HP+/Project SOAR Oral PrEP Modeling

Webinar Series: Five Ways to Accelerate Progress Toward the 95-95-95 Goals

January 16, 2018

USAID FROM THE AMERICAN PEOPLE

PEPFAR

PROJECT SOAR SUPPORTING OPERATIONAL AIDS RESEARCH

HP+ HEALTH POLICY PLUS

Activity Overview

Activity – Objective

- Provide impact, cost, and cost-effectiveness data for decision-making to assist countries in strategic planning for the introduction and scale-up of oral pre-exposure prophylaxis (PrEP)

Activity Process

July-December 2017	Identify specific modeling questions related to oral PrEP introduction (Mozambique, Lesotho, Uganda, Swaziland)
August-October 2017	Develop modeling approach and adapt tools/create new tools
November-December 2017	Distill lessons to design a desk analysis that can be applied to additional countries
December 2017-January 2018	Provide data for decision-making to facilitate introduction or scale-up of oral PrEP

Activity – Countries

- In-depth country exercises conducted in Swaziland, Uganda, Mozambique, and Lesotho
  - Different stages for PrEP introduction and roll-out
  - Country buy-in and interest
- Desk studies in:
  - Ethiopia
  - Haiti
  - Kenya
  - Malawi
  - Nigeria
  - Tanzania
  - Zambia
  - Zimbabwe

Activity – Methodology

- Expand and adapt existing modeling tools
  - *Incidence Patterns Model (IPM):* uses published data in DHS and AIS surveys to estimate HIV incidence in each risk group and province
    - Used to estimate correction factors for HIV incidence in Goals, allowing projections for populations not included as part of the Goals model structure (sero-discordant couples, specific age groups)
  - *Goals* model
    - Apply correction factors estimated from IPM analysis to disaggregate HIV incidence in Goals risk groups to account for additional population groups
- Combine these tools into a single platform that is designed to address policy questions raised in country
  - *Oral PrEP Workbook* is a Microsoft Excel-based tool that links the *IPM* with *Goals* and visualizes the results

Oral PrEP Modeling Questions

- Q1. How would **different scenarios for rolling out oral PrEP** to progressively broader sub-populations based on risk and geography affect the impact, cost-effectiveness, and total cost of the program?
- Q2. How do the impact, cost, and cost-effectiveness vary by **risk group**?
  - Female sex workers (FSW)
  - Sero-discordant couples (SDCs)
  - Men who have sex with men (MSM)
  - People who inject drugs (PWID)
  - Adolescent girls and young women with multiple partners (AGYW)
  - Adult men (AM)
- Q3. How would varying **levels of future scale-up of ART and VMMC** affect the impact and cost-effectiveness of oral PrEP?
- Q4. How would varying **unit cost of oral PrEP by risk group** affect the relative cost-effectiveness of providing PrEP to the different risk groups?
- Q5. How would varying **levels of adherence by risk group** affect the relative impact and cost-effectiveness of providing PrEP to the different risk groups?

Results – Uganda Example

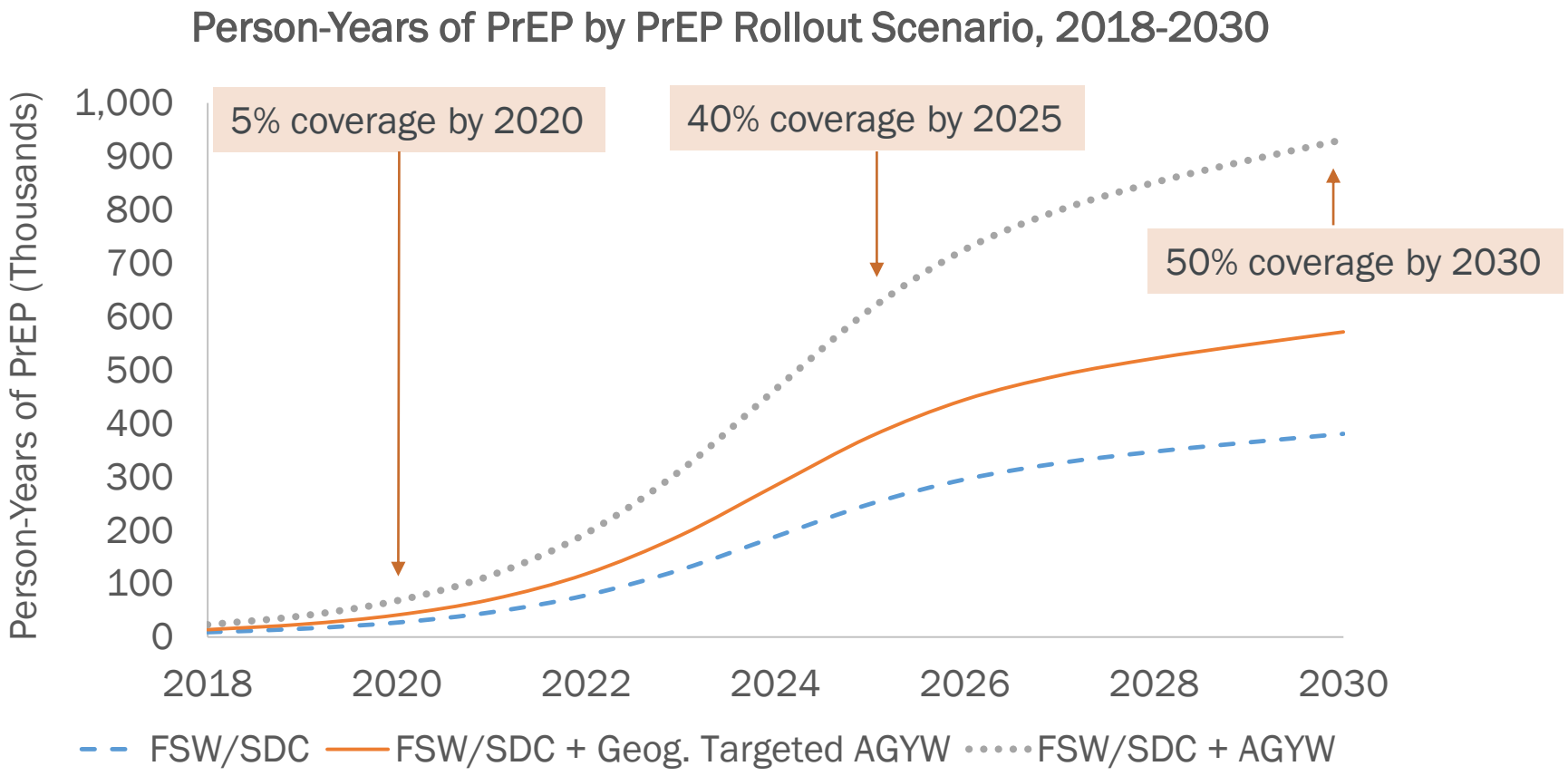
How would rolling out oral PrEP to different risk groups and geographic areas affect the impact, cost-effectiveness, and total cost of oral PrEP?

Example Oral PrEP Rollout Scenarios

- Female sex workers (FSW) and sero-discordant couples (SDC):
  - National oral PrEP rollout
- FSW and SDC + geographically targeted young women:
  - Same as above plus oral PrEP rollout for medium-risk adolescent girls and young women (multiple partners, not formal FSW) ages 15–24 in provinces/regions with higher than the median HIV incidence
- All risk groups:
  - National oral PrEP rollout for FSW, SDC, and medium-risk adolescent girls and young women ages 15–24

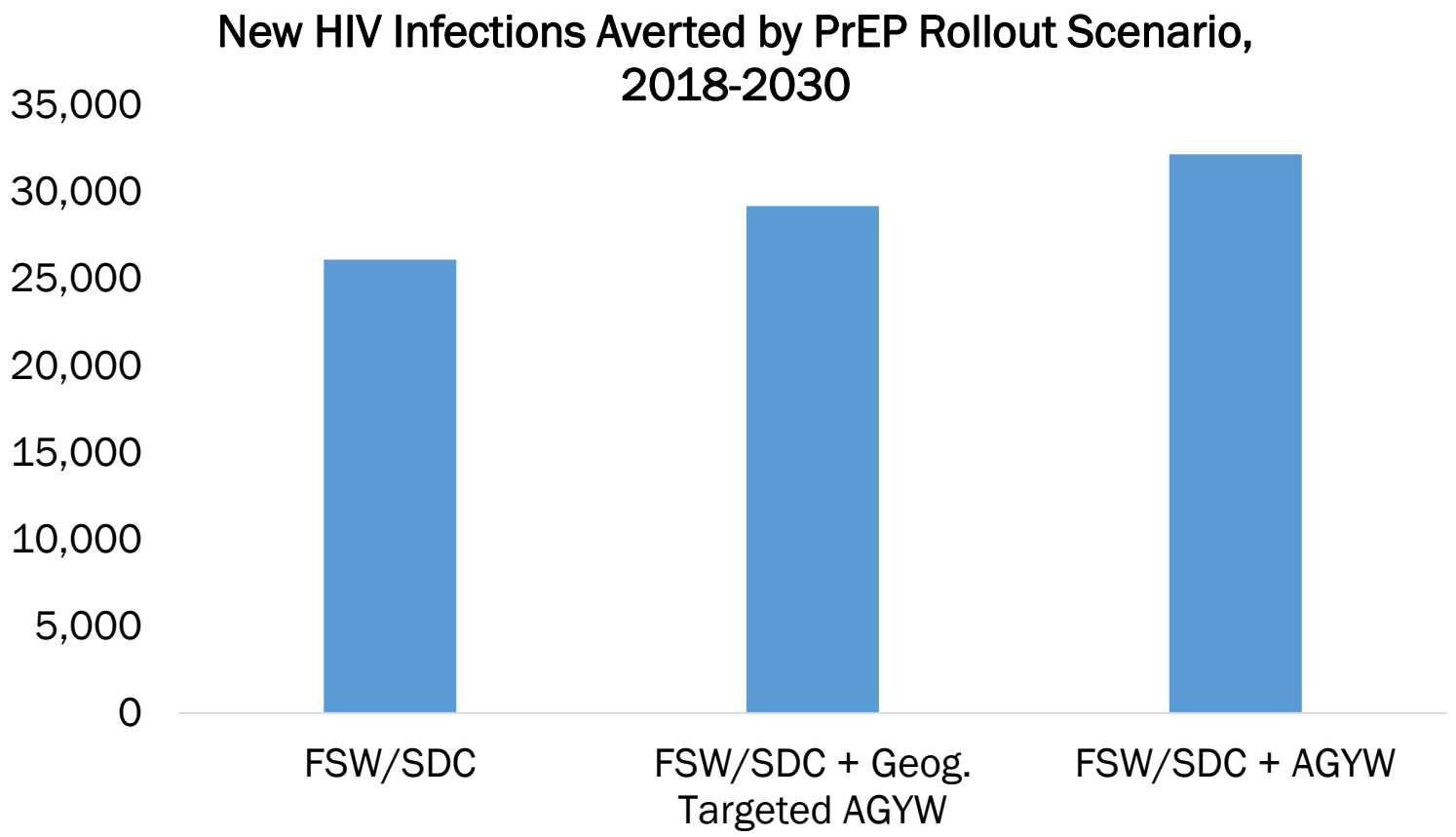
Note: Unless otherwise indicated, the analyses on the following slides assume that the country achieves 90-90-90 targets by 2020—81% of PLHIV on ART, 90% of ART patients are virally suppressed, and 90% of males 10–29 are circumcised.

Scale-Up Pattern for Each Rollout Scenario



Coverage: percentage of indicated target population provided with oral PrEP in indicated year

Impact from Rolling Out Oral PrEP



-ART scenario: 90-90-90 by 2020

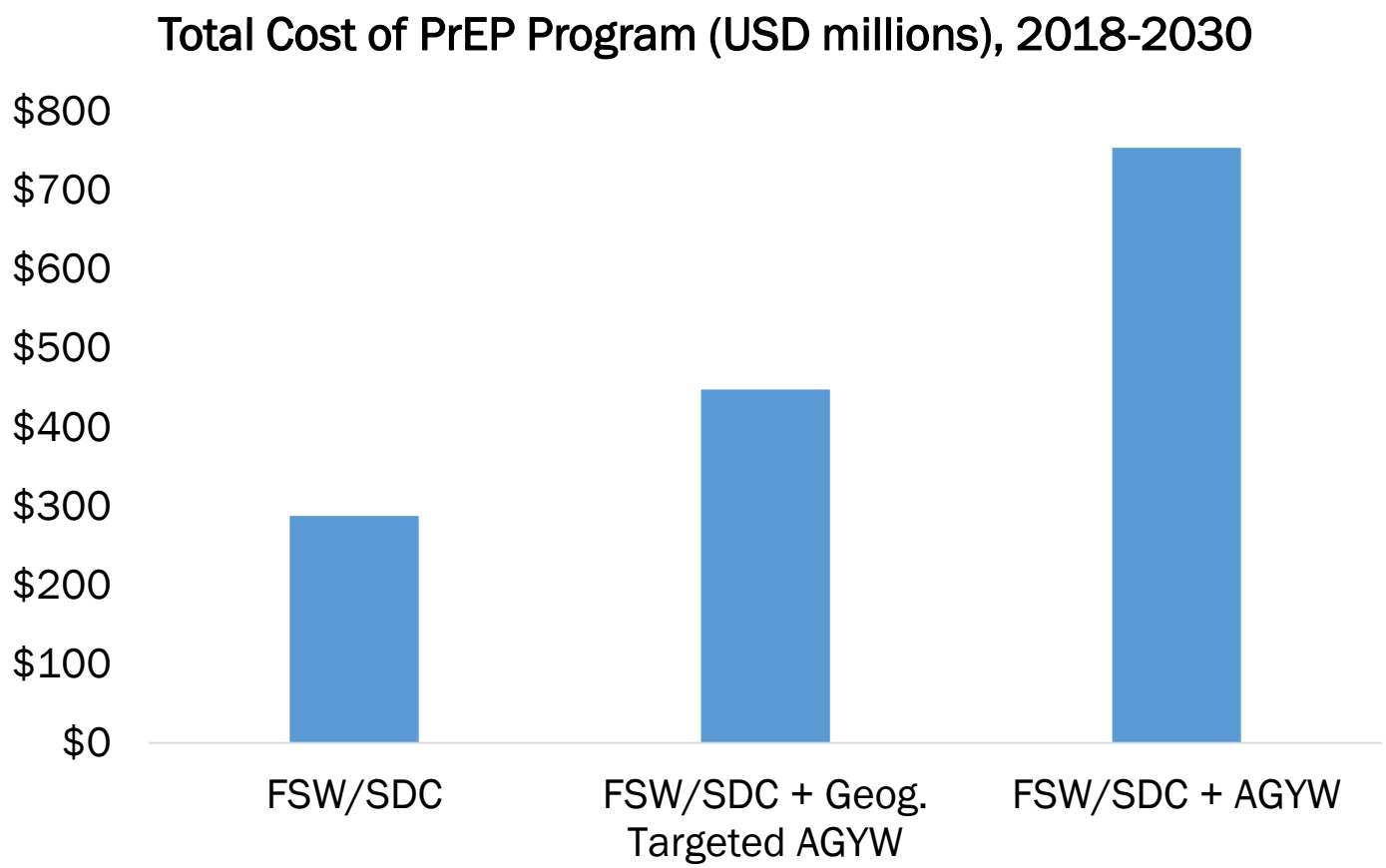
Unit Cost Derivation:
Annual cost of oral PrEP per person per year

	Kenya Average (USD)	Uganda Average (USD)	Uganda Average (UGX)
Cost Category	**Target**	**Target**	**Target**
Other*	$17	**$17**	**UGX 59,845**
Training	$1	**$1**	**UGX 3,591**
Adherence	$55	**$32**	**UGX 114,137**
Demand Generation	$3	**$2**	**UGX 5,568**
Labs	$17	**$17**	**UGX 61,041**
Personnel	$26	**$15**	**UGX 53,589**
ARV	$84	**$50**	**UGX 179,210**
Total Cost	$202	**$133**	**UGX 476,980**

GNI PPP: UGANDA to Kenya
0.581469649
USD to UGX
3590.67

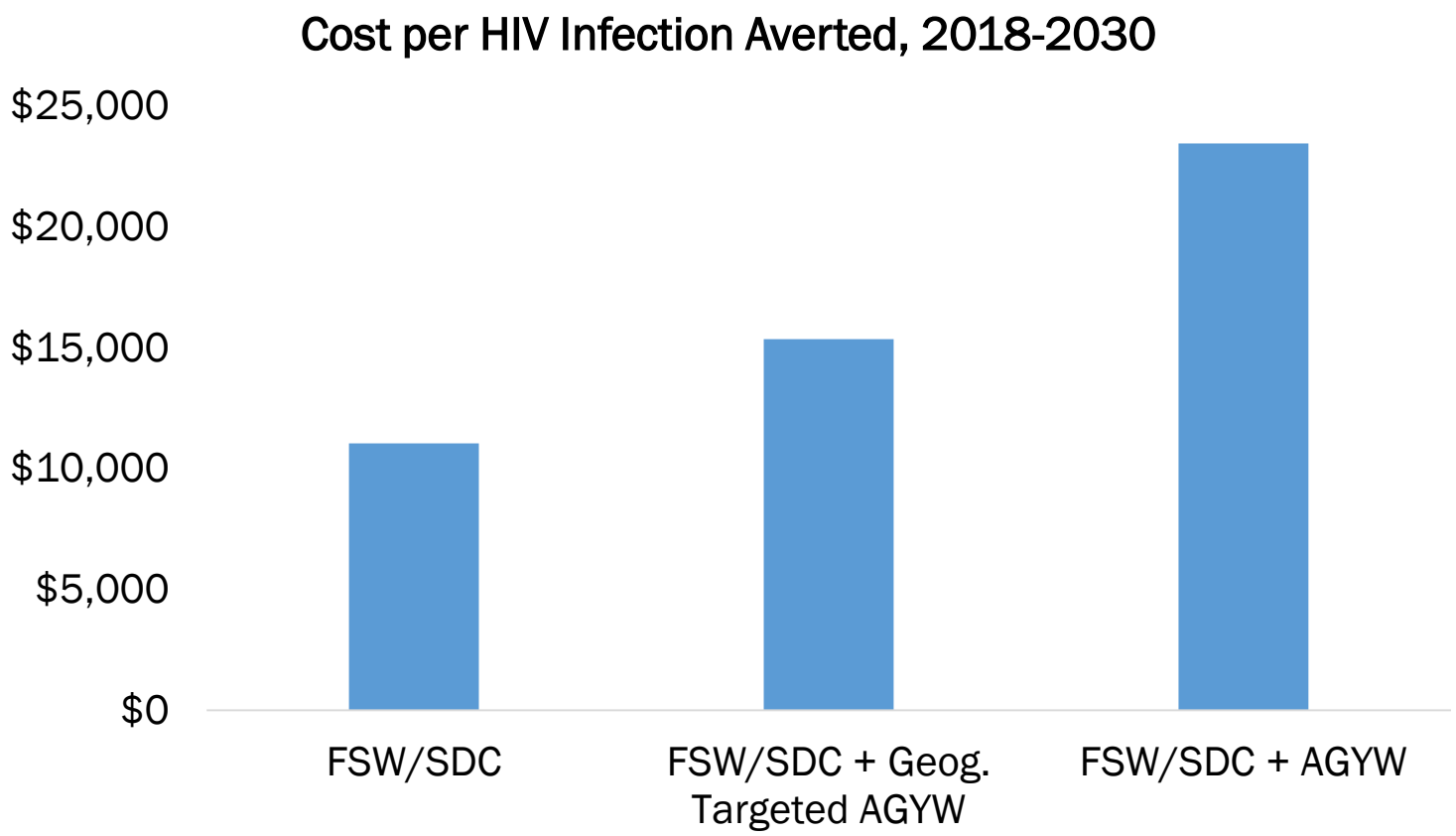
GNI PPP: Gross National Income Per Capita, a measure of each country's average labor costs.

The cost of adding oral PrEP to the HIV program depends on the size of the target population



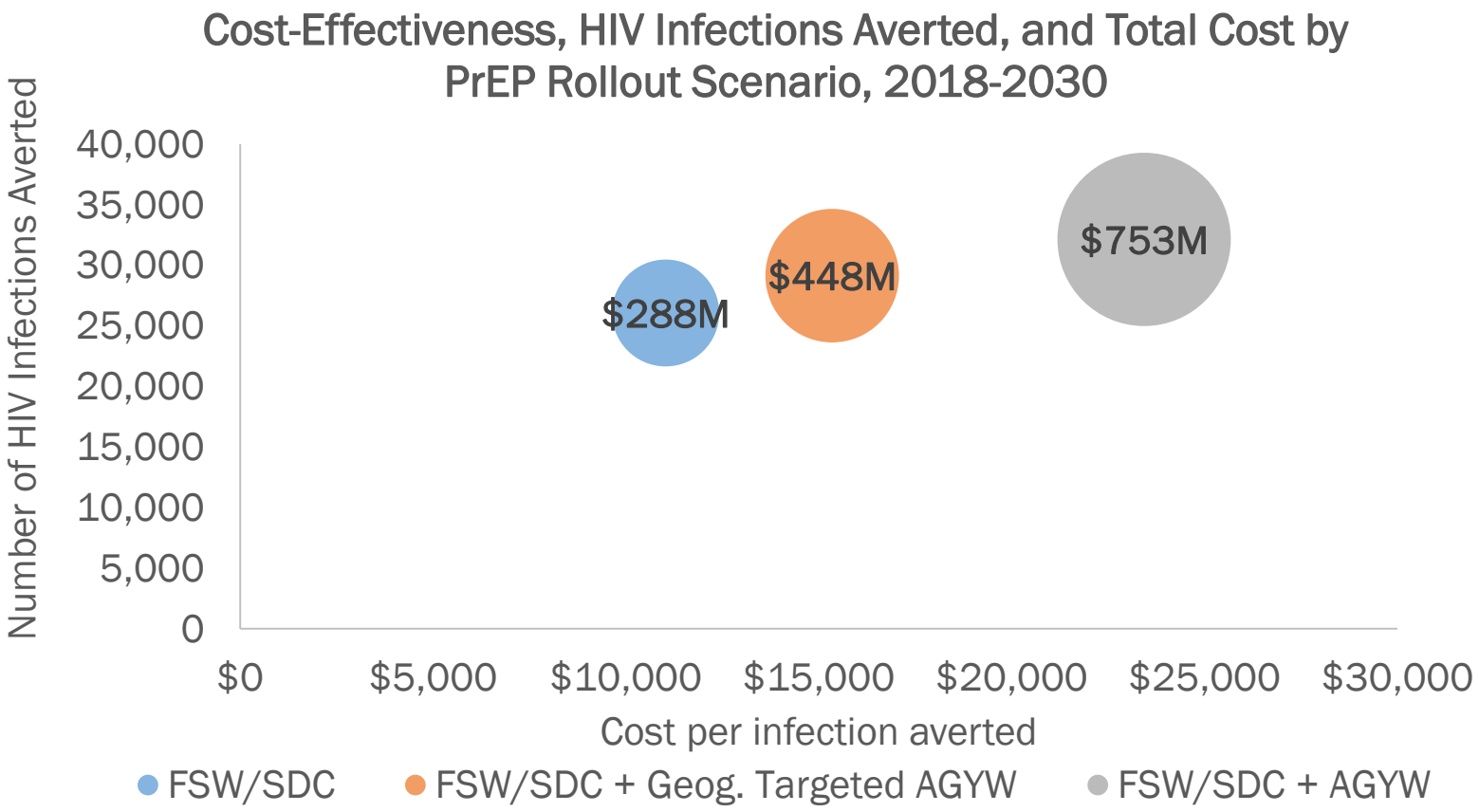
-ART scenario: 90-90-90 by 2020

Cost-Effectiveness of Rolling Out Oral PrEP



-ART scenario: 90-90-90 by 2020

Geographically prioritizing oral PrEP for young women in Uganda increases cost-effectiveness without sacrificing impact



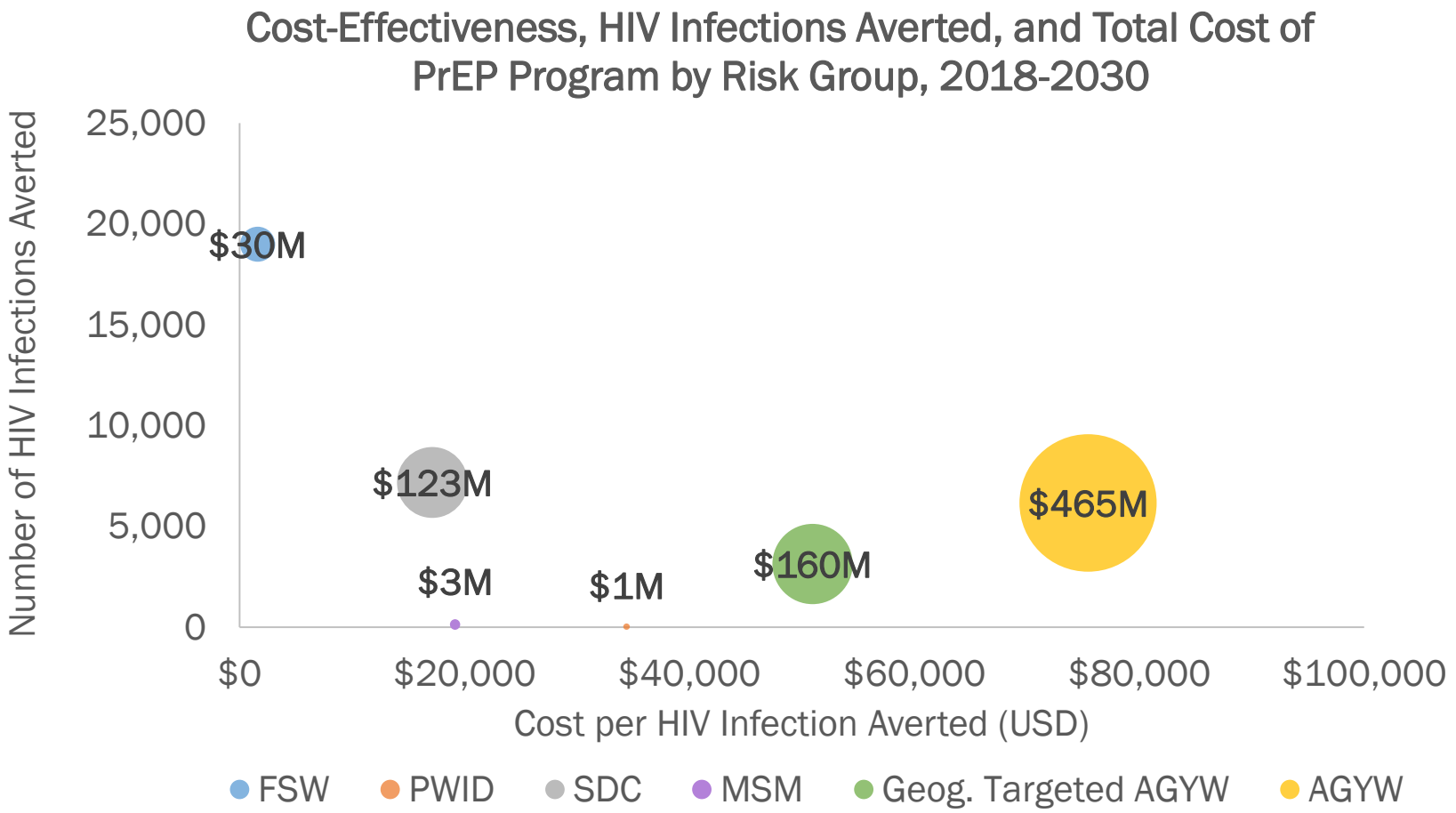
-Bubble size and data labels: Total cost of adding PrEP program, USD millions
-ART scenario: 90-90-90 by 2020

Efficacy trial	Country or city	Annual HIV incidence in control group (95% CI)
ASPIRE (MTN 020)	South Africa	6.2% (4.7%, 7.9%)
ASPIRE (MTN 020)	Malawi, Uganda, Zimbabwe	2.6% (1.7%, 3.9%)
Ring Study (IPM 027)	South Africa and Uganda	6.1% (4.6%, 7.9%)
FACTS 001	South Africa	4.0% (3.1%, 5.2%)
MTN 003 (Voice)	South Africa, Uganda, Zimbabwe	4.2% (2.9%, 5.8%)
MTN 003 (Voice)	South Africa, Uganda, Zimbabwe	6.8% (5.3%, 8.6%)
FEM-PrEP	Arusha (Tanzania)	0.0% (NA)
FEM-PrEP	Bloemfontein (South Africa)	3.4% (0.9%, 8.7%)
FEM-PrEP	Bondo (Kenya)	4.7% (2.6%, 7.9%)
FEM-PrEP	Pretoria (South Africa)	6.0% (3.5%, 9.6%)
HPTN 043	South Africa, Tanzania, Zimbabwe	2.4% (CI NA)
HPTN 035	United States, Malawi, South Africa, Zambia, Zimbabwe	3.9% (2.9%, 5.1%)
HPTN 035	United States, Malawi, South Africa, Zambia, Zimbabwe	4.0% (3.0%, 5.3%)
HVTN 503 (Phambili)	South Africa	7.4% (2.4%, 17.4%)
RV144 (Thai Trial)	Thailand	0.3% (0.2%, 0.4%)
CAPRISA 004	South Africa	9.1% (6.9%, 11.7%)
MDP 301	South Africa, Tanzania, Uganda, Zambia	4.2% (3.4%, 5.3%)
HPTN 039	South Africa, Zimbabwe, Zambia	3.1% (2.1%, 4.5%)
MIRA	Harare (Zimbabwe)	2.5% (1.9%, 3.3%)
MIRA	Durban (South Africa)	7.0% (5.5%, 8.8%)
MIRA	Johannesburg (South Africa)	3.3% (2.1%, 4.9%)

Trials whose population was listed as “Women,” from HIV Incidence in Prevention Trials and Observational Studies: A Summary Table, downloaded June 15, 2017 from http://www.vaccineenterprise.org/timely-topics/HIV-incidence-summary-table

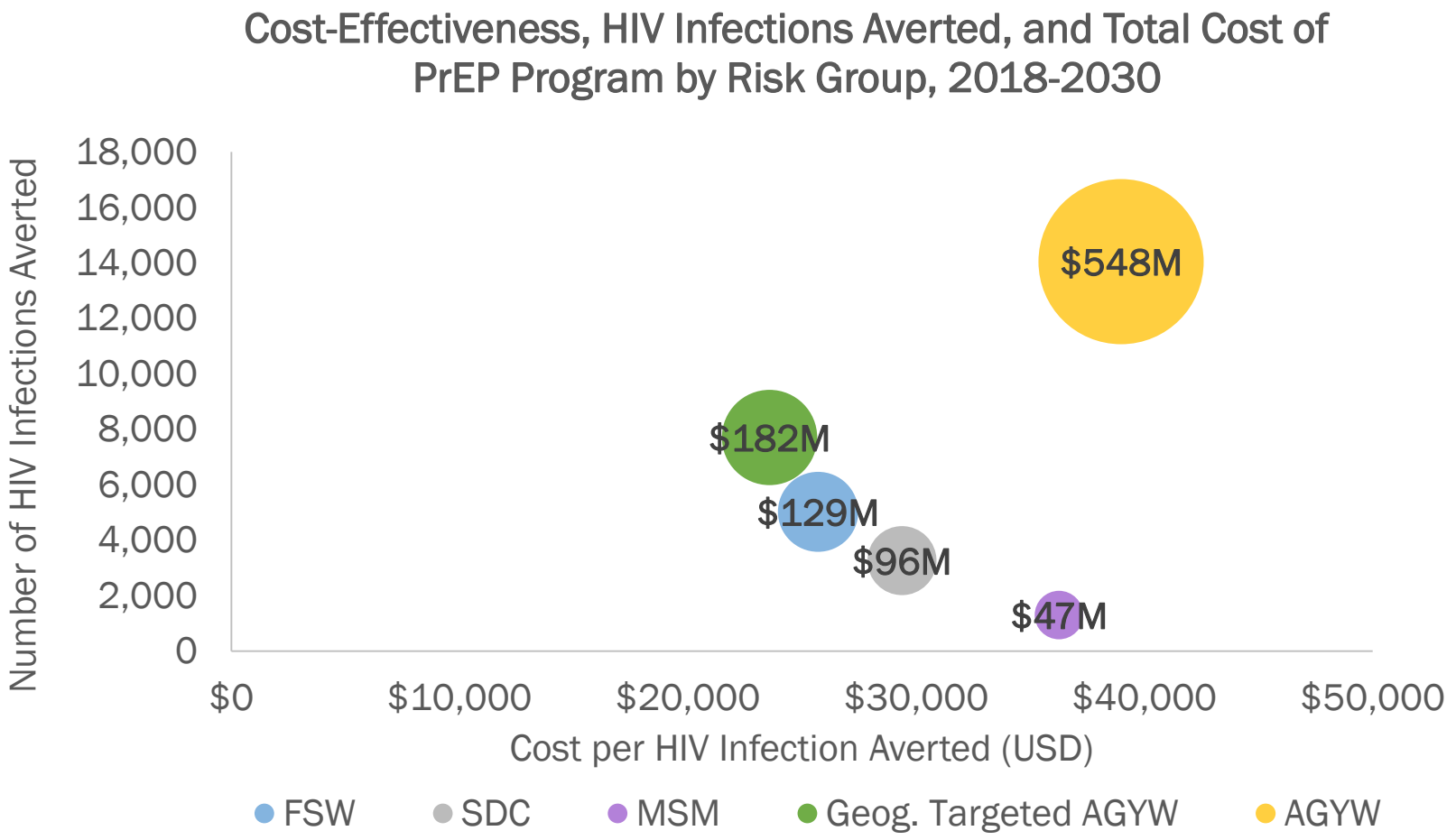
How do the impact, cost, and cost-effectiveness vary by risk group?

Uganda



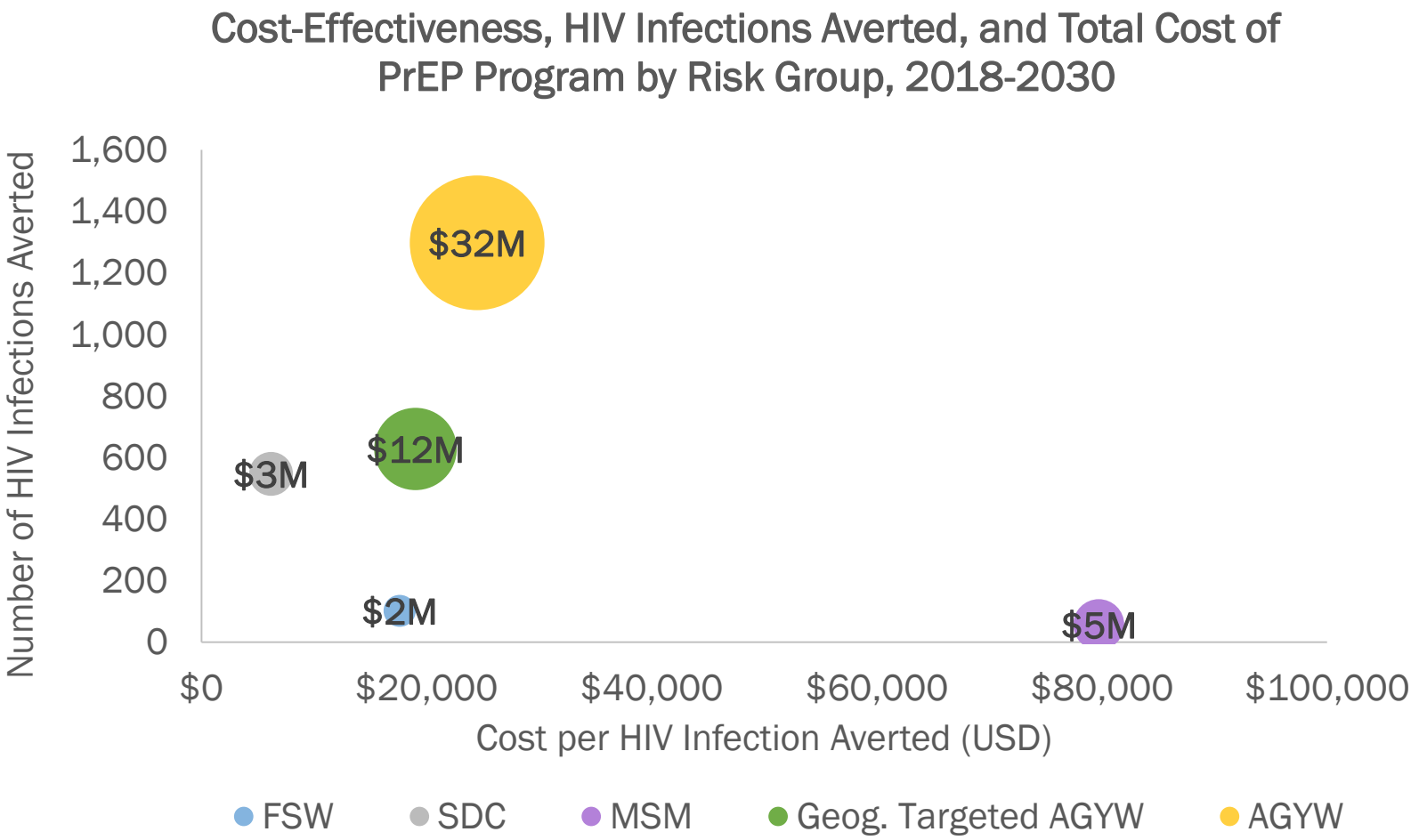
-Bubble size and data labels: Total cost of adding PrEP program, USD millions

Mozambique



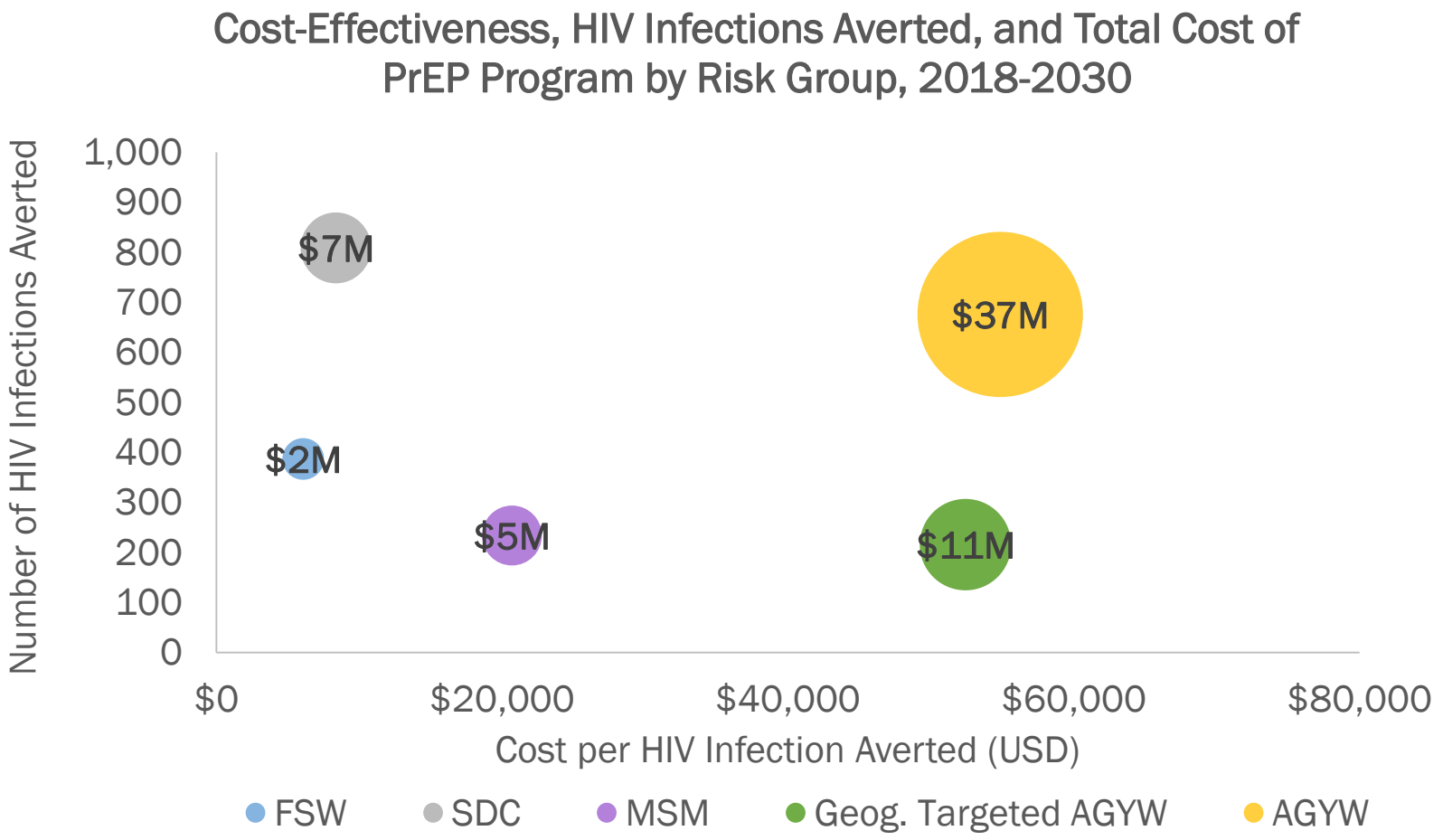
-Bubble size and data labels: Total cost of adding PrEP program, USD millions

Swaziland



-Bubble size and data labels: Total cost of adding PrEP program, USD millions

Lesotho



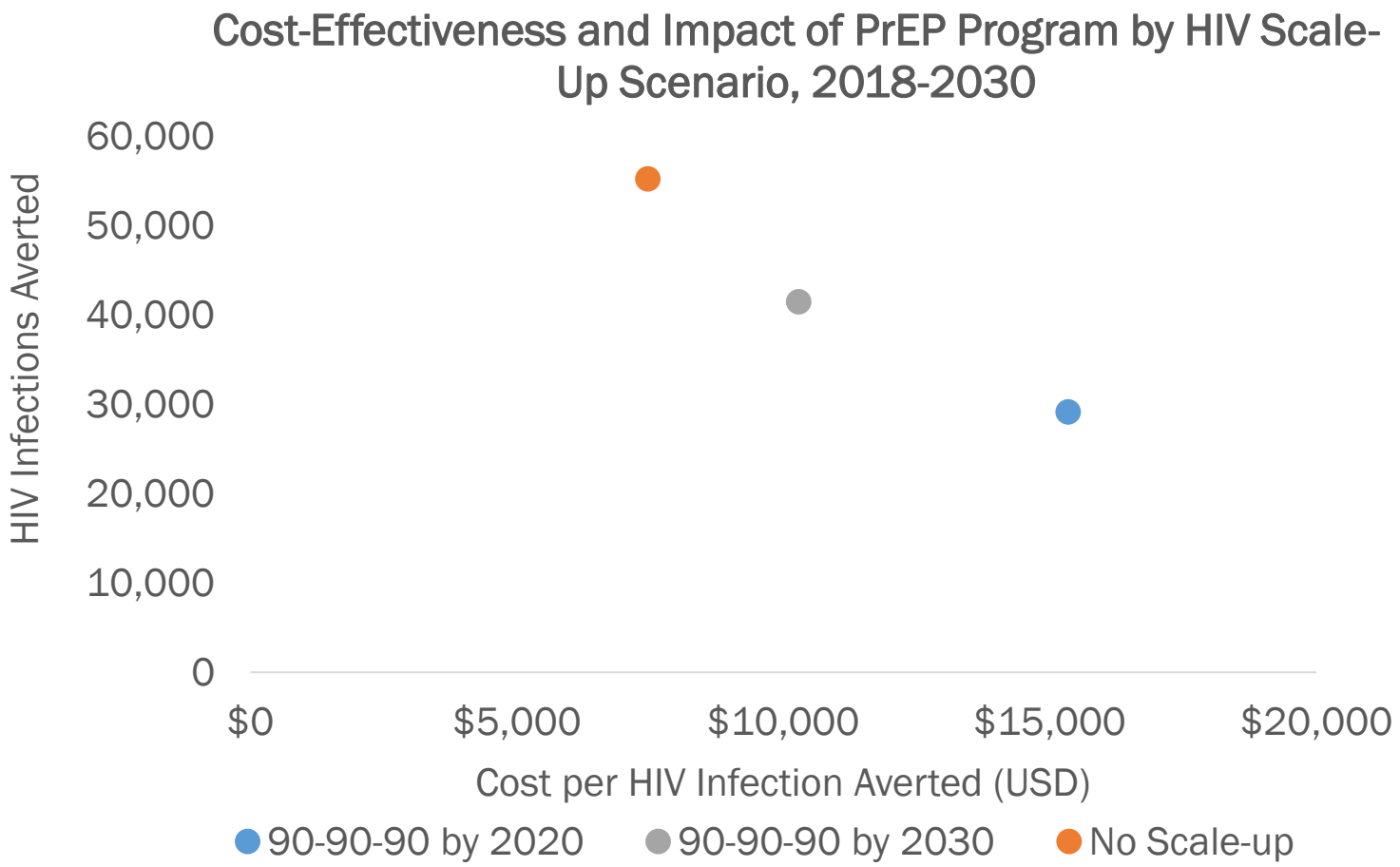
-Bubble size and data labels: Total cost of adding PrEP program, USD millions

How would varying levels of future scale-up of ART and VMMC affect the impact and cost-effectiveness of oral PrEP?

Example ART and VMMC Scenarios

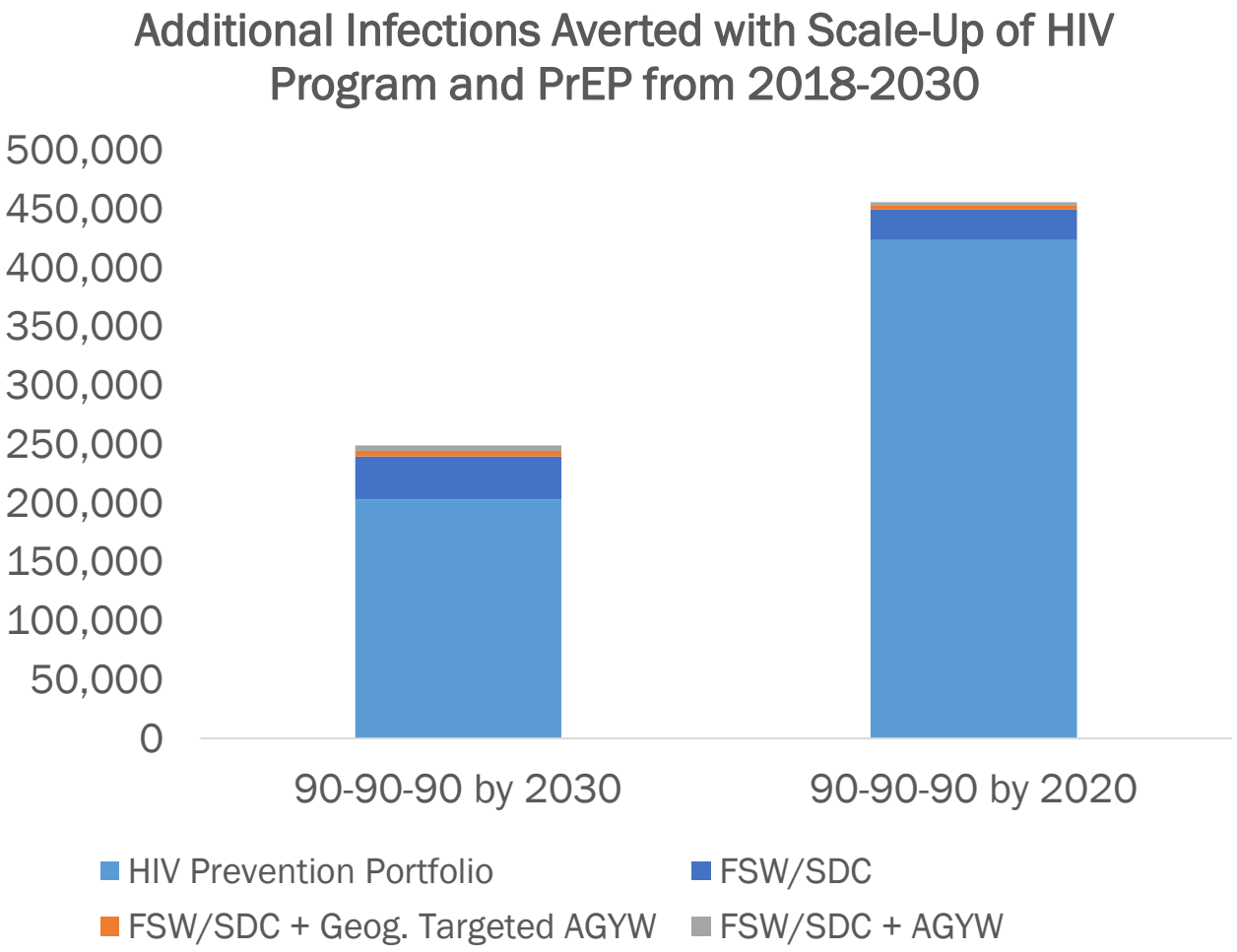
- 90-90-90 by 2020:
  - Country achieves 90-90-90 targets by 2020—81% of PLHIV on ART, 90% of ART patients are virally suppressed, and 90% of males 10–29 are circumcised
- 90-90-90 by 2030:
  - Country achieves 90-90-90 ART and VMMC targets by 2030
- Continue Current Coverage:
  - ART, VMMC, and viral suppression coverages remain at current levels

Oral PrEP has impact even with achievement of 90-90-90; PrEP impact and cost-effectiveness increase as ART scale-up lags



-PrEP Rollout: FSW/SDC + Geog. Targeted AGYW

PrEP prevents new HIV infections even with scale-up of ART and VMMC



Questions?

Brief break before finishing presentation – more discussion to follow

How would varying unit cost of oral PrEP by risk group affect the relative cost-effectiveness of providing PrEP to the different risk groups?

Unit Cost Derivation:
Mozambique

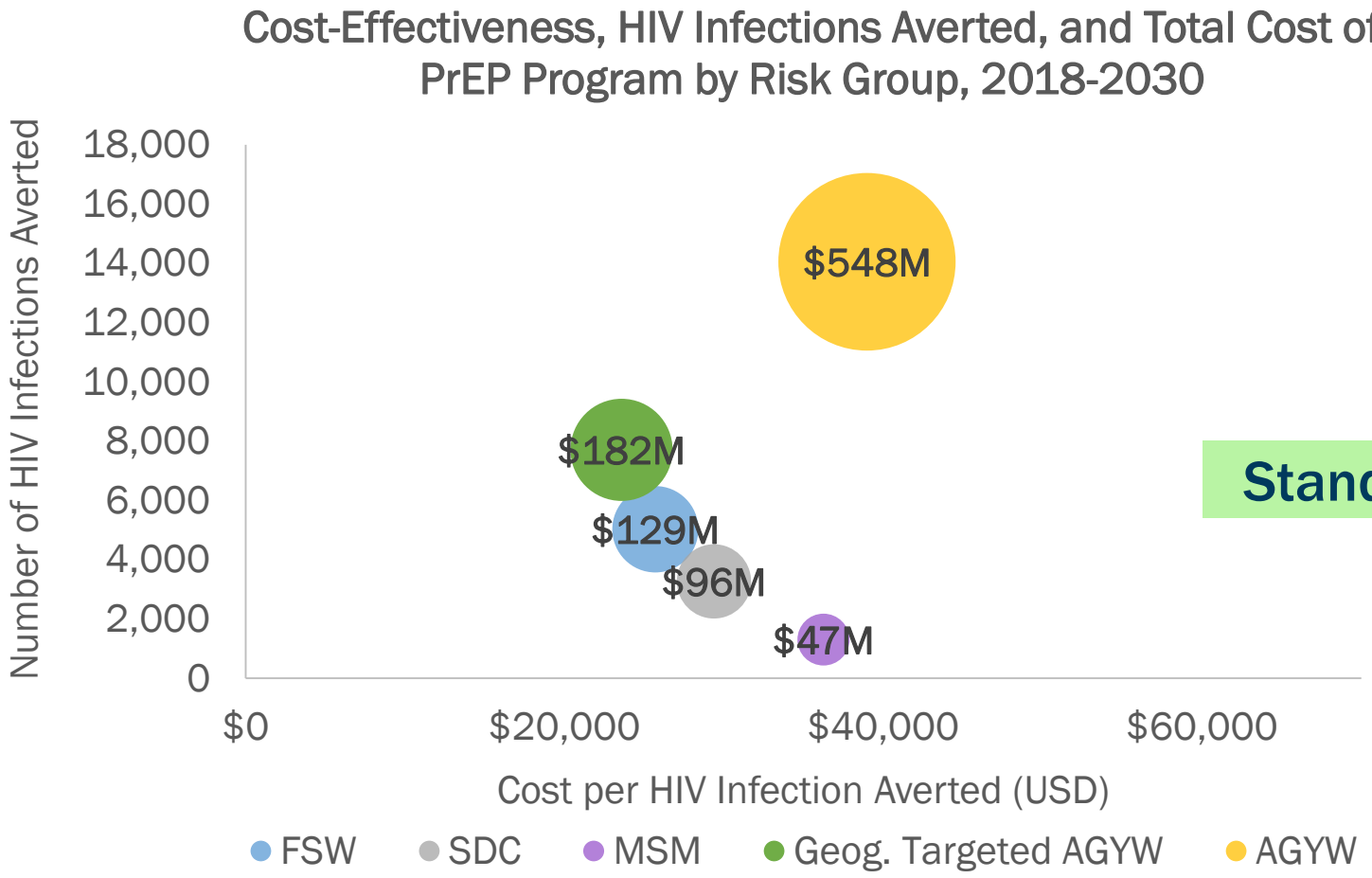
GNI PPP: Moz to Kenya		Kenya Average (USD)	Mozambique Average (USD)	Mozambique Average (MZN)
0.380191693	Cost Category	Target	Target	Target
	Other*	$28	$28	MZN 1,721
USD to MZN	Training	$8	$8	MZN 506
60.7249	Adherence	$55	$21	MZN 1,262
	Demand Generation	$21	$8	MZN 493
	Labs	$17	$17	MZN 1,032
	Personnel	$44	$17	MZN 1,016
	ARV	$84	$84	MZN 5,101
	Total Cost	$257	$183	MZN 11,130

GNI PPP: Gross National Income Per Capita, a measure of each country's average labor costs

Unit Cost Variation by Risk Group

Scenario	FSW	SDC	MSM	Geog. Targeted AGYW	AGYW
Standard unit cost	$122	$122	$122	$122	$122
Key population higher cost	$122 * 1.5 = $183	$122	$183	$122	$122
General population higher cost	$122	$183	$122	$183	$183

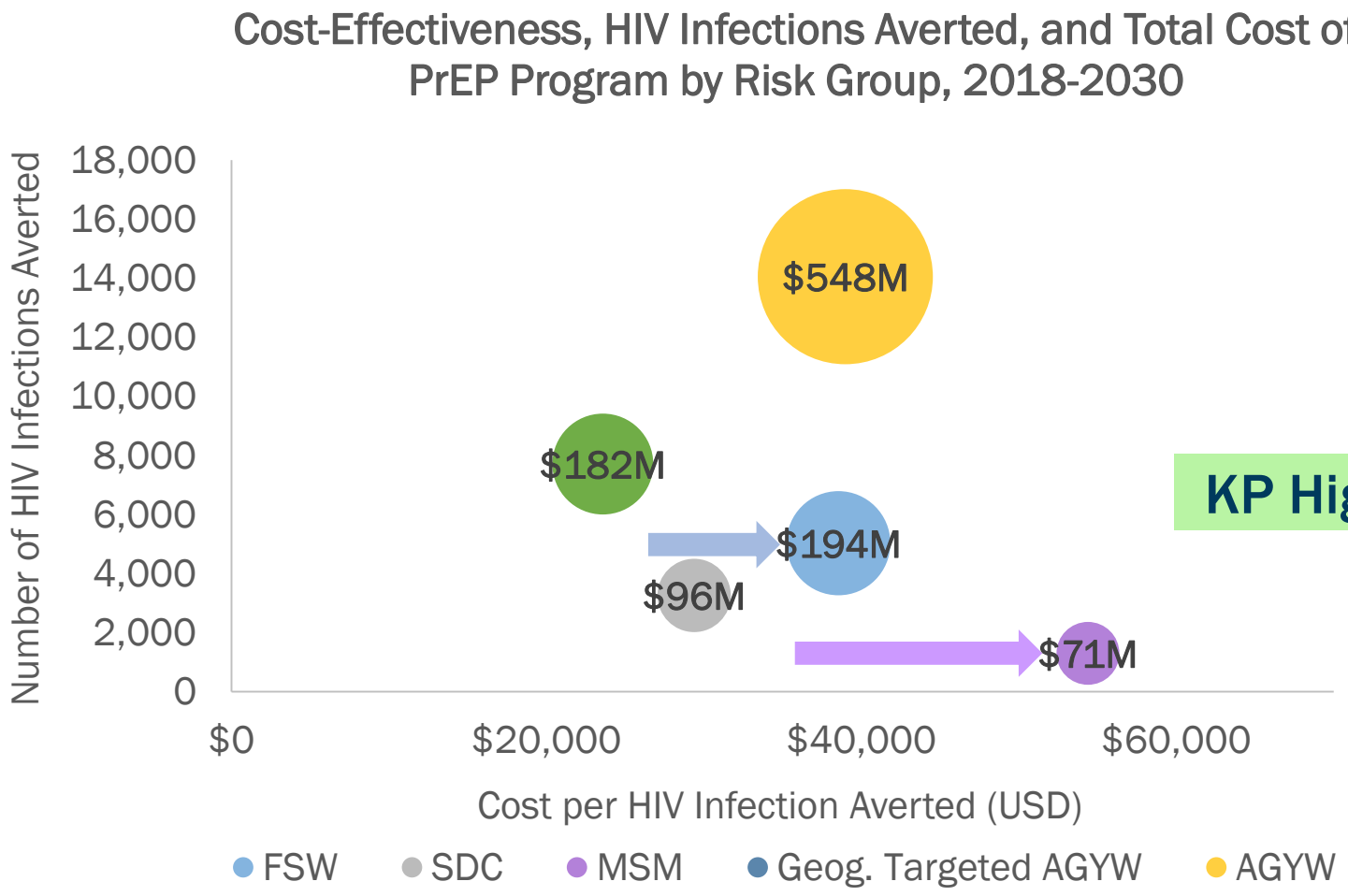
Unit cost sensitivity analysis demonstrates change in cost-effectiveness by risk group



Standard Cost

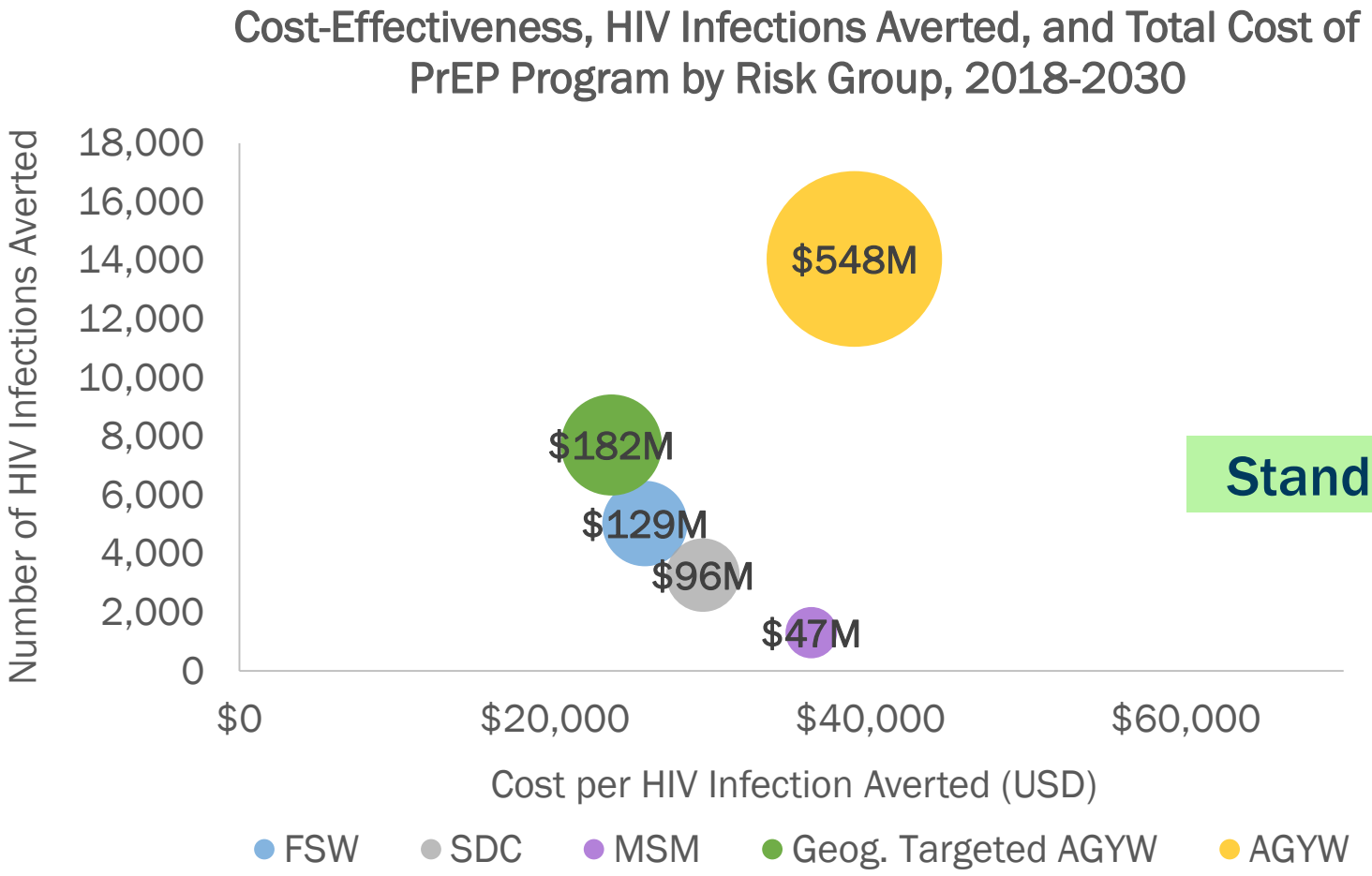
-Bubble size and data labels: Total cost of adding PrEP program, USD millions

Unit cost sensitivity analysis demonstrates change in cost-effectiveness by risk group



-Bubble size and data labels: Total cost of adding PrEP program, USD millions

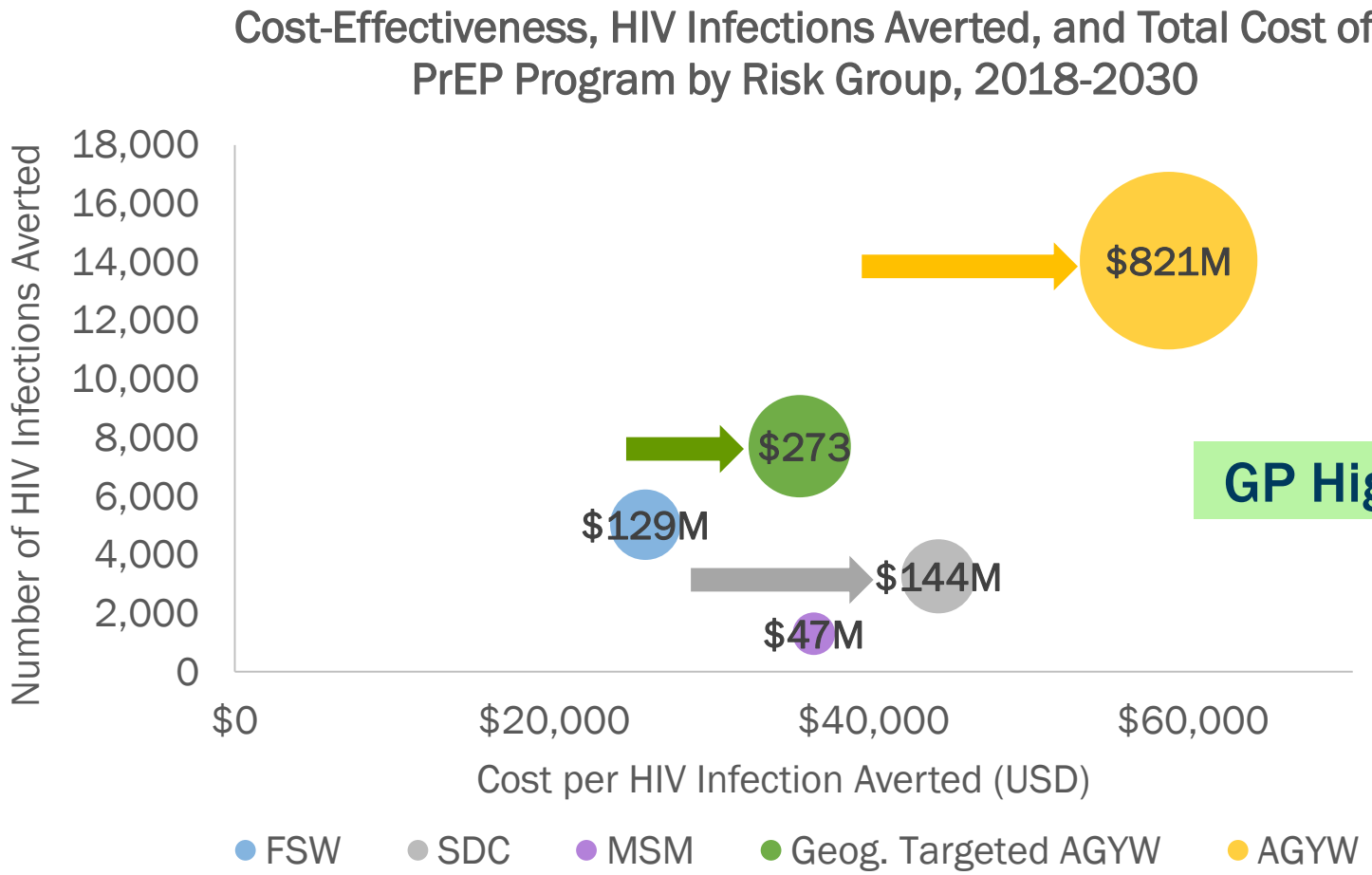
Unit cost sensitivity analysis demonstrates change in cost-effectiveness by risk group



Standard Cost

-Bubble size and data labels: Total cost of adding PrEP program, USD millions

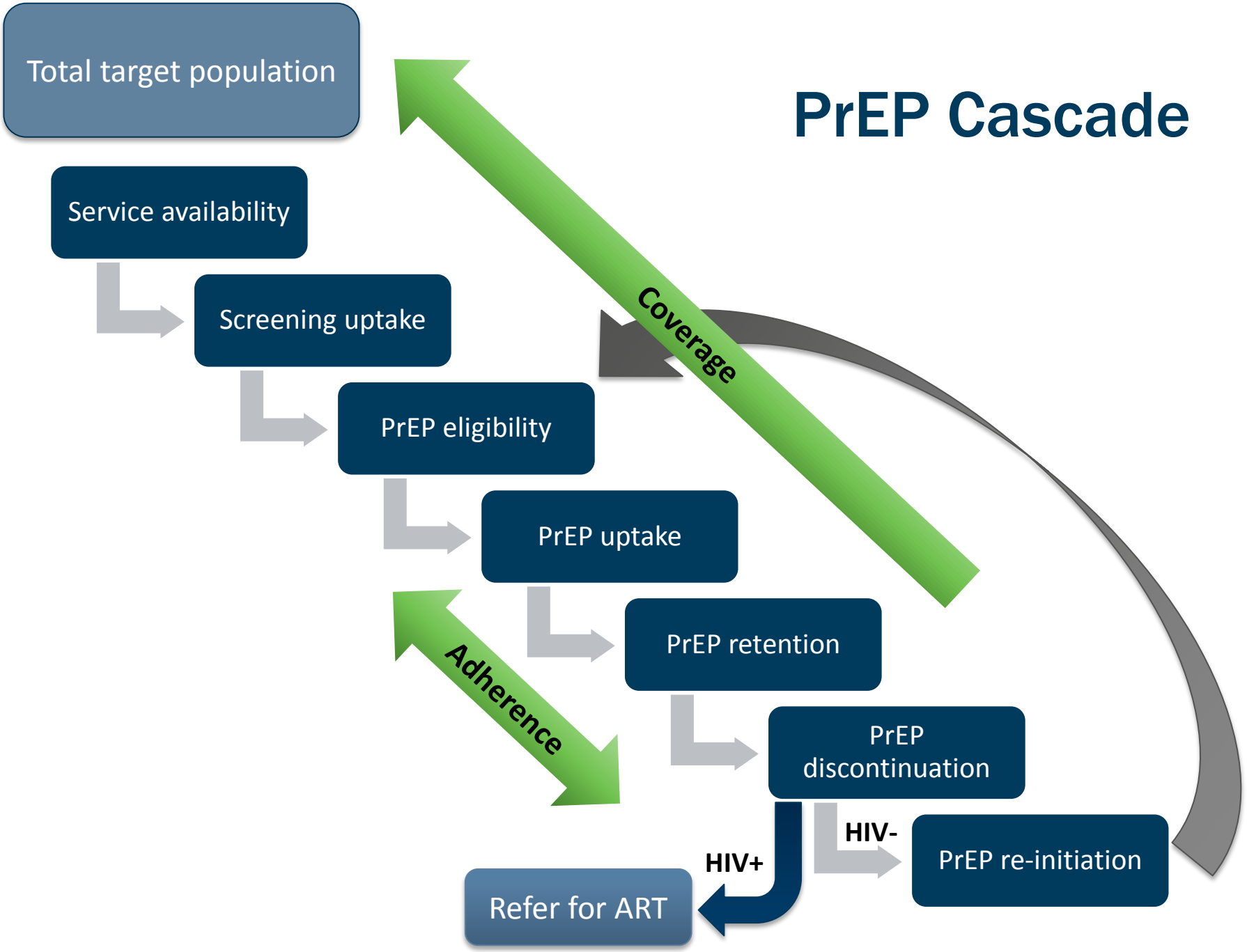
Unit cost sensitivity analysis demonstrates change in cost-effectiveness by risk group



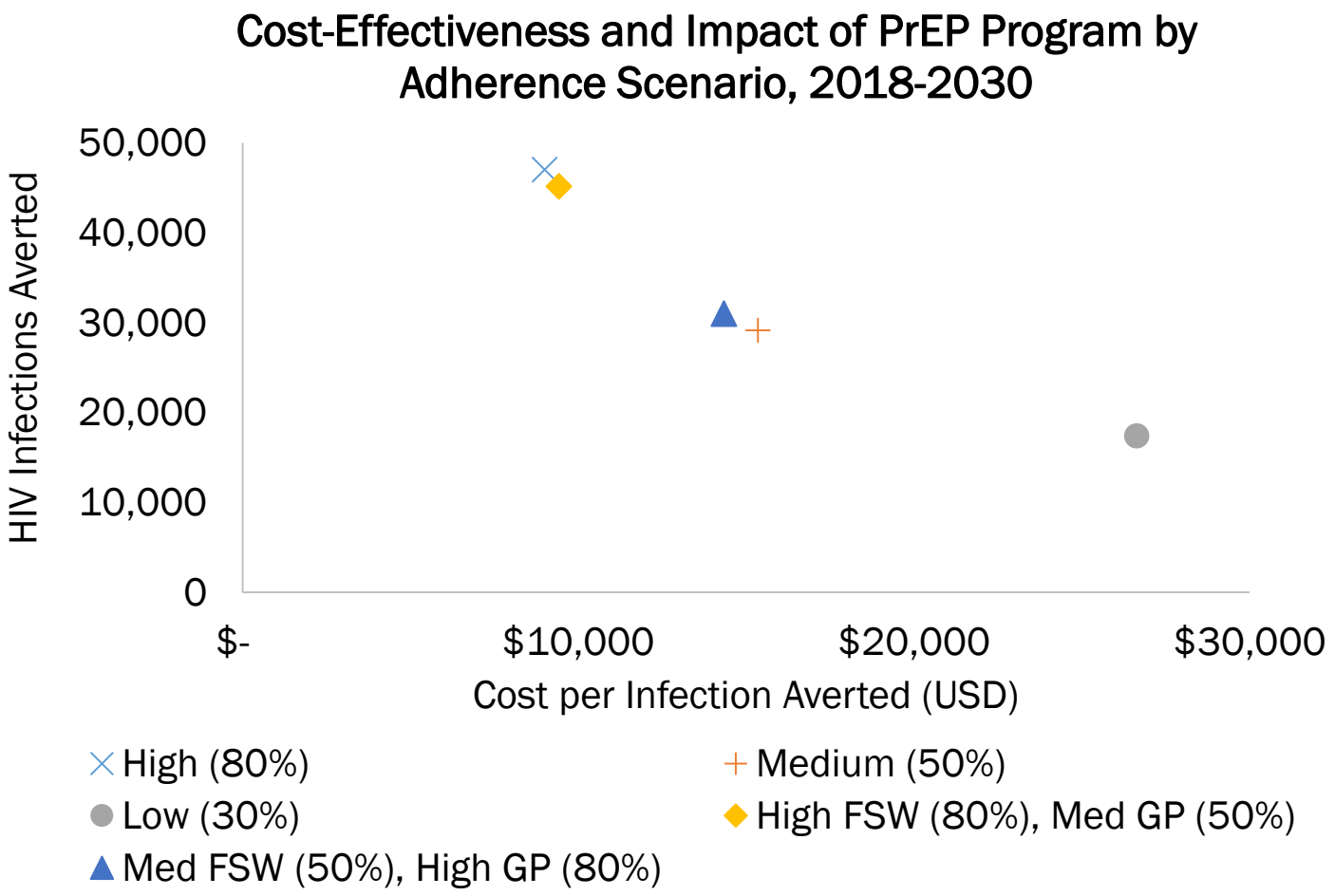
-Bubble size and data labels: Total cost of adding PrEP program, USD millions

How would varying levels of adherence by risk group affect the relative impact and cost-effectiveness of providing PrEP to the different risk groups?

PrEP Cascade



Lower Adherence Averts Fewer Infections



Discussion and Next Steps

Strengths of the Modeling Approach

- Combines the more detailed risk structure of the Incidence Patterns Model (IPM) with the dynamic projections and HIV interventions in the Goals model
  - Incorporation of risk groups not previously modeled in Goals: sero-discordant couples, adolescent girls and young women
  - Dynamic modeling can take into account projected changes in HIV incidence from scaling up ART and other HIV prevention interventions
- Use of rigorous data from published DHS and AIS surveys to disaggregate HIV incidence by risk group
- PrEP workbook allows users flexibility in defining rates and levels of scale-up of PrEP, target populations, unit costs, etc. while automating the communication between the IPM and Goals models

Limitations of the Analytic Process

- Uncertainty in estimates of HIV incidence by subpopulation and geographic unit
  - Cost-effectiveness between risk groups cannot be compared at the provincial or regional level
- Unknown or uncertain population sizes for various risk populations will make determination of targets and coverage uncertain
- Limited primary data are available on cost of oral PrEP
  - Even less is known about cost variations by setting, service delivery model, and subpopulations
  - This introduces uncertainty into analyses of relative cost-effectiveness of oral PrEP overall and of providing oral PrEP to different risk groups
- Cannot model changes in individual risk characteristics over time; average population characteristics are modeled instead
- Modeling team cannot provide prioritization and targets at a district level during this phase of model development

Possible Future Work

- Countries can request customized modeling exercises with full stakeholder engagement
- Countries can refine the modeling estimates by collecting data on:
  - PrEP costs, coverage, and adherence by risk group or service delivery method
  - HIV incidence for key and priority populations
  - Key and priority population sizes
- The modeling team is proposing developing an implementation tool that assists decision-makers to:
  - Generate PrEP numeric targets by risk group and district
  - Incorporate detailed cost and implementation data as they become available to refine cost projections

Discussion – Scenarios

- Given these results, which populations should be prioritized for oral PrEP?
- Should oral PrEP be rolled out to some populations before others, or simultaneously? What about geographic prioritization?
- Are there different modeling scenarios that would be helpful?

Acknowledgements

- The team thanks the Ministry of Health in Lesotho, Mozambique, Swaziland, and Uganda, PEPFAR country teams, and USAID Washington (Delivette Castor, Elizabeth Russell, and Sangeeta Rana) for their support of this work.
- The Oral PrEP Workbook was developed by Carel Pretorius, with support from Yu Teng and Robert Glaubius of Avenir Health and Juan Dent of Palladium
- HP+/Project SOAR PrEP modeling team:
  - Katharine Kripke, HP+ Activity Manager kkripke@avenirhealth.org
  - Steven Forsythe, Project SOAR Activity Manager sforsythe@avenirhealth.org
  - Juan Dent, Juan.Dent@thepalladiumgroup.com
  - Robert Glaubius, RGlaubius@avenirhealth.org
  - Matthew Hamilton, mhamilton@avenirhealth.org
  - Guy Mahiane, GMahiane@avenirhealth.org
  - Carel Pretorius, cpretorius@avenirhealth.org
  - Meghan Reidy, mreidy@avenirhealth.org
  - Melissa Schnure, Melissa.Schnure@thepalladiumgroup.com
  - Yu Teng, YTeng@avenirhealth.org

Health Policy Plus (HP+) is a five-year cooperative agreement funded by the U.S. Agency for International Development under Agreement No. AID-OAA-A-15-00051, beginning August 28, 2015. The project's HIV activities are supported by the U.S. President's Emergency Plan for AIDS Relief (PEPFAR). HP+ is implemented by Palladium, in collaboration with Avenir Health, Futures Group Global Outreach, Plan International USA, Population Reference Bureau, RTI International, ThinkWell, and the White Ribbon Alliance for Safe Motherhood.

Project SOAR (Cooperative Agreement AID-OAA-14-00026) is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents of this presentation are the sole responsibility of the SOAR Project and Population Council and do not necessarily reflect the views of USAID or the United States Government. Through operations research, Project SOAR will determine how best to address challenges and gaps that remain in the delivery of HIV and AIDS care and support, treatment, and prevention services. Project SOAR will produce a large, multifaceted body of high-quality evidence to guide the planning and implementation of HIV and AIDS programs and policies. Led by the Population Council, Project SOAR is implemented in collaboration with Avenir Health, Elizabeth Glaser Pediatric AIDS Foundation, Johns Hopkins University, Palladium, and The University of North Carolina.