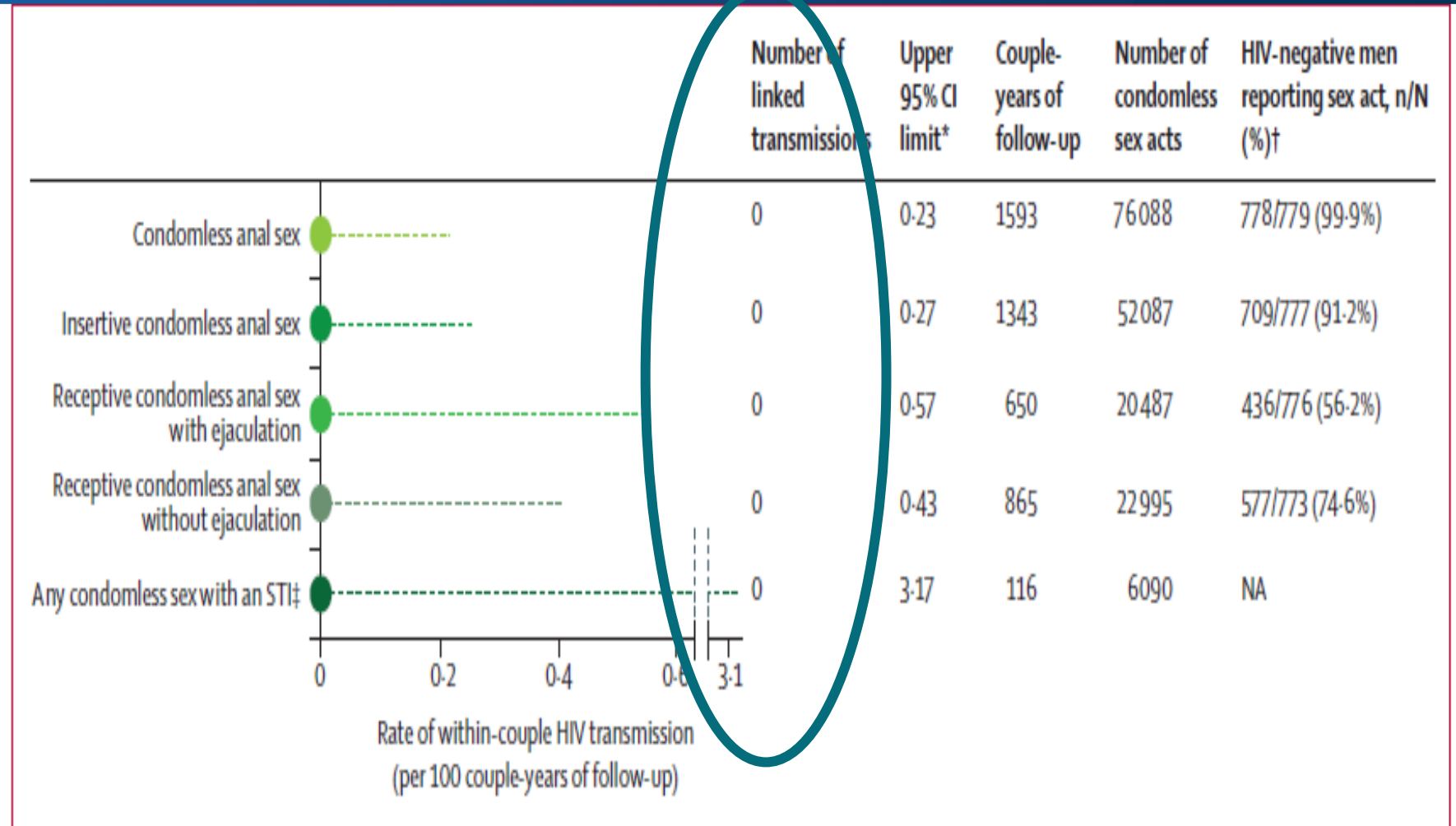
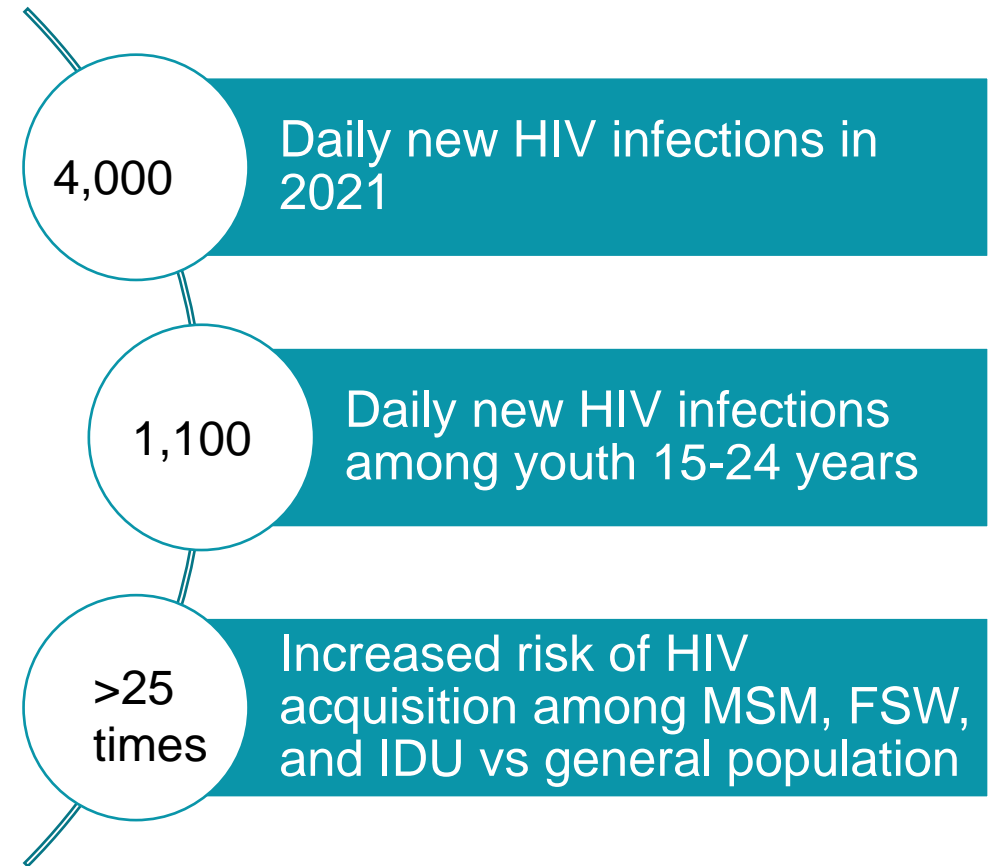
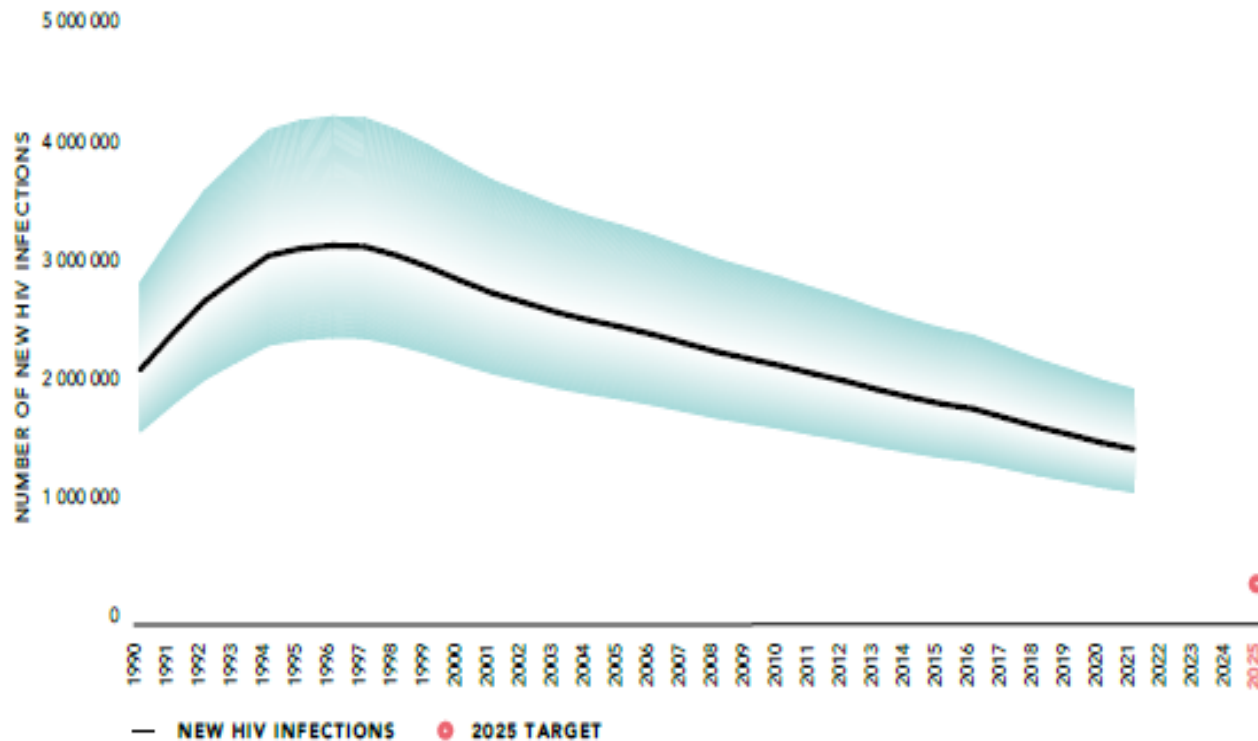


Figure 1: Rate of within-couple HIV transmission through condomless sex according to sexual behaviour reported by the HIV-negative partner



# New HIV infections: Where are we now?

Global number of new HIV infections 1990-2021, and 2025 target

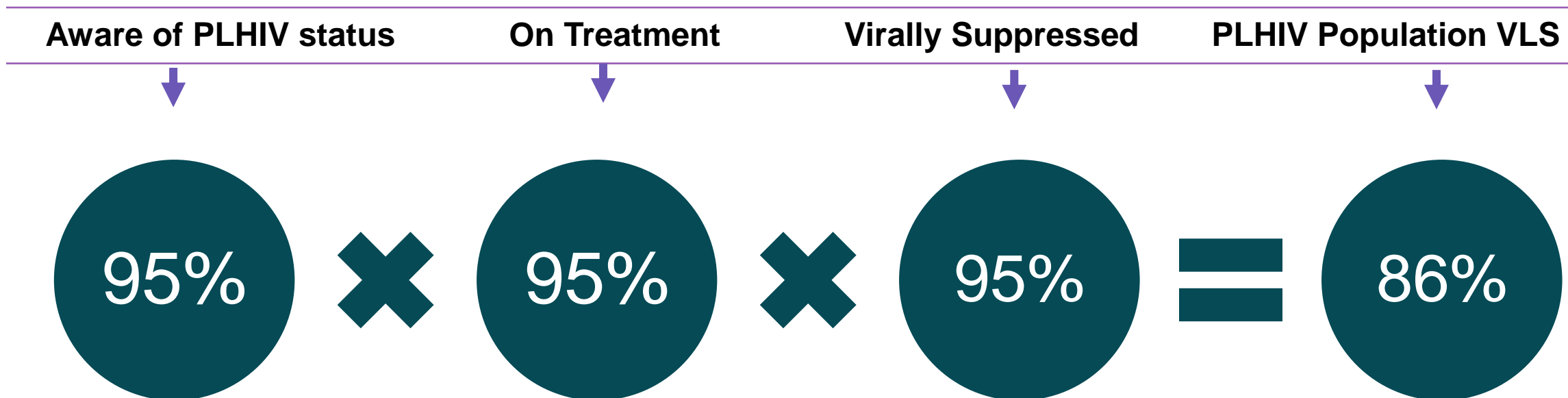


Source: IN DANGER: UNAIDS Global AIDS Update 2022.



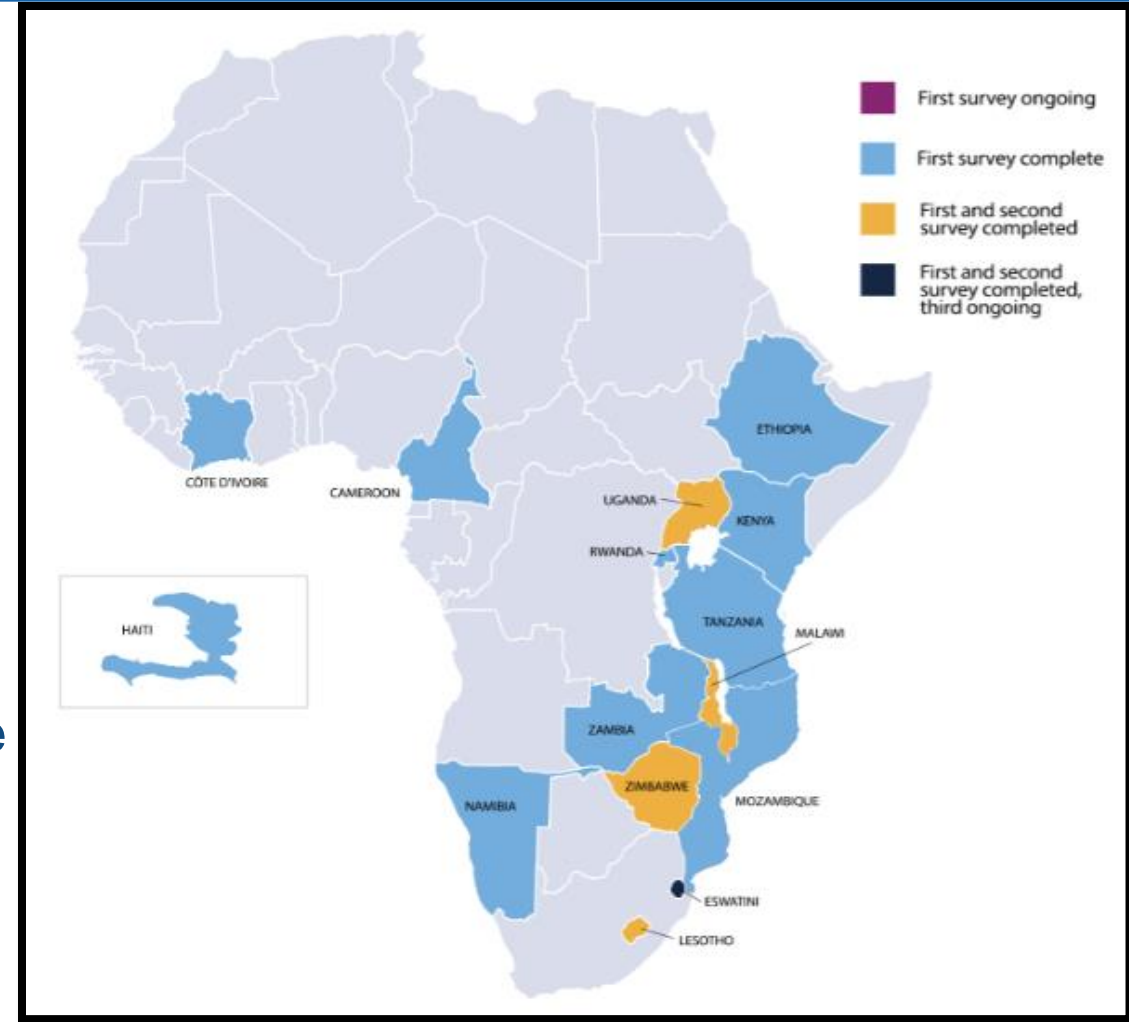
# Population viral load suppression: Where do we need to be?

## UNAIDS Targets for VLS at Population Level

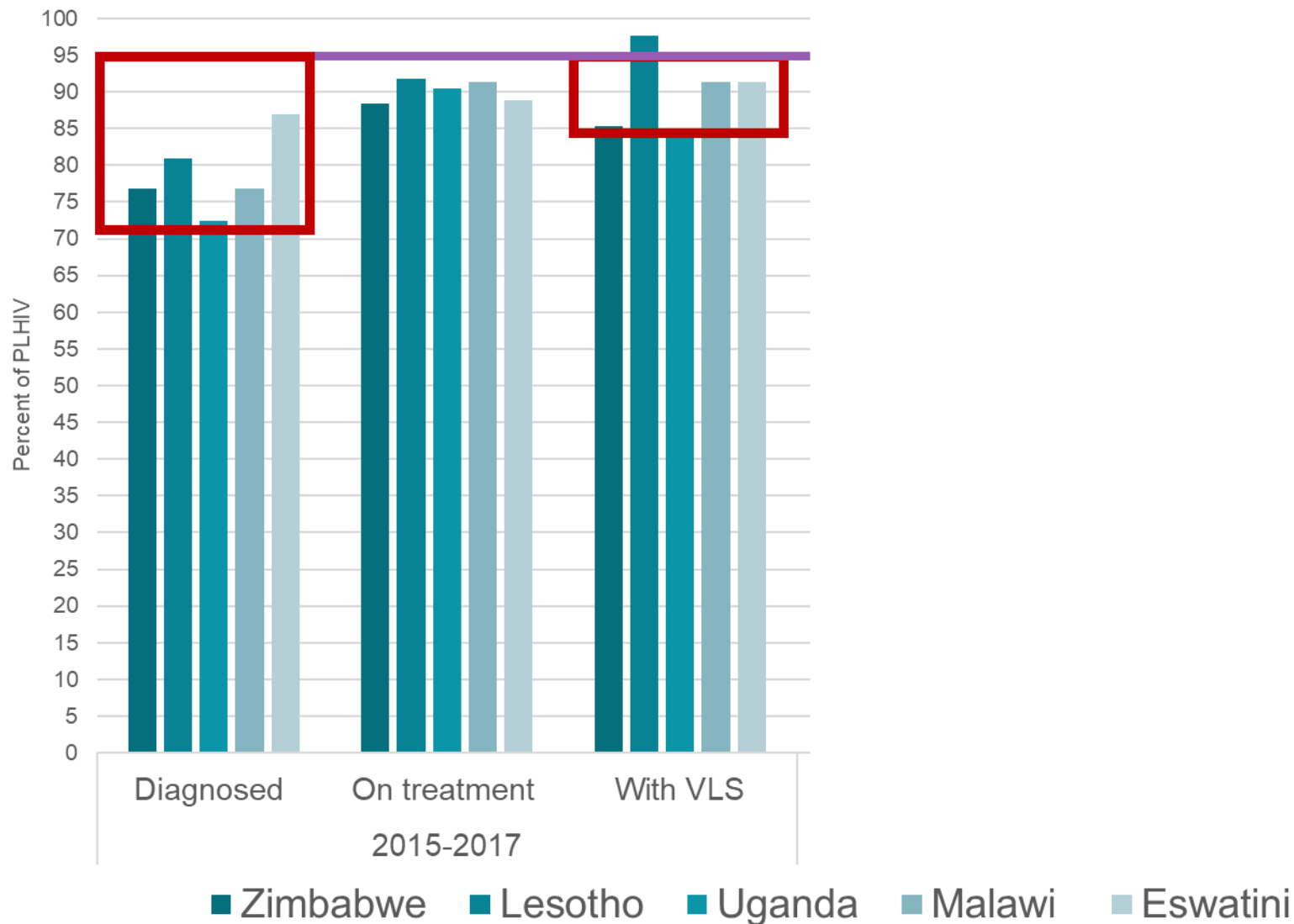


# Population HIV Impact Assessments (PHIA)

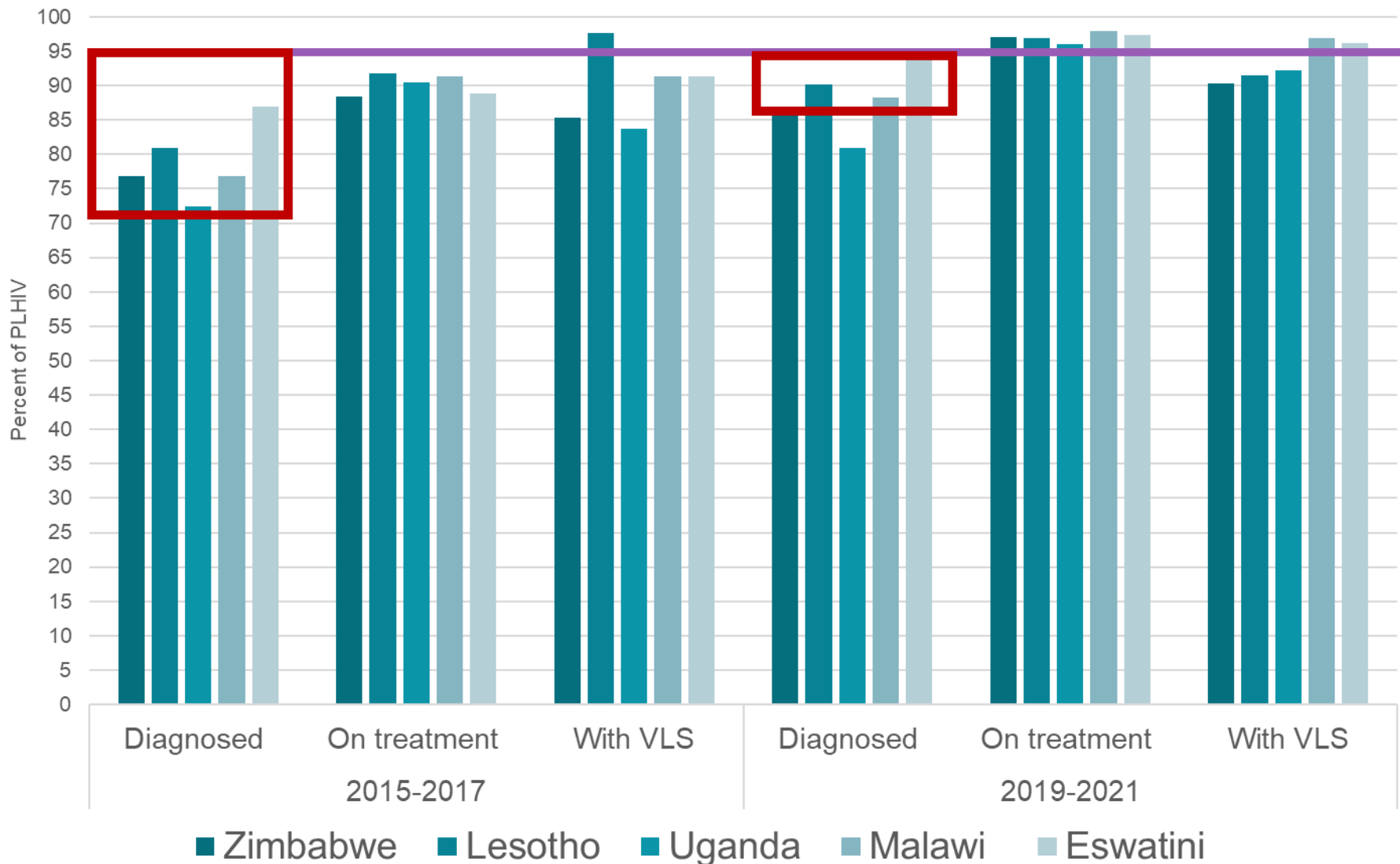
- Nationally representative household surveys funded by PEPFAR through CDC
- Conducted since 2011 in 15 countries in SSA and Haiti by Ministries of Health with ICAP support
  - Several countries with 2 PHIA's in the past ~5 years
  - Eswatini with 3 PHIA's since 2011
- Standardized methodology with random selection of sampling units and households
- All individuals in selected households 15 years and older are surveyed
- All receive HIV testing with viral load testing for those HIV-positive (irrespective of awareness of HIV)
- All HIV-positive persons with VL<1000 copies per ml have ARV levels measured in blood
- 95-95-95 are ARV adjusted



# 2015-2021: 95-95-95 Achievements among individuals 15+ years in 5 SSA Countries

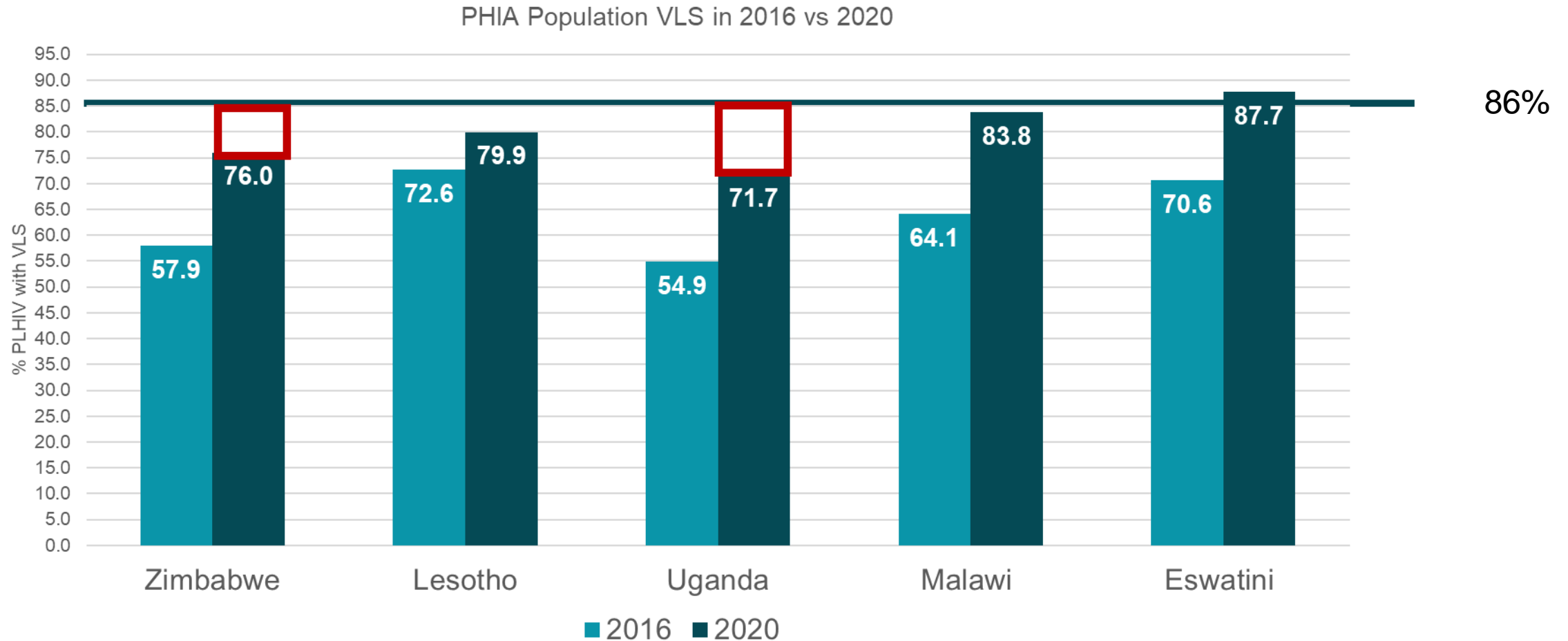


# 2015-2021: 95-95-95 Achievements among individuals 15+ years in 5 SSA Countries



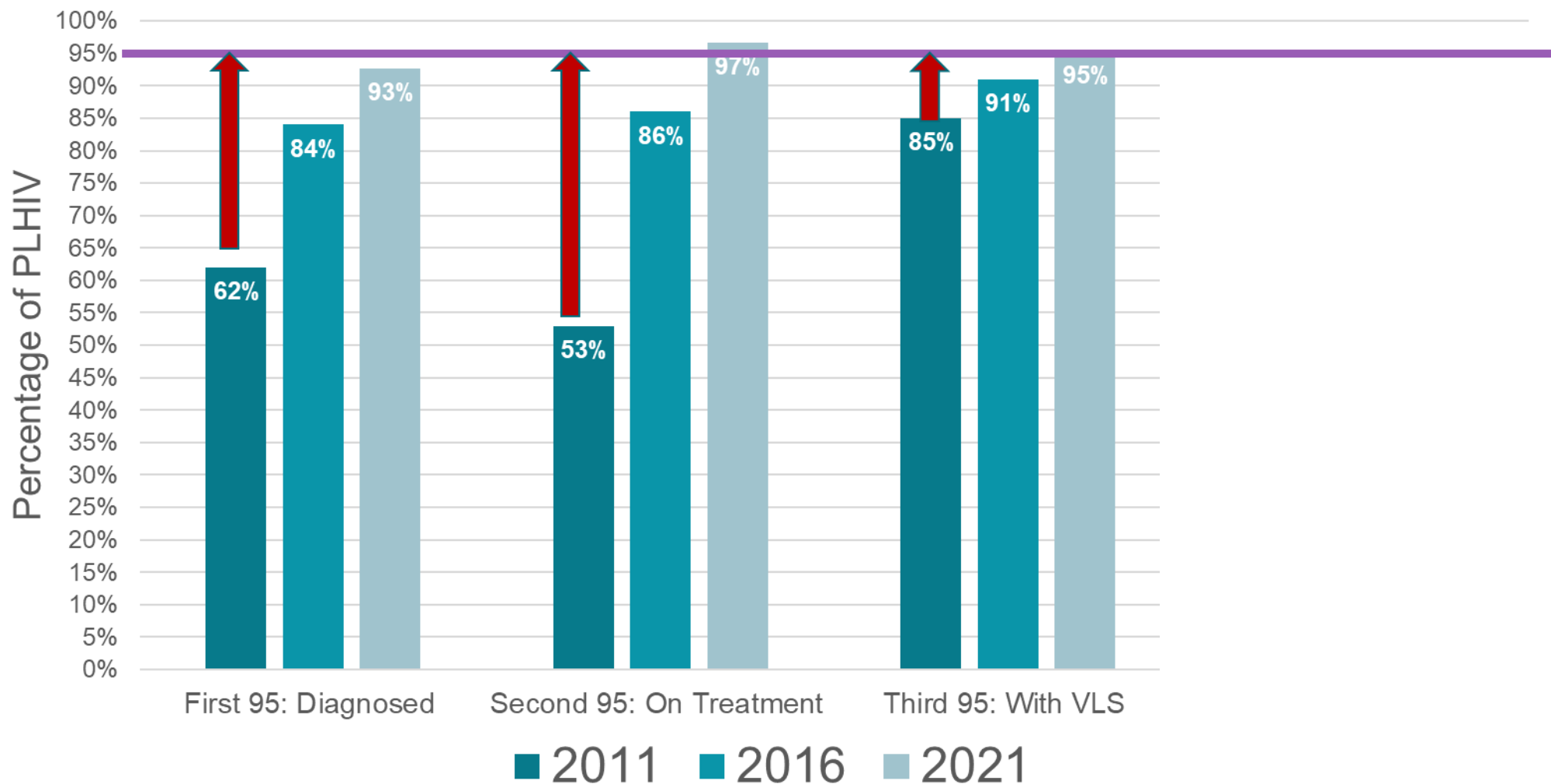
- All 5 countries did better on all 95's in a ~5-year period
- First 95 (HIV testing, awareness) is a persistent gap, yet a critical gateway to ART and population VLS

# How are achievements in 95-95-95 translating to population VLS among ALL individuals 15+ years?



- There is progress in the past~ 5 years among all countries
- >20% of the PLHIV still capable of HIV transmission in many countries

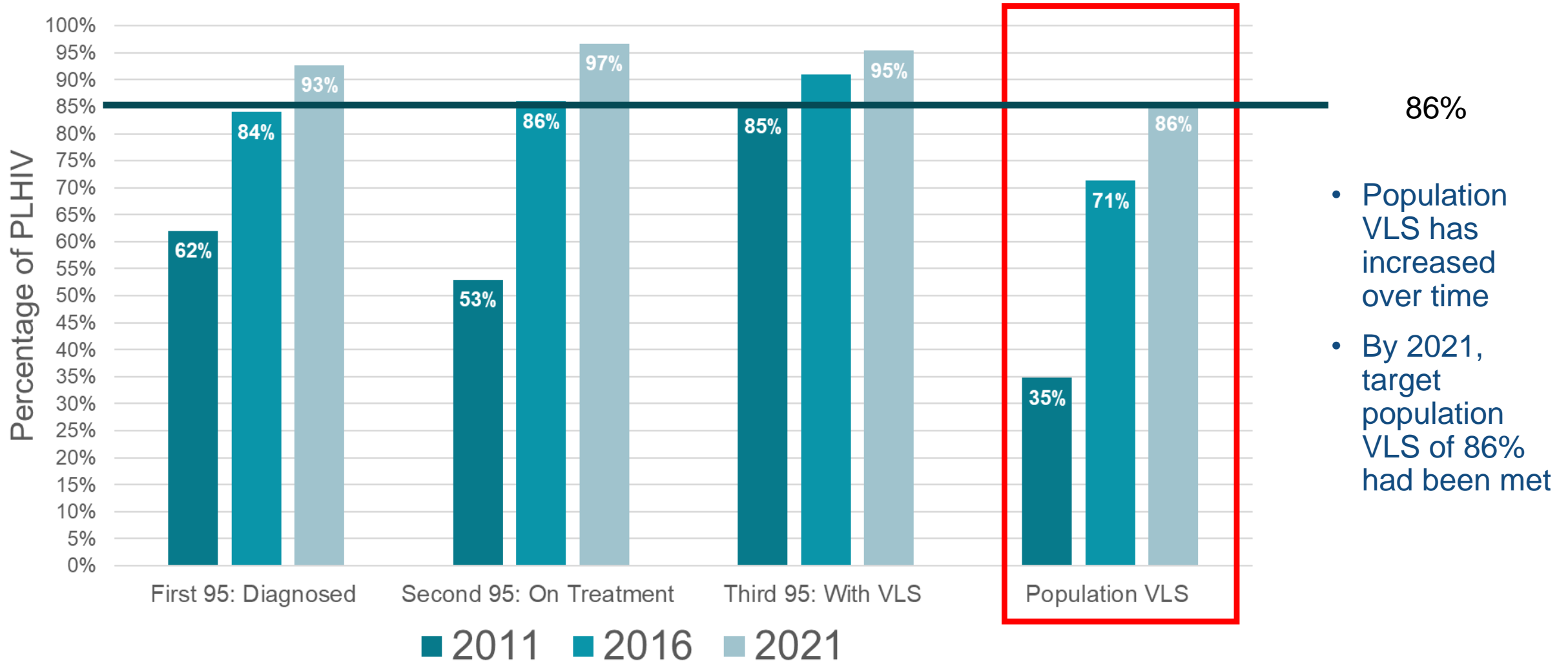
# Eswatini: 95-95-95 and Population VLS among adults 18-49 years (2011-2021)



- By 2021, Eswatini had achieved 94-97-96 among all adults 15+ years

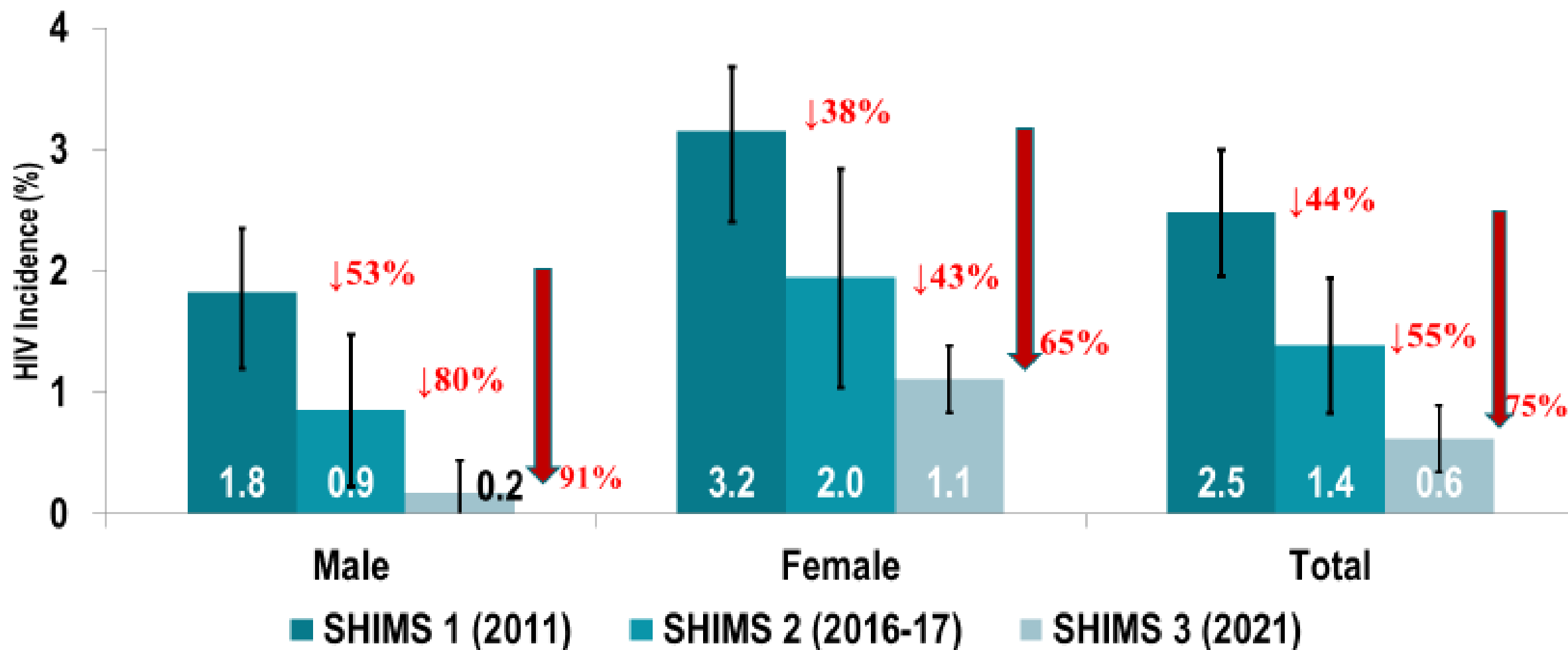
Improvement in all 95's over time

# Eswatini: 95-95-95 and Population VLS among adults 18-49 years (2011-2021)





# Eswatini: HIV incidence among adults 18-49 years (2011-2021)



- Significant decline in HIV incidence among men and women 18-49 years

# Eswatini National HIV/AIDS Program 2010-2021

- Programs at scale among individuals 15 years and older
  - Community and key stakeholder engagement
  - Differentiated service delivery, multi-month dispensing

Combination  
HIV  
Prevention



HIV  
diagnosis,  
treatment,  
VLS

>500,000

- Condoms distributed annually to target KP

>300,000

- Average annual HIV tests 2014-2021, test and start strategy for all populations, index testing

>200,000

- PLHIV on ART, average 16,000 new PLHIV on ART annually 2011-2021

>150,000

- Average #VL tests conducted annually 2017-2021

>24,000

- # enrolled in HIV recent infection surveillance program since 2019, 15 hotspot response activities, including community dialogues

~10,000

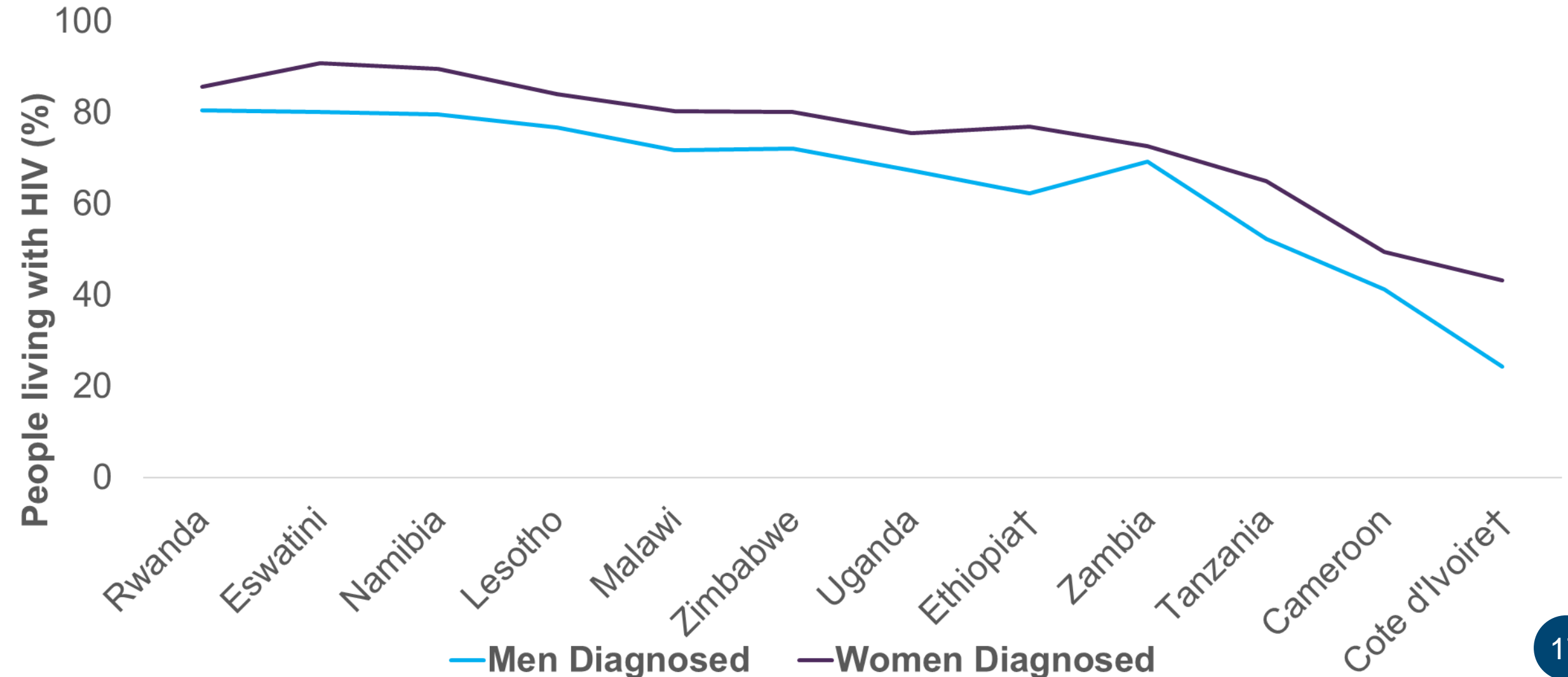
- Average number of men receiving VMMC annually 2010-2021

~10,000

- Average # adults initiating oral PrEP annually 2019-2021

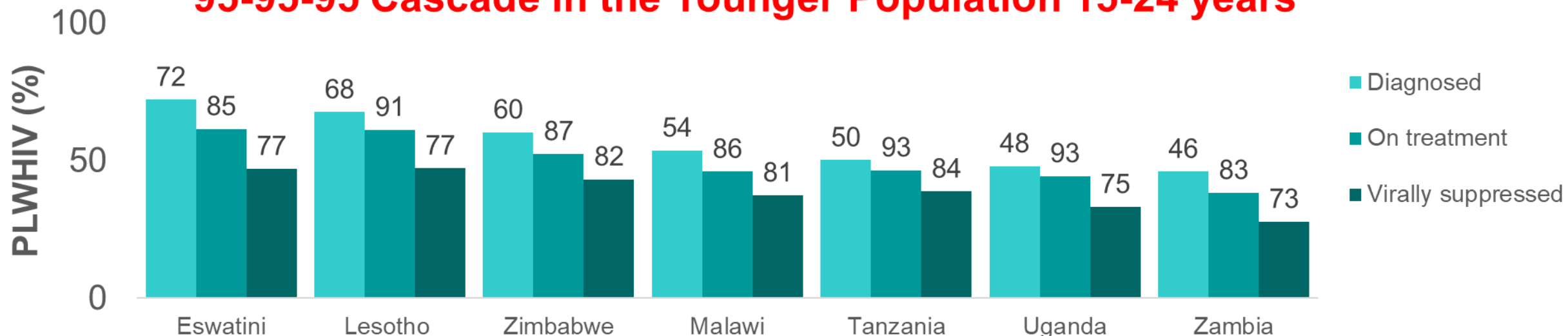
# Future Directions: Address Program Gaps

## Men lag behind women in awareness of HIV-positive status

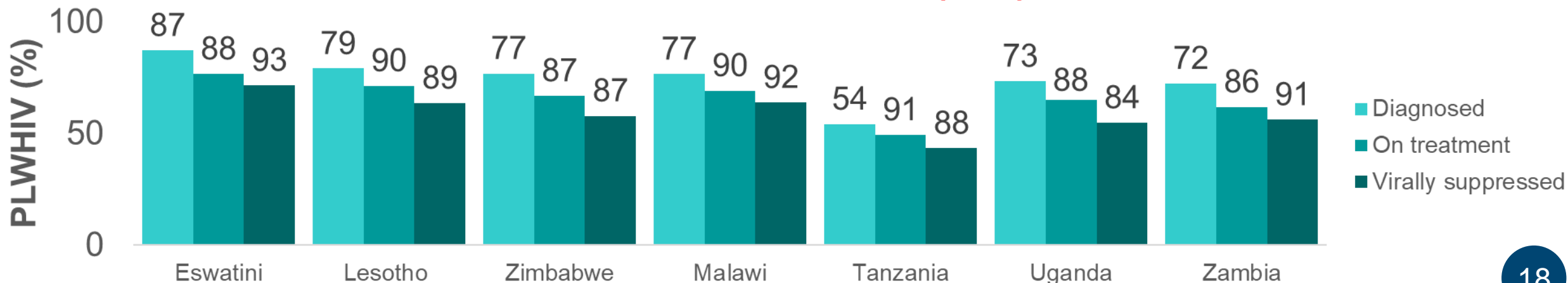


# Gaps: Youth as a vulnerable population

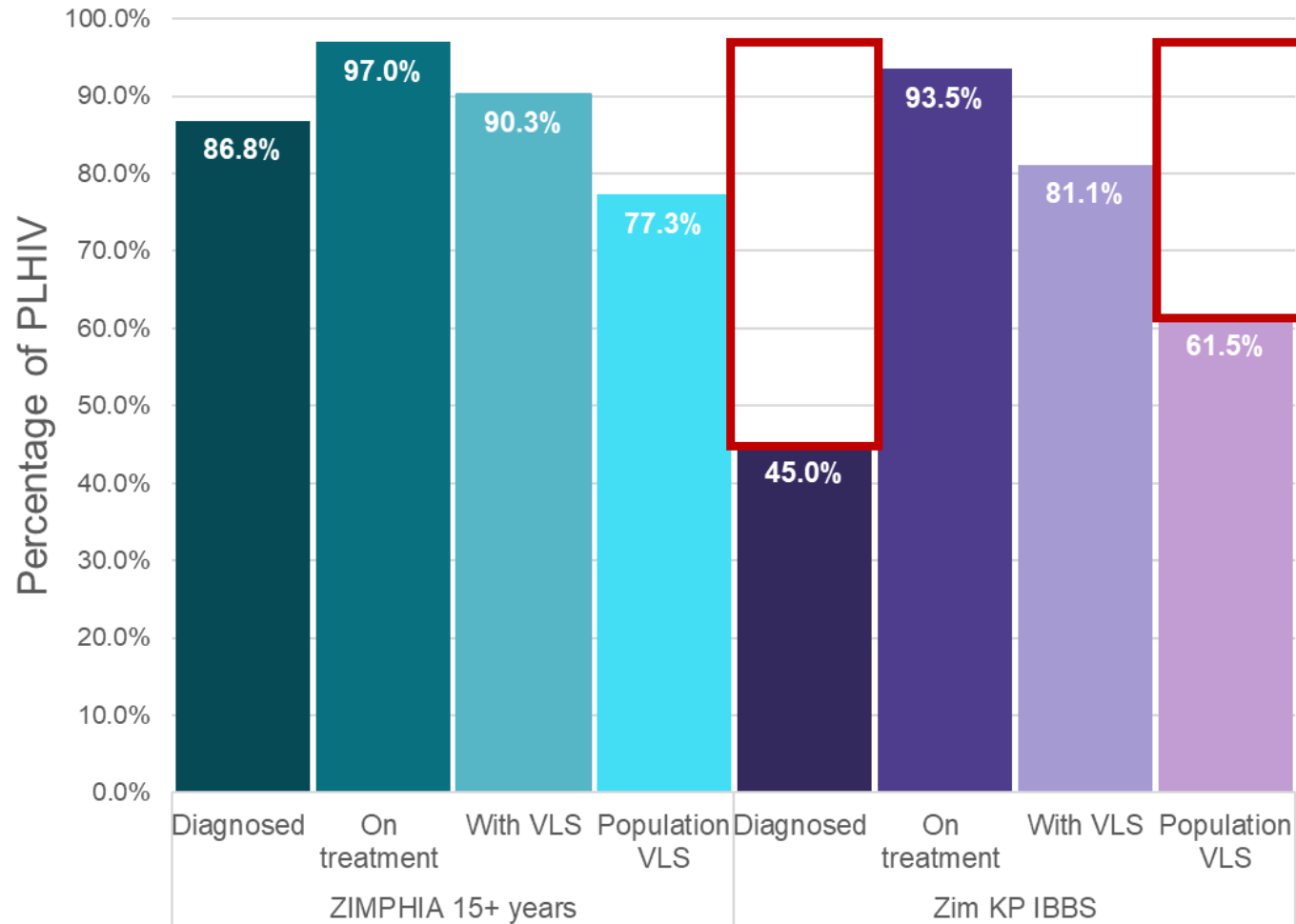
## 95-95-95 Cascade in the Younger Population 15-24 years



## Older Population (25+)



# Gaps: Key populations



- 2020 ZIMPHIA data in general population vs 2020 Zim BBS data
- 95's almost achieved in general population, <50% of KP know their HIV status
- Population VLS among KP lower than general population: continued potential of HIV transmission
- <50% KP had disclosed their PLHIV status to their partner

Source:

Zimbabwe HIV Population HIV Impact Assessment Survey (ZimPHIA 2020). Summary Sheet. Dec. 2020

HIV and STI biobehavioral survey among men who have sex with men, transgender women, and genderqueer individuals in Zimbabwe: Final Report, Aug 2020

# Conclusions

- There has been substantial progress towards achieving 95-95-95 targets in several African countries, and tangible decline in HIV incidence where these targets have been achieved
  - Yet gaps remain among youth, men, key populations
  - These gaps mean a substantial proportion of the PLHIV population is still capable of HIV transmission
- VLS is not a one-time goal, it must be maintained over a lifetime. PLHIV need comprehensive support over time and differentiated service delivery
  - Ensuring commodities are available to deliver 95-95-95 at scale: HIV test kits, ART, viral load testing
  - Navigating ART fatigue and side effects: long-acting injectable ART offers new opportunities
  - Rapid diagnosis of virological failure and ART resistance, and prompt switching of ART regimens
  - Prevention, diagnosis and management of co-morbidities: hypertension, diabetes, cancers, mental health
- Primary HIV prevention is important
  - Long-acting PrEP offers important new option
  - Continued scale up of VMMC
  - Continuing need for comprehensive STI management (including point of care testing) and wholistic reproductive health services

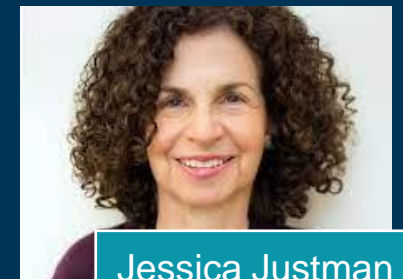
# Acknowledgments



- Ministries of Health
- Eswatini Ministry of Health for commitment to confronting the HIV epidemic and their ongoing support and guidance
- All the PHIA teams that enabled the conduct of these surveys
- ICAP teams in New York, Regional Office and Country offices
- Technical support from Centers for Disease Control and Prevention
- Funding from President's Emergency Plan for AIDS Relief (PEPFAR)



Rejoice Nkambule



Jessica Justman



Wafaa El Sadr

Overall support for the HIV Prevention Trials Network (HPTN) is provided by the National Institute of Allergy and Infectious Diseases (NIAID), Office of the Director (OD), National Institutes of Health (NIH), National Institute on Drug Abuse (NIDA), the National Institute of Mental Health (NIMH), and the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) under Award Numbers UM1AI068619-15 (HPTN Leadership and Operations Center), UM1AI068617-15 (HPTN Statistical and Data Management Center), and UM1AI068613-15 (HPTN Laboratory Center). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

PHIAs/SHIMS were supported by the US President's Emergency Plan for AIDS Relief (PEPFAR) through CDC under the terms of cooperative agreements, #U2GGH001271, #U2GGH001226 and #U2GGH002173. The findings and conclusions are those of the authors and do not necessarily represent the official position of the funding agencies. The mark "CDC" is owned by the U.S. Dept. of Health and Human Services and is used with permission. Use of this logo is not an endorsement by HHS or CDC of any particular product, service, or enterprise.



@HIVptn

<https://phia.icap.columbia.edu/>

