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Allocation of HIV Resources towards Maximizing the Impact of Funding in Selected Eastern European and Central Asian Countries

ALBANIA

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THE GLOBAL FUND

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Optima HIV

UNAIDS

ALBANIA

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Executive Summary

The Eastern European and Central Asian region continues to have the fastest increasing HIV epidemic in the world (1). The COVID-19 pandemic and the on-going war in Ukraine threaten economic growth and progress towards HIV targets. To ensure that progress against the HIV epidemic can continue, it is vital to make cost-effective funding allocation decisions to maximize the impact of HIV programs. An allocative efficiency analysis was conducted in partnership with the Albania National AIDS Program, Institute of Public, the Global Fund, UNAIDS, Swiss Tropical and Public Health Institute, and the Burnet Institute.

Summary and key recommendations for HIV resource optimization include:

- Albania has maintained a low level HIV epidemic among key populations, with 2019 Integrated Biological and Behavioural Surveillance prevalence estimates of 2.0% and 1.4% prevalence among men who have sex with men and people who inject drugs, respectively (2).
- In 2021 an estimated US$1.5M was spent on targeted HIV interventions, with prevention programs for key population accounting for 45% of this, followed by antiretroviral therapy (ART) (36%) and opioid substitution therapy (18%).
- In a baseline scenario with 2021 spending maintained, including a fixed annual spending on ART, there were estimated to be 975 new HIV infections, 302 HIV-related deaths and 7,5423 HIV-attributable disability-adjusted life years (DALYs) over 2023-2030.
- **Optimizing spending would involve prioritizing ART scale up where possible before prevention programs for female sex workers, men who have sex with men and people who inject drugs.** The model estimated that 65% of diagnosed people living with HIV were on treatment in 2021. [1] Emigration, including among diagnosed people living with HIV, contributes as a barrier to treatment scale-up; however, the optimization suggests that any gains in treatment uptake should be pursued as a priority to reduce new infections and deaths.
- Optimized reallocation of 2021 spending can advance epidemic gains without additional resources and was estimated to avert 407 new infections (58%), 182 deaths (60%) and 4,233 DALYs (56%) over 2023-2030 relative to the baseline scenario of continued 2021 spending.
- With additional resources available, priorities were identified as continued scale up of ART, followed by programs for people who use inject drugs and men who have sex with men.
- Moving from the 80-65-84 care cascade modeled in 2021[1] to reach the 95-95-95 targets by 2030 will require progress on all pillars. Meeting the 95% diagnosis target may be possible with optimized allocation of an additional US$920,000 per annum, or a total 163% of 2021 targeted spending. Continued expansion of ART coverage through ongoing increases in spending or decreases in the procurement cost of antiretroviral drugs will support progress toward the 95% treatment target, but novel programs may be necessary to improve linkage to care and treatment adherence.

[1] Fitted through model calibration specifically for this analysis and may slightly differ from reported estimates.

1 Background

In 2021 Albania had an estimated population of 2.9 million and a low HIV prevalence epidemic, with an estimated 1,400 people living with HIV and annual new HIV infections peaking around 100-120 cases between 2010 and 2018 (3). While annual new infections have been decreasing for the last three years, available data may have underestimated the actual number of HIV cases, as only a small proportion of the population has been tested for HIV, particularly among key populations (4). The HIV epidemic among key populations is small, with an estimated HIV prevalence of 2.0% among men who have sex with men (MSM) and 1.4% among people who inject drugs (PWID) in 2019 (2).

In 2021 Albania over 80% of people living with HIV were diagnosed but more than a third of those diagnosed were not on treatment (5). A high proportion of new diagnoses were considered late diagnoses, with an estimated 60% of new reported cases being identified at a late stage of HIV (4).

The national response to the HIV epidemic is guided by the National Strategy for the Prevention and Control of HIV/AIDS in Albania. Activities to increase awareness of HIV/AIDS were initiated in the early 1990s, along with routine HIV screening of paid and volunteer donor blood (6). Shortly thereafter, the confidential and voluntary HIV counselling and testing (VCT) program was introduced and antiretroviral therapy (ART) has been offered to people living with HIV since 2004, procured through UNICEF and funded by the Albanian government (7).

The HIV response in Albania is increasingly domestically funded. In 2018, US$3.4M was spent on HIV/AIDS in Albania, and 74% of combined HIV and tuberculosis spending was funded through the Government of Albania (8), increasing from 46% in 2005 (9).

This is the first Optima HIV analysis conducted in Albania with support from the Global Fund, UNAIDS and other partners. The analysis is to estimate the optimal allocation of HIV resources, based on latest reported values in 2021, with findings described below.

2 Objectives

Objective 1. What is the **optimized resource allocation** by targeted HIV intervention to minimize HIV infections and deaths by 2030 under five funding scenarios of 50, 75, 100, 125 and 150 percentage of the current HIV funding? What is the expected cascade (gap) under these scenarios?

Objective 2. If national governments do not scale up HIV programs identified for prioritization under optimized allocation for different funding envelopes, what will the impact be on the epidemic by 2030? That is, what is the **opportunity lost to avert HIV infections, deaths** and disability-adjusted life years (DALYs)?

Objective 3. What is the **most efficient HIV resource allocation for best achieving 95-95-95 targets** by 2030, and what is the level of resources required for achieving these targets? What is the number of HIV infections prevented and deaths averted under this scenario?

3 Methodology

An allocative efficacy modeling analysis was undertaken in collaboration with the Albania National AIDS Program, Institute of Public Health. Epidemiological and program data were provided by the country team and validated during a regional workshop that was held in September 2022 in Istanbul, Turkey. Country teams were consulted before and after the workshop on data collation and validation, objective and scenario building, and results validation. Demographic, epidemiological, behavioral, programmatic, and expenditure data from various sources including UNAIDS Global AIDS Monitoring and National AIDS Spending Assessment reports, integrated bio-behavioral surveillance surveys, national reports and systems were collated.

Due to incomplete spending data from 2021 at the time of the analysis, in Albania baseline spending was derived from the 2018 NASA (8), using program unit costs from 2018 and 2021 program coverage data to estimate spending in 2021. Budget optimizations were based on targeted HIV spending for programs with a direct and quantifiable impact on HIV parameters included in the model, with a total of US$1.5M.

The allocative efficacy analysis was conducted using Optima HIV, an epidemiological model of HIV transmission overlayed with a programmatic component and a resource optimization algorithm. The model was developed by the Optima Consortium for Decision Science in partnership with the World Bank, and a detailed description of the Optima HIV model is available in Kerr et al (10).

3.1 Populations and HIV programs

Populations and HIV programs considered in this analysis were:

- Key populations
  - Female sex workers (FSW)
  - Clients of sex workers (Clients)
  - Men who have sex with men (MSM)
  - People who inject drugs (PWID), male
- General populations
  - Male 0-14 (M0-14)
  - Female 0-14 (F0-14)
  - Male 15-49 (M15-49)
  - Female 15-49 (F15-49)
  - Male 50+ (M50+)

    - Female 50+ (F50+)
- Targeted HIV programs
    - Antiretroviral therapy (ART)
    - Prevention of mother-to-child transmission (PMTCT)
    - Opioid substitution therapy (OST)
    - HIV testing and prevention programs for female sex workers (FSW programs)
    - HIV testing and prevention programs for men who have sex with men (MSM programs)
    - HIV testing and prevention programs for people who inject drugs, including needle-syringe programs (NSP & PWID)

3.2 Model constraints

Within the optimization analyses, no one on treatment, including ART, PMTCT, or OST, can be removed from treatment, unless by natural attrition. All other programs were constrained to not reduce by more than 50%, unless optimizing a reduced budget.

3.3 Treatment retention parameters

The model did not include any defined HIV programs aimed at improving linkage or retention in treatment, adherence or viral suppression. Objective 1 (optimizing spending across programs to minimize infections and deaths) maintained the most recent values for time to be linked to care, loss-to-follow-up, return to care and viral suppression until 2030. Subsequently, the projected care cascade with optimized spending may underestimate the second and third pillars if additional programs that are not in the model are implemented or scaled-up.

Unlike Objective 1, which maintained most recent values for a number of care parameters, the optimization in Objective 3 (achieving 95-95-95 targets) *assumed* that the proportion of diagnosed people on treatment and the proportion of people on treatment with viral suppression would linearly increase to reach 95% by 2030. Objective 3 therefore includes the impact of improvements to reach the treatment and viral suppression targets but not the cost of programs required to achieve these gains, which would require further work to quantify.

3.4 Model weightings

Objective 1 aimed to minimize new HIV infections and HIV-related deaths by 2030 for a given budget, with a weighting of 1 to 7 for infections to deaths. Objective 3 weightings were to reach 95% diagnosis by 2030 with the minimal possible total spending. As no defined HIV programs target treatment retention or viral suppression, Objective 3 optimization of defined programs assumed that the proportion of diagnosed people in care would reach 95% and the proportion of people on treatment with viral suppression would reach 95%.

4 Findings

4.1 Objective 1

*What is the **optimized resource allocation** by targeted HIV intervention to minimize HIV infections and deaths by 2030 under five funding scenarios of 50, 75, 100, 125 and 150 percentage of the current HIV funding? What is the expected cascade (gap) under these scenarios?*

2021 HIV spending. Albania has estimated spending of US$1.5M in 2021 for the targeted HIV programs considered above, incorporating both domestic and international sources. The majority (45%) of targeted spending was for prevention programs for key populations, followed by ART (36%) and OST (18%) (Figure 2; Table A5).

Resource needs to maintain 2021 ART coverage. In 2021, ART coverage among diagnosed people living with HIV was 65%. If ART unit costs remain constant (US$696, based on 2018 unit costs used for this analysis), ART spending would need to increase by US$200,000 (38% of 2021 ART spending) from 2021 to 2030 to maintain a constant proportion of diagnosed people living with HIV on treatment given current epidemic trends, including current coverage of other HIV programs. Maintaining the "status quo" proportion of diagnosed people living with HIV on treatment will require additional future investment in HIV (Figure 1a), further reductions in ART unit costs, or reallocation of resources from other HIV programs.

To compare scenarios with optimized allocation of resources within a fixed budget envelope, a counterfactual "Baseline" of fixed annual spending on ART was used. This would result in different epidemic projections to maintaining fixed coverage (Figure 1b) but means that optimizations consider how the needs for additional treatment can be met.

Comprehensive strategic information was not available to define the combination of factors leading to people not being retained in care and on treatment, and specific programs to improve linkage to care or treatment adherence were not modeled or costed in this analysis. Although treatment is available to all diagnosed people living with HIV in Albania, there is a gap in strategic information where some diagnosed people living with HIV are neither reported to be on treatment nor lost to follow-up. It was assumed that additional spending on ART would be able to return these people to treatment, but further exploration of the limitations in achieving higher coverage of treatment may be necessary (including migration and acceptability of treatment regimens).

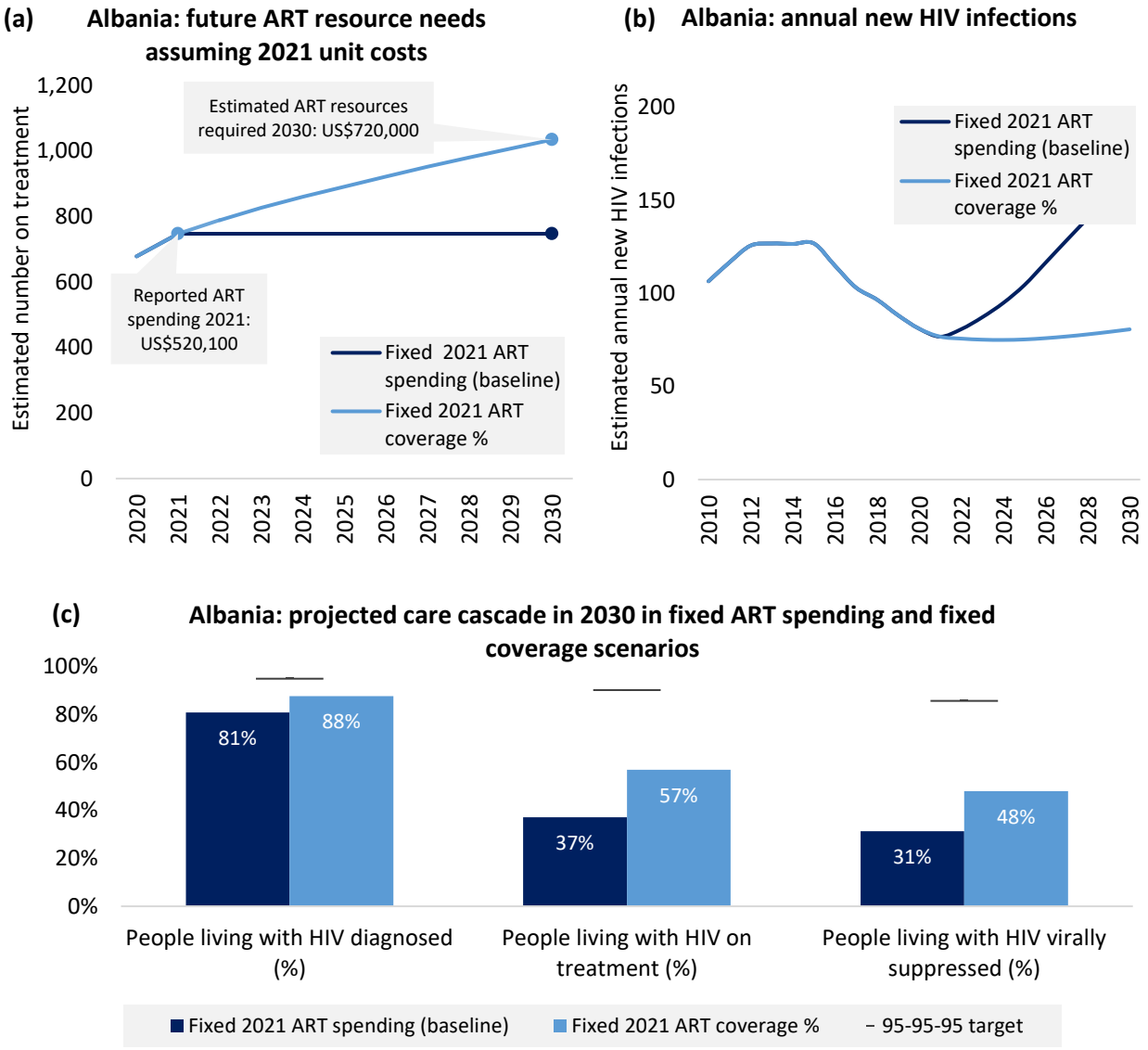

Figure 1. Fixed proportional coverage of people living with HIV on ART compared to fixed ART spending: resource needs and epidemic outcomes by 2030. Panels show (a) Resources required to maintain 2021 proportional coverage of ART among people living with HIV until 2030 if ART unit cost remains constant; (b) Estimated number of annual new HIV infections if ART spending is fixed until 2030 (baseline) compared to if ART proportional coverage is fixed; and (c) Projected HIV care cascade among all people living with HIV if ART spending is fixed at 2021 values compared to if ART coverage is fixed at 2021 values. ART, antiretroviral therapy.

Baseline scenario. In the baseline scenario maintaining 2021 spending on programs with fixed allocations, the model projects that there would be 975 new HIV infections, 302 HIV-related deaths and 7,543 HIV-attributable DALYs over 2023-2030 (Table 1). Without additional spending on ART, the HIV care cascade in this scenario was projected to be "81-46-84" in the year 2030 (i.e. 81% of people diagnosed, 46% of diagnosed people on treatment and 84% of people on treatment virally suppressed)

(Figure 1c). The low proportion of people on treatment in 2030 reflects that ART spending will need to increase over time just to maintain constant percentage treatment coverage, since more people will continue to be diagnosed.

Optimized resource allocation of 2021 spending. Optimization of 2021 spending identified that additional impact may be possible by prioritizing scale-up of ART before prevention and testing programs for FSW, MSM and PWID (Figure 2). Assuming that more people could be accessed for treatment through enhanced linkage to care and adherence programs, then this could reduce mortality as well as new infections through treatment-as-prevention. In the model, only 65% of people diagnosed with HIV were estimated to be on treatment in 2021; ART is available to all patients however in practice there are unique challenges for Albania to increase treatment coverage given high levels of emigration, including among diagnosed people living with HIV who have left the country. Programs for key populations were deprioritized in the theoretical optimization not because they are not effective or important, but because of the high impact and cost-effectiveness of ART at preventing mortality and new infections among all populations through treatment-as-prevention.

It has been estimated that effective procurement of ART may have reduced ART unit costs since 2018. This would enable not only increased coverage of ART at a lower cost, but reinvestment of savings into other HIV programs to achieve the impact of higher budget level optimizations without an increase in total spending.

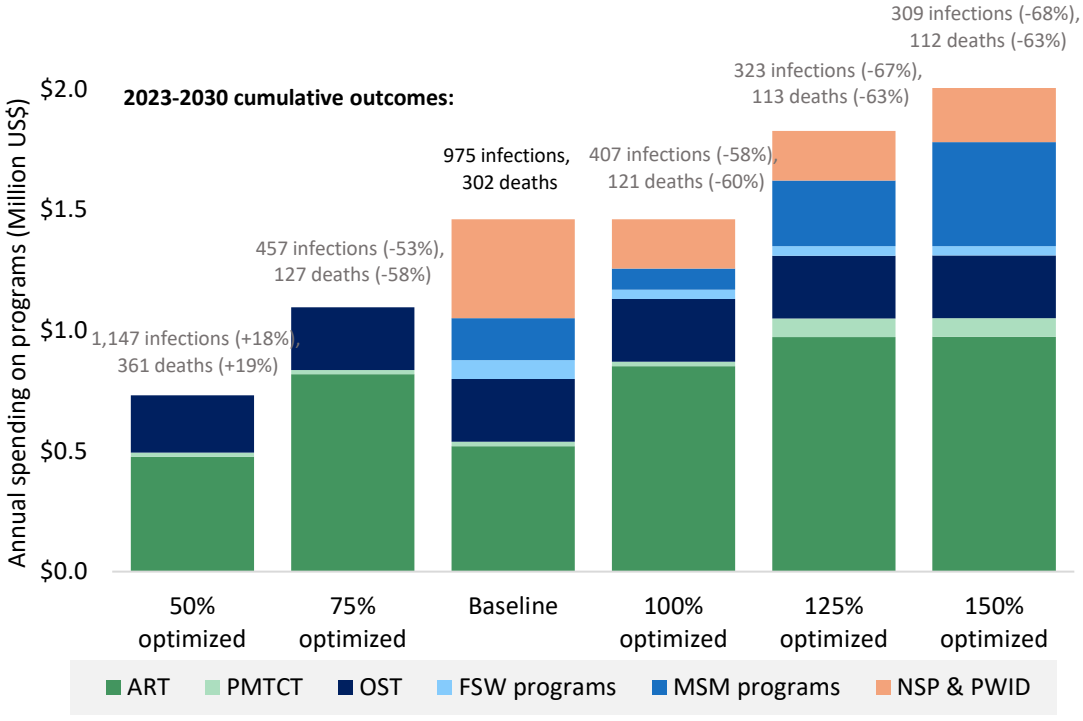

Figure 2. Optimized allocations under varying levels of annual HIV budgets for 2023 to 2030, to minimize new infections and HIV-related deaths by 2030. Percentage optimized refers to the percentage of baseline HIV spending (i.e. 2021 spending). ART, antiretroviral therapy; PMTCT, prevention of mother to child transmission; FSW, female sex worker; MSM, men who have sex with men; NSP & PWID, programs for people who inject drugs, including needle-syringe programs; OST, opioid substitution therapy.

Optimized resource allocation at different budget levels. As the total budget envelope increased, the priorities were identified as continued scale up of ART, followed by programs for PWID and MSM.

If funding were reduced, priorities were identified as maintaining as many people on treatment as possible.

Impact of optimization on HIV epidemic. Compared with the baseline scenario, optimized reallocation of 2021 spending could avert 568 new infections (58%), 182 deaths (60%) and 4,233 DALYs (56%) over 2023-2030. This benefit increases to 68% infections, 63% deaths and 59% DALYs averted with an optimized 150% budget (Figure 3; Table 1). Beyond 150% budget the modeled programs had all reached close to their saturation levels, and increased investment had diminishing returns. At this level of spending different approaches may be needed to reach those not accessible by current services.

Increased impact was possible in the model even with 75% optimized spending compared to the baseline (Figure 3), since the reallocation of (reduced) funds was still able to increase ART spending by 39%. This highlights the importance of increasing treatment coverage though whatever mechanisms are available.

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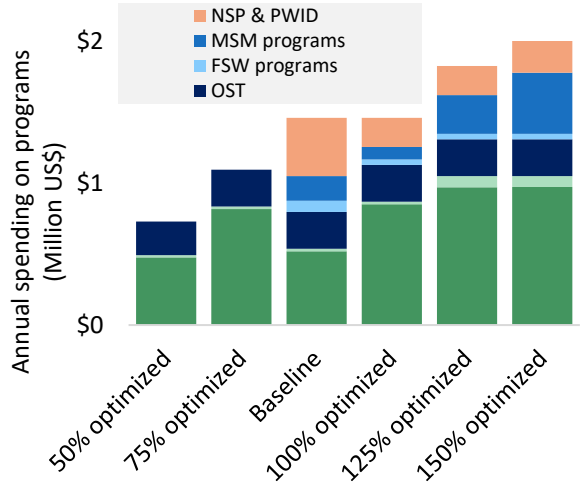
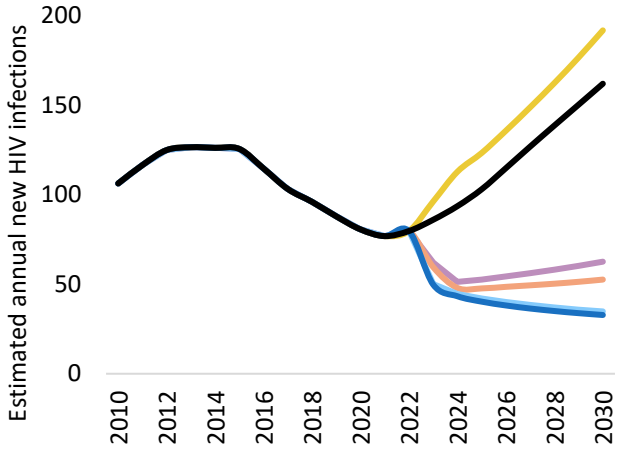
Allocation of HIV resources towards maximizing the impact of funding

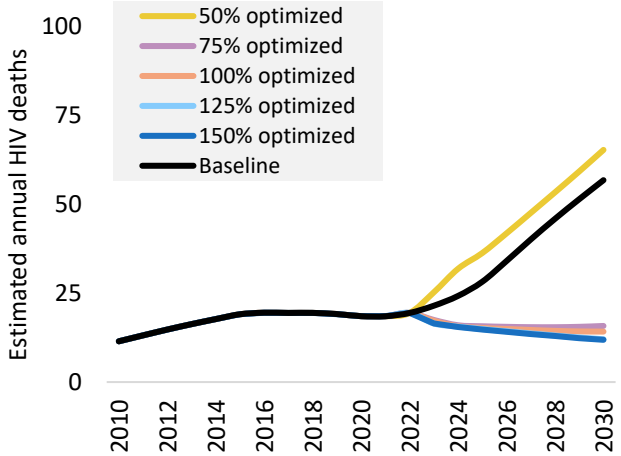
(a) Albania: budget optimizations



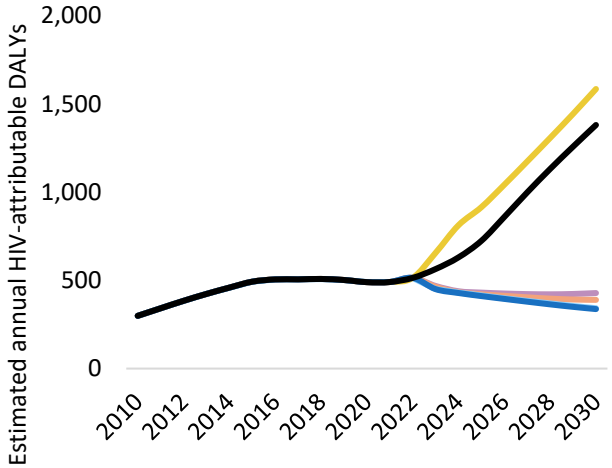
(b) Albania: annual new HIV infections in budget optimizations



(c) Albania: annual HIV deaths in budget optimizations



(d) Albania: annual HIV-attributable DALYs in budget optimizations



(e) Albania: projected care cascade in 2030

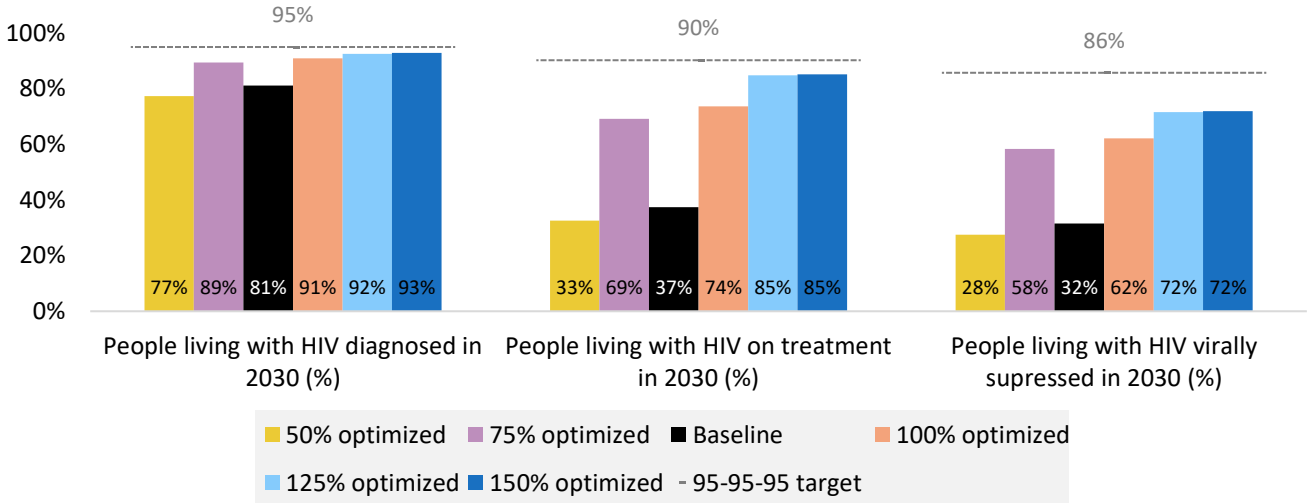


Figure 3. Model outcomes from budget optimization scenarios aiming to minimize infections and deaths. Panels show (a) optimal budget allocations under varying levels of annual HIV budgets according to percentage of estimated 2021 spending; (b) estimated annual new HIV infections; (c) HIV-related deaths; (d) HIV-related disability-adjusted life years (DALYs); and (e) projected care cascade for the year 2030 among all people living with HIV. ART, antiretroviral therapy; PMTCT, prevention of mother to child transmission; FSW, female sex worker; MSM, men who have sex with men; NSP & PWID, programs for people who inject drugs, including needle-syringe programs; OST, opioid substitution therapy.

4.2 Objective 2

*If national governments do not scale up HIV programs identified for prioritization under optimized allocation for different funding envelopes, what will the impact be on the epidemic by 2030? That is, what is the **opportunity lost to avert HIV infections, deaths** and DALYs?*

Zero HIV spending. The continued investment in HIV programs is essential to avoid epidemic rebound. In a scenario with no HIV spending from 2023, the model estimates that there would be 1,306 (+134%) more new infections, 465 (+154%) more deaths and 10,649 (+141%) more DALYs over 2023-2030 compared to the baseline scenario of fixed annual spending on programs (Table 1).

Table 1. Cumulative new HIV infection, HIV-related deaths, HIV-related DALYs between 2023-2030 under different scenarios, and differences in impacts compared to the baseline scenario of fixed 2021 spending on programs.

	Cumulative new HIV infections 2023-2030	*Cumulative HIV deaths 2023-2030*	*Cumulative HIV DALYs 2023-2030*	*Difference in infections from baseline*	*Difference in deaths from baseline*	*Difference in DALYs from baseline*
No HIV spending from 2023	2,280	767	18,191	134%	154%	141%
50% optimized	1,147	361	8,930	18%	19%	18%
75% optimized	457	127	3,454	-53%	-58%	-54%
Baseline	975	302	7,543			
100% optimized	407	121	3,310	-58%	-60%	-56%
125% optimized	323	113	3,142	-67%	-63%	-58%
150% optimized	309	112	3,113	-68%	-63%	-59%
95-95-95	239	89	2,631	-75%	-70%	-65%

Percentage optimized refers to percentage of baseline spending.

4.3 Objective 3

*What is the **most efficient HIV resource allocation for best achieving 95-95-95 targets** by 2030, and what is the level of resources required for achieving these targets? What is the number of HIV infections prevented and deaths averted under this scenario?*

Based on both baseline and 100% optimized spending, Albania's care cascade is not projected to reach 95-95-95 targets by 2030 (equivalent to 95-90-86 of all people living with HIV) (Figure 3e).

To reach the 95% diagnosis target, a minimum of an additional US$920,000 per annum, or a total 163% of 2021 targeted spending, was required over 2023-2030. Additional programs that are focused on prevention and testing services to people at high past or present risk (e.g. former sex workers or people with a history of injecting drug use) may make it possible to reach the 95% diagnosis target more cost-efficiently.

No programs were modeled to improve linkage and retention in treatment, adherence, and viral suppression, and thus the cost of reaching the second and third cascade pillars is unknown. In addition to ART spending, novel programs may be necessary in Albania to improve linkage to care, treatment adherence and retention to achieve 95% treatment coverage and 95% viral suppression.

Achieving the 95-95-95 targets could avert 736 new infections (75%), 213 deaths (70%) and 4,912 DALYs (65%) compared to the baseline scenario of fixed 2021 spending on programs and no improvements to linkage to care or treatment adherence (Figure 4).

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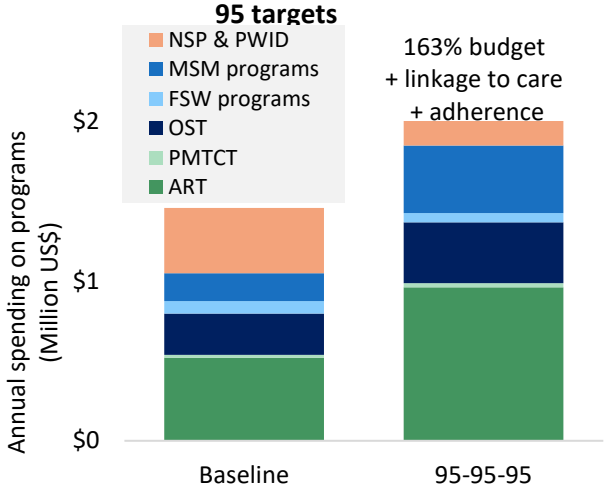
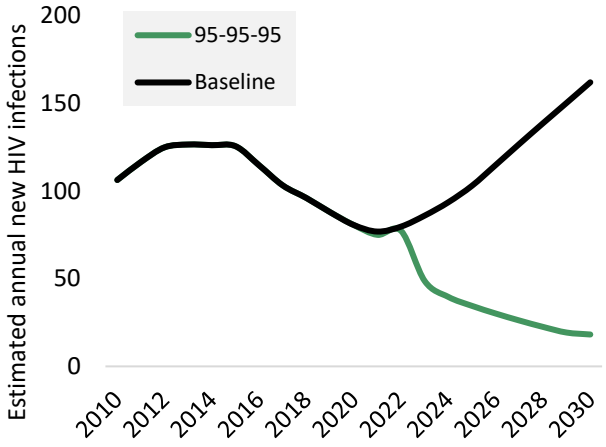
Allocation of HIV resources towards maximizing the impact of funding

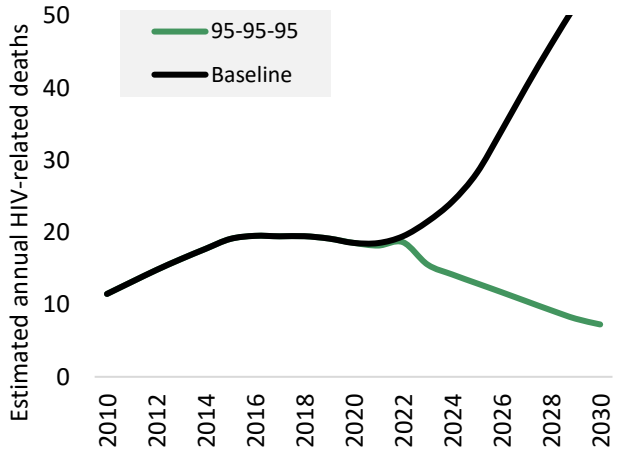
(a) Albania: optimized budget to reach 95-95-95 targets



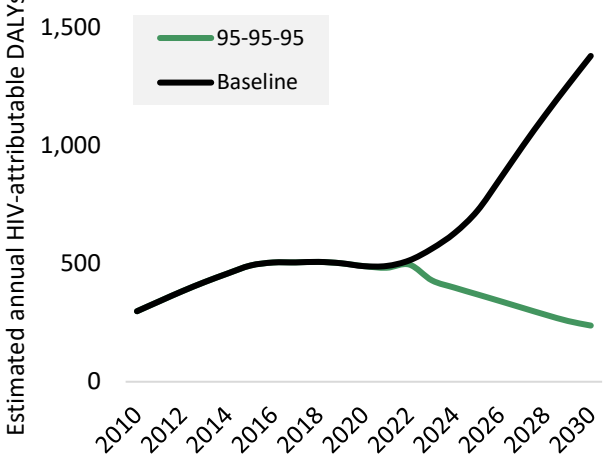
(b) Albania: annual new HIV infections in 95-95-95 scenario



(c) Albania: annual HIV deaths in 95-95-95 scenario



(d) Albania: annual HIV-attributable DALYs in 95-95-95 scenario



(e) Albania: projected care cascade

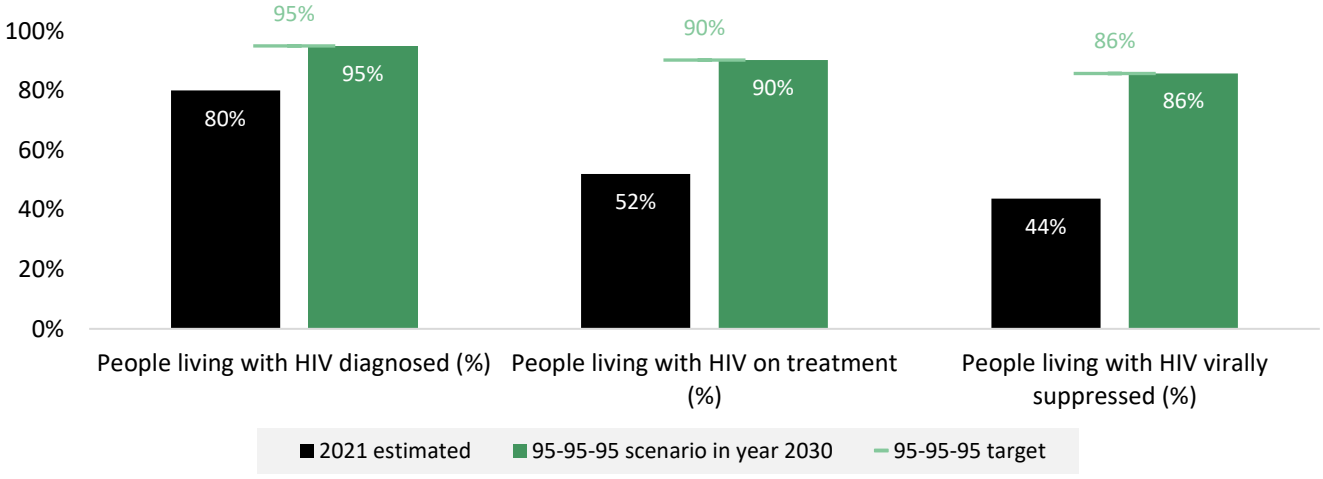


Figure 4. Optimized HIV budget level and allocation to achieve 95-95-95 targets by 2030. Panels show (a) optimal budget allocations; (b) estimated annual new HIV infections; (c) HIV-related deaths; (d) HIV-related disability-adjusted life years; and (e) estimated care cascade in baseline year 2021 and projected for the year 2030 as a proportion of all people living with HIV. ART, antiretroviral therapy; PMTCT, prevention of mother to child transmission; FSW, female sex worker; MSM, men who have sex with men; NSP & PWID, programs for people who inject drugs, including needle-syringe programs; OST, opioid substitution therapy.

5 Study limitations

As with any modeling study, there are limitations that should be considered when interpreting results and recommendations from this analysis.

- **Population sizes:** There is uncertainty in population size estimates; for key populations stigma may lead to underestimation of population size which may influence estimates of people living with HIV and subsequently, service and funding needs for each key population.
- **Epidemiological indicators** come from population surveys or programmatic data that have varying degrees and types of biases. Uncertainty in these indicators combined with uncertainty in population sizes can lead to uncertainty in model calibration and projected baseline outcomes and subsequently, service and funding needs for each key population.
- **Effect (i.e. impact) sizes for interventions** are taken from global literature (e.g. the effectiveness of condom use for preventing infections). Actual program effects may vary depending on context or quality of implementation.
- **Geographical heterogeneity** is not modeled, and outcomes represent national averages. There may be opportunities for additional efficiency gains through appropriate geographical targeting.
- **Cost functions for each program** are a key driver of model optimizations. Cost functions determine how program coverage will change if funding is reallocated, as well as maximum achievable program coverage. There is uncertainty in the shapes of these cost functions, values which could influence how easily or how high programs could be scaled up.
- **Retention in care.** This analysis did not consider programs that could improve linkage and retention in care for people diagnosed, or viral suppression for people on treatment. These programs will be essential to achieving the 95-95-95 targets and future analyses should focus on quantifying the spending and impacts of relevant programs.
- **Currency.** The COVID-19 pandemic and global economic crises have led to instability in currencies over the past few years. Spending is reported in US$, but what this value represents in local currency may change over time in unknown ways.
- **Other efficiency gains** such as improving technical or implementation efficiency were not considered in this analysis.
- **Equity** in program coverage or HIV outcomes was not captured in the model but should be a key consideration in program implementation. Policy makers and funders are

encouraged to consider resources required to improve equity, such as through investment in social enablers to remove human rights-based barriers to health, and technical or implementation efficiency gains. In addition, prevention programs may have benefits outside of HIV, such as for sexually transmitted infections, hepatitis C, and community empowerment. These were not considered in the optimization but should be factored into programmatic and budgeting decisions.

6 Conclusions

This modeling analysis evaluated the allocative efficiency of direct HIV programs in Albania, finding that an optimized resource allocation can have an impact on reducing infections and deaths. Albania has maintained a low level of HIV prevalence over the last decade, and this, in part, can be attributed to past investment in the HIV response. There are opportunities to improve the cost effectiveness in how resources are allocated through optimally investing in treatment programs, with secondary priorities being to maintain or increase programs for key populations. New or scaled-up programs focusing on supporting linkage to care, adherence and retention in treatment are needed to reach care cascade targets by 2030, and the cost of these programs will require future exploration.

Acknowledgements

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Country team: Roland Bani and Marjeta Dervishi, Albania National AIDS Program, Institute of Public Health

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Global Fund: Corina Maxim, Shufang Zhang

Swiss Tropical and Public Health Institute: Andrew Shattock, Sherrie Kelly

University College London: Tom Palmer

UNAIDS: Eleanora Hvazdziova

7 Appendices

Appendix 1. Model parameters

Table A1. Model parameters: transmissibility, disease progression and disutility weights.

Interaction-related transmissibility (% per act)		
	Insertive penile-vaginal intercourse	0.04%
	Receptive penile-vaginal intercourse	0.08%
	Insertive penile-anal intercourse	0.11%
	Receptive penile-anal intercourse	1.38%
	Intravenous injection	0.80%
	Mother-to-child (breastfeeding)	36.70%
	Mother-to-child (non-breastfeeding)	20.50%
Relative disease-related transmissibility		
	Acute infection	5.60
	CD4 (>500)	1.00
	CD4 (500) to CD4 (350-500)	1.00
	CD4 (200-350)	1.00
	CD4 (50-200)	3.49
	CD4 (<50)	7.17
Disease progression (average years to move)		
	Acute to CD4 (>500)	0.24
	CD4 (500) to CD4 (350-500)	0.95
	CD4 (350-500) to CD4 (200-350)	3.00
	CD4 (200-350) to CD4 (50-200)	3.74
	CD4 (50-200) to CD4 (<50)	1.50
Changes in transmissibility (%)		
	Condom use	95%
	Circumcision	58%
	Diagnosis behavior change	0%
	STI cofactor increase	265%
	Opioid substitution therapy	54%
	PMTCT	90%
	ARV-based pre-exposure prophylaxis	95%
	ARV-based post-exposure prophylaxis	73%
	ART not achieving viral suppression	50%
	ART achieving viral suppression	100%
Disutility weights		
	Untreated HIV, acute	0.08
	Untreated HIV, CD4 (>500)	0.01
	Untreated HIV, CD4 (350-500)	0.02
	Untreated HIV, CD4 (200-350)	0.07
	Untreated HIV, CD4 (50-200)	0.27
	Untreated HIV, CD4 (<50)	0.55
	Treated HIV	0.05

Source: Optima HIV User Guide Volume VI Parameter Data Sources

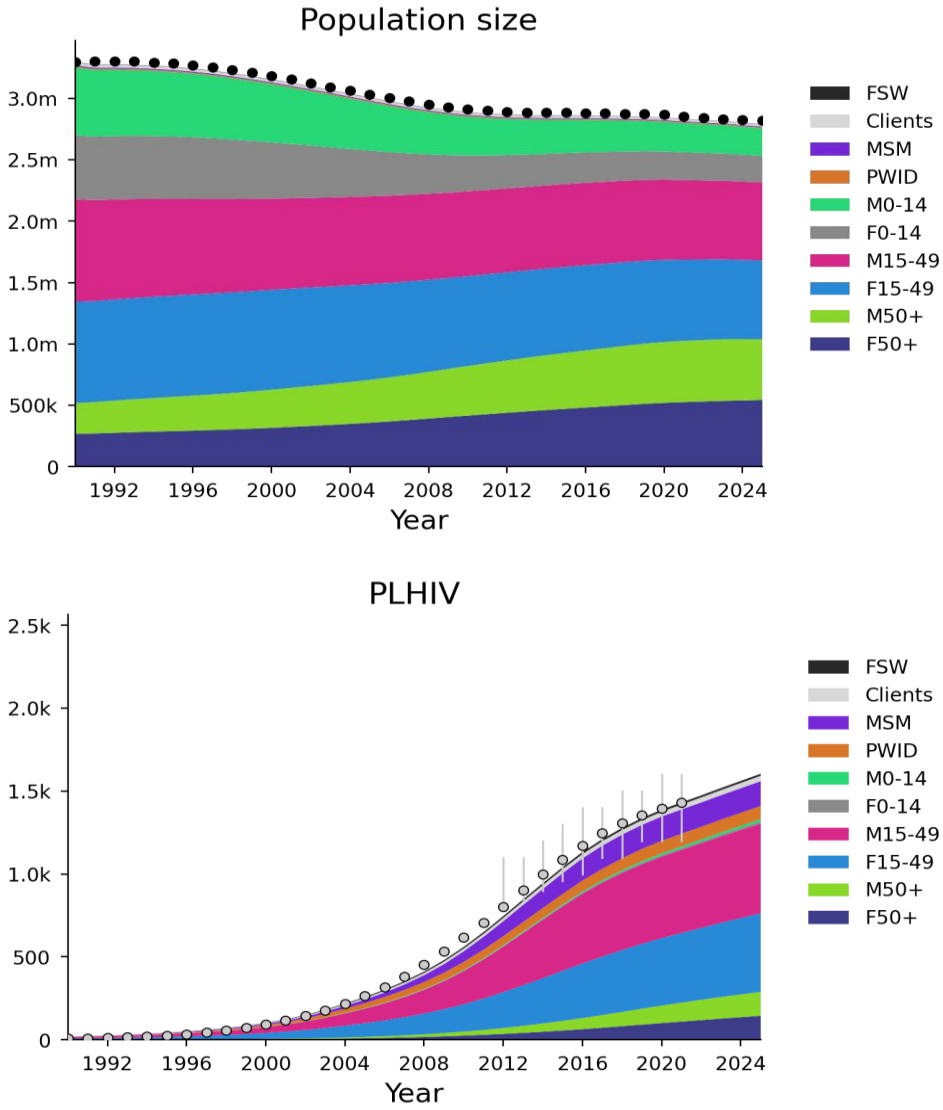
Table A2. Model parameters: treatment recovery and CD4 changes due to ART, and death rates

Treatment recovery due to suppressive ART (average years to move)		
	CD4 (350-500) to CD4 (>500)	2.20
	CD4 (200-350) to CD4 (350-500)	1.42
	CD4 (50-200) to CD4 (200-350)	2.14
	CD4 (<50) to CD4 (50-200)	0.66
	Time after initiating ART to achieve viral suppression (years)	0.20
CD4 change due to non-suppressive ART (%/year)		
	CD4 (500) to CD4 (350-500)	3%
	CD4 (350-500) to CD4 (>500)	15%
	CD4 (350-500) to CD4 (200-350)	10%
	CD4 (200-350) to CD4 (350-500)	5%
	CD4 (200-350) to CD4 (50-200)	16%
	CD4 (50-200) to CD4 (200-350)	12%
	CD4 (50-200) to CD4 (<50)	9%
	CD4 (<50) to CD4 (50-200)	11%
Death rate (% HIV-related mortality per year)		
	Acute infection	0%
	CD4 (>500)	0%
	CD4 (350-500)	1%
	CD4 (200-350)	1%
	CD4 (50-200)	6%
	CD4 (<50)	32%
	Relative death rate on ART achieving viral suppression	23%
	Relative death rate on ART not achieving viral suppression	49%
	Tuberculosis cofactor	217%

Source: Optima HIV User Guide Volume VI Parameter Data Sources

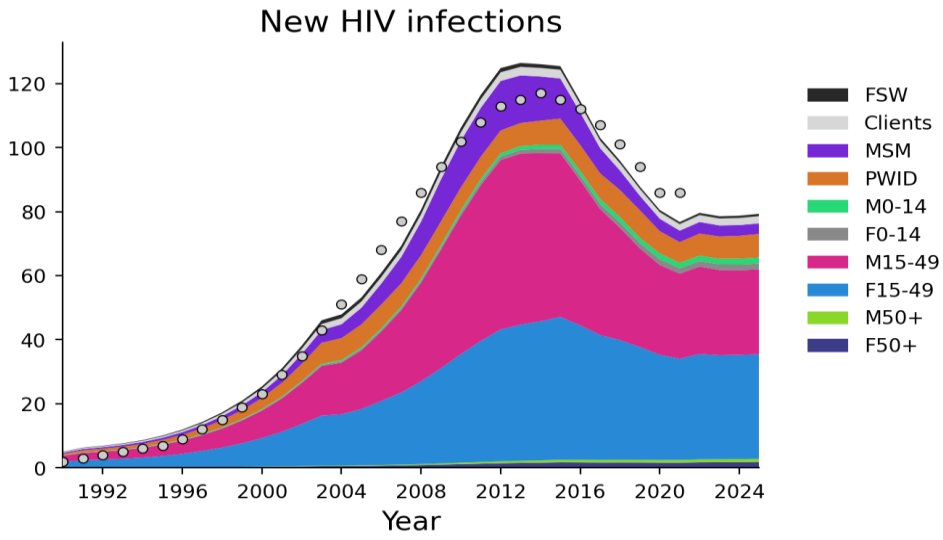
Appendix 2. Model calibration

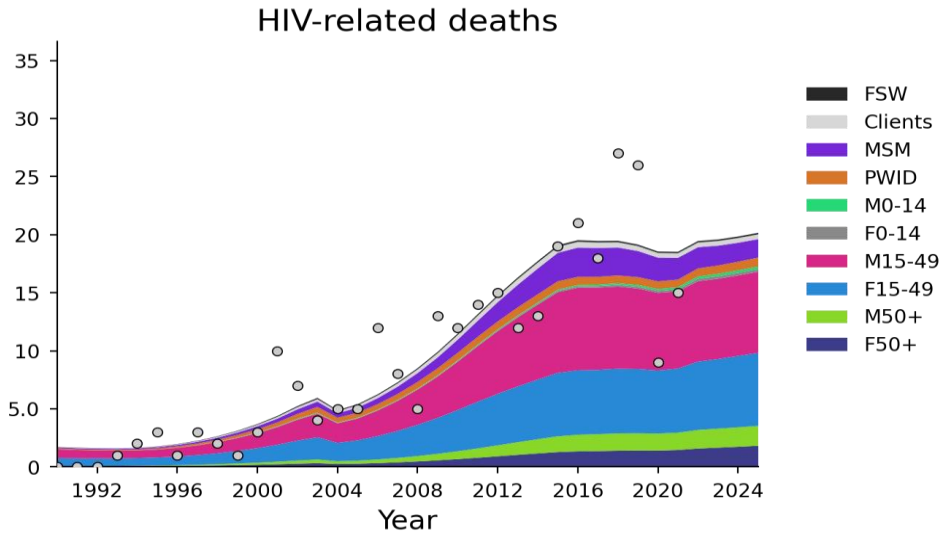
Figure A1. Calibration outputs. Dots represent official country estimates based on World Population Prospects, Spectrum model, surveillance surveys, program data and UNAIDS.

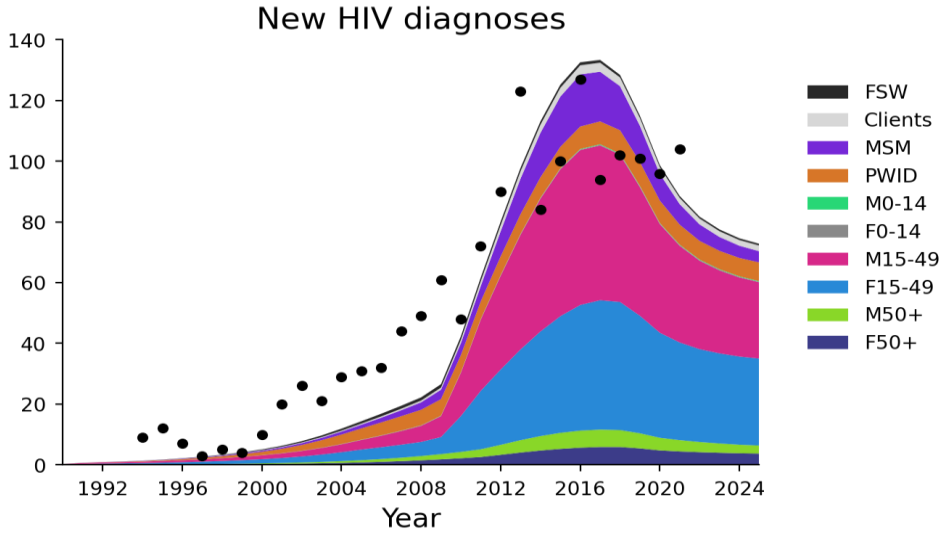


ALBANIA

Allocation of HIV resources towards maximizing the impact of funding







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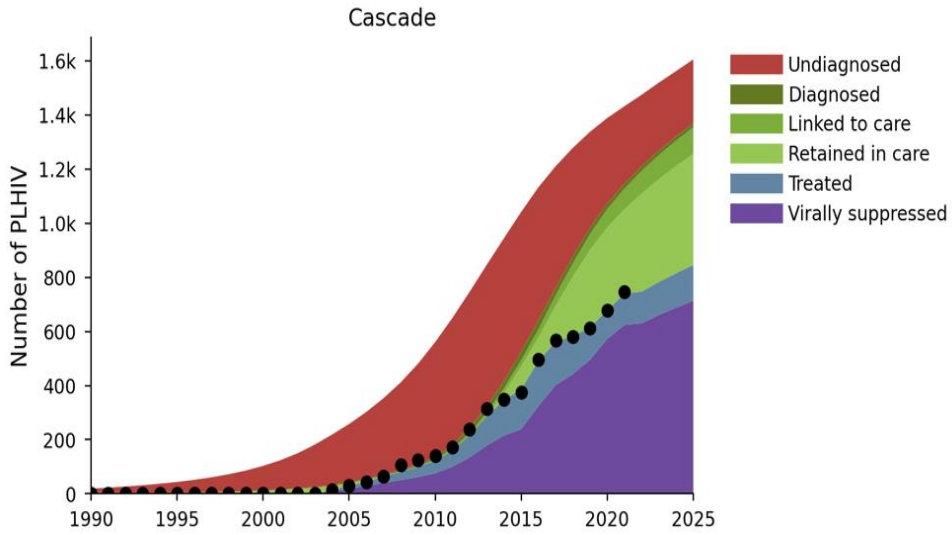
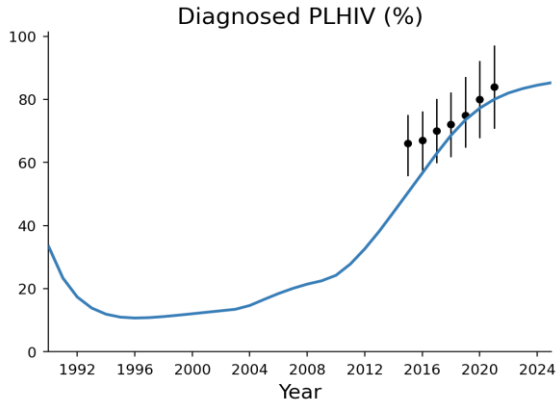
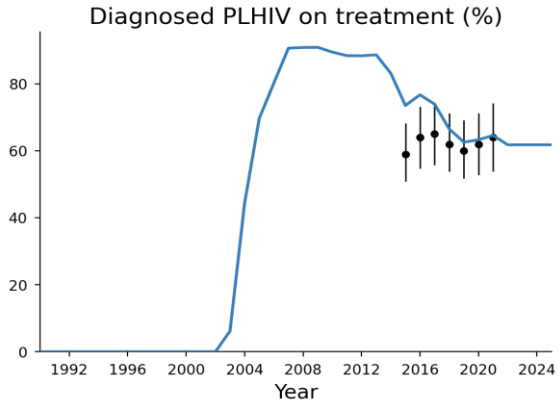
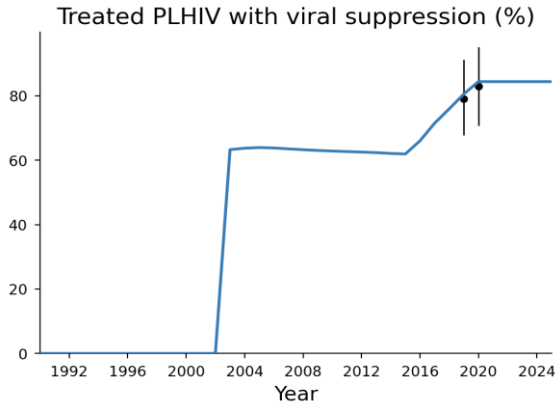
Allocation of HIV resources towards maximizing the impact of funding









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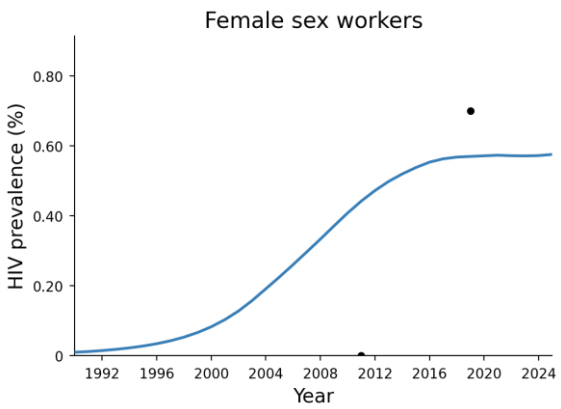
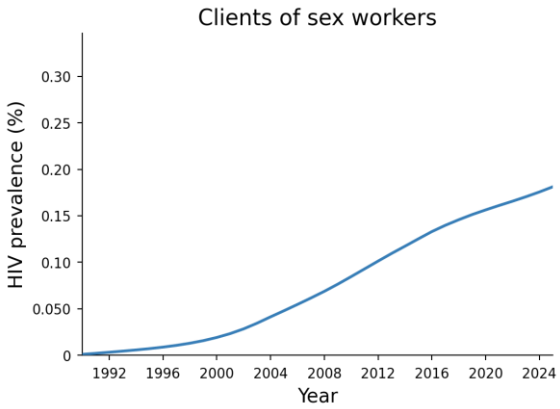
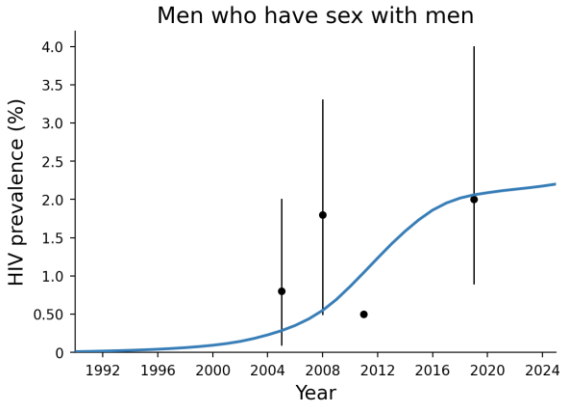
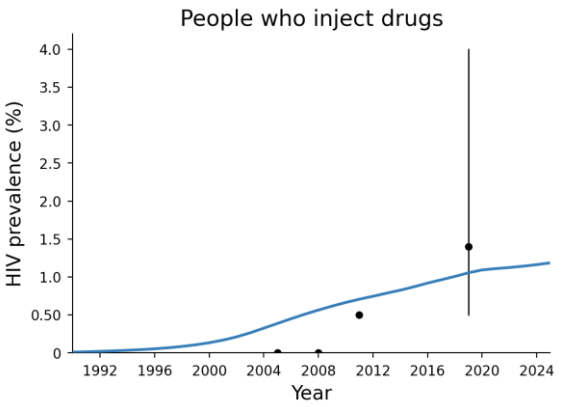
Allocation of HIV resources towards maximizing the impact of funding



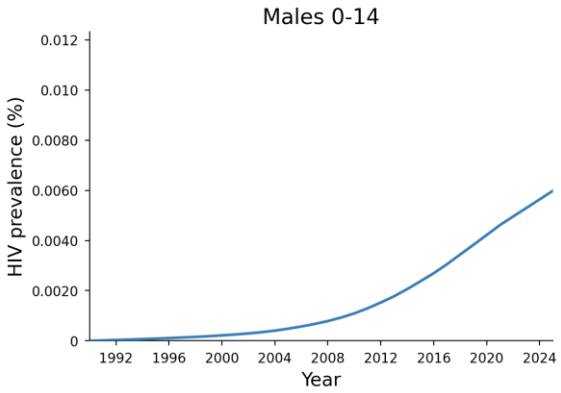


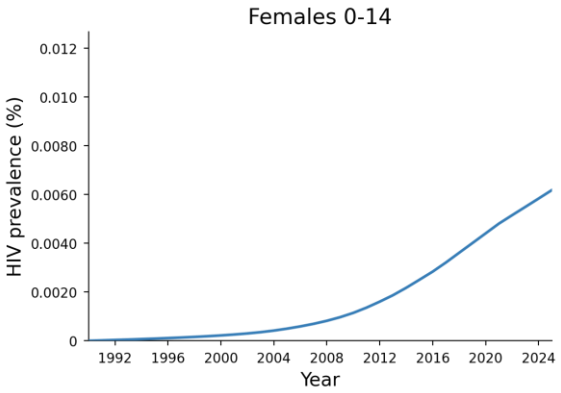


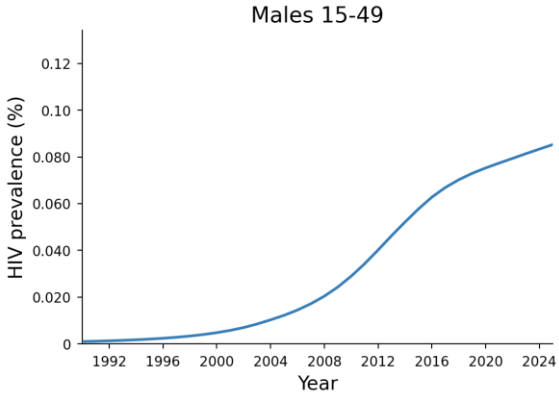


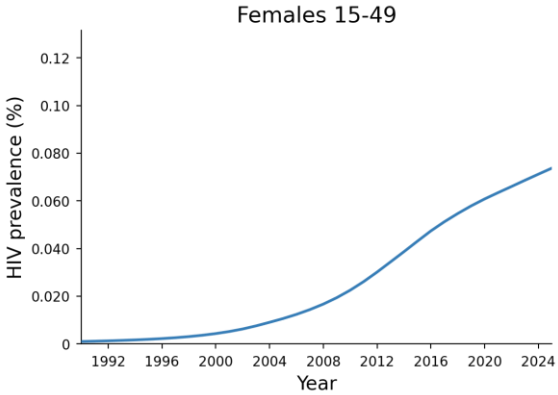
ALBANIA

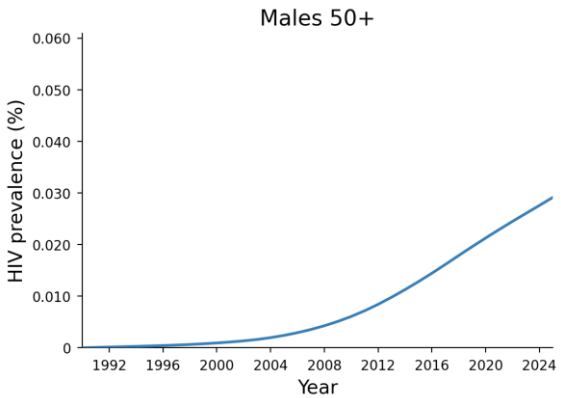
Allocation of HIV resources towards maximizing the impact of funding

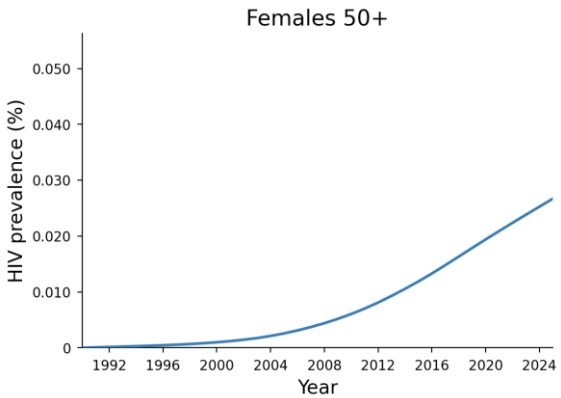












Appendix 3. HIV program costing and impacts

Table A3. HIV program unit costs and saturation values.

HIV program	Unit cost (USD)	Saturation (low)	Saturation (high)
Antiretroviral therapy	$696.30	95%	100%
Prevention of mother-to-child transmission	$4,500.00	95%	100%
HIV testing and prevention programs for FSW	$234.91	55%	70%
HIV testing and prevention programs for MSM	$117.50	55%	70%
PWID and NSP program	$221.31	55%	70%
Opioid substitution therapy	$256.37	15%	30%

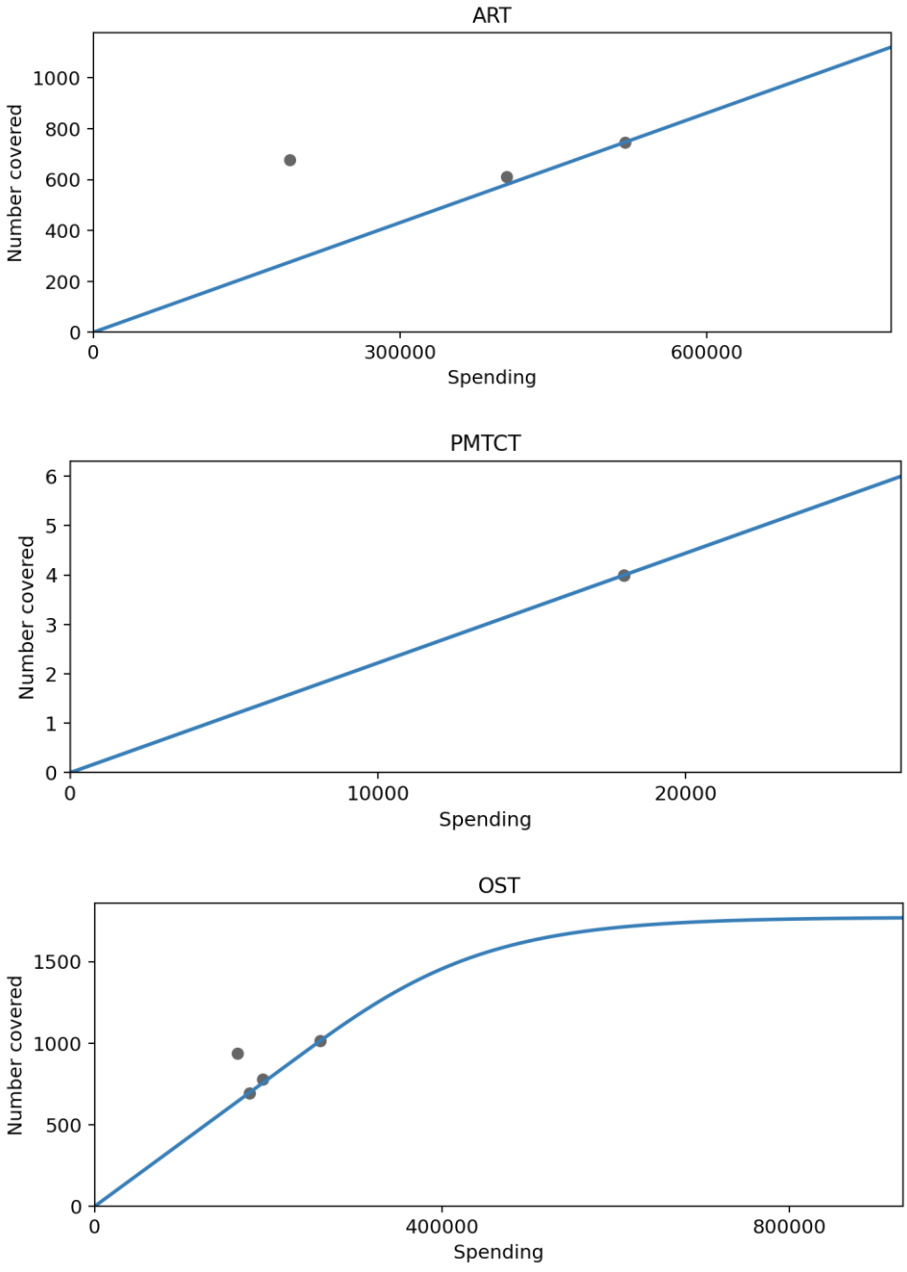
ART, antiretroviral therapy; PMTCT, prevention of mother to child transmission; FSW, female sex worker; MSM, men who have sex with men; NSP & PWID, programs for people who inject drugs, including needle-syringe programs; OST, opioid substitution therapy.
* High saturation value represents the maximum achievable coverage considering social and structural constraints on program access and uptake.

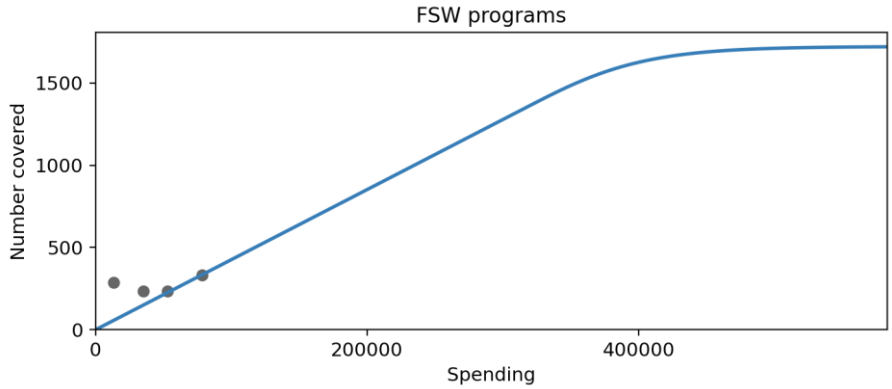
Table A4. Data inputs of impact of programs.

HIV program	Parameter	Population interactions or population	In absence of any programs		For each individual reached by this program	
			Low	High	Low	High
NSP & PWID	Probability of needle sharing (per injection)	PWID	22%	22%	13%	13%
FSW programs	HIV testing rate (average tests per year)	FSW	0.24	0.25	0.70	0.70
MSM programs	HIV testing rate (average tests per year)	MSM	0.15	0.15	1.48	1.48
NSP & PWID	HIV testing rate (average tests per year)	PWID	0.25	0.25	1.36	1.36
MSM programs	Condom use for casual acts	MSM, MSM	65%	65%	97%	99%
MSM programs	Condom use for casual acts	MSM, M15-49	61%	61%	84%	85%
MSM programs	Condom use for casual acts	MSM, F15-49	61%	61%	84%	85%
NSP & PWID	Condom use for casual acts	PWID, PWID	65%	65%	79%	79%
NSP & PWID	Condom use for casual acts	PWID, F15-49	60%	60%	76%	76%
NSP & PWID	Condom use for casual acts	PWID, F50+	60%	60%	76%	76%
FSW programs	Condom use for commercial acts	Clients, FSW	75%	75%	82%	82%
OST	Number of PWID on OST	Total	0	0	-	-
ART	Number of people on treatment	Total	0	0	-	-
PMTCT	Number of people on PMTCT	Total	0	0	-	-

ART, antiretroviral therapy; FSW, female sex worker; MSM, men who have sex with men; NSP & PWID, programs for people who inject drugs, including needle-syringe programs; OST, opioid substitution therapy; PWID, people who inject drugs; PMTCT, prevention of mother to child transmission.
- The number of people modeled as receiving ART, PMTCT and OST is equal to the coverage of the respective programs.

Figure A2. Cost functions. Figures show relationship between total spending and number covered among target populations of each program.




FSW programs
Number covered
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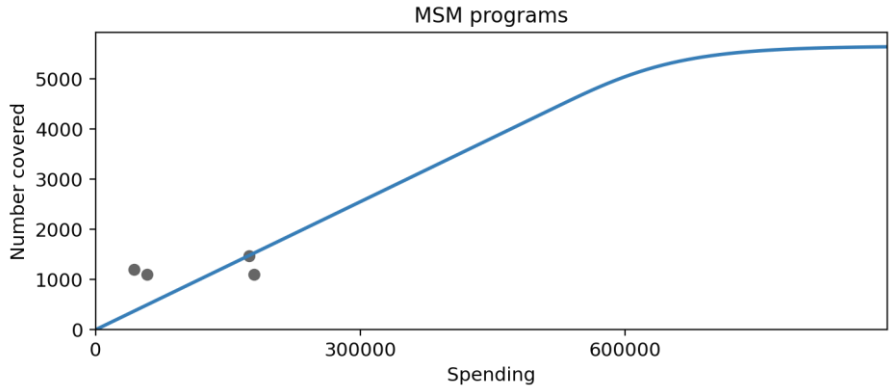
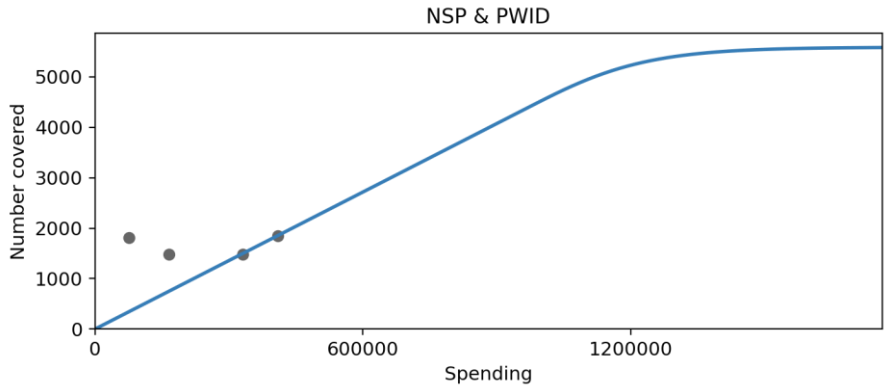
1000
500
0
0
200000
400000
Spending


MSM programs
Number covered
5000
4000
3000
2000
1000
0
0
300000
600000
Spending


NSP & PWID
Number covered
5000
4000
3000
2000
1000
0
0
600000
1200000
Spending

Appendix 4. Annual HIV budget allocations at varying budgets

Table A5. Annual HIV budget (US$) allocations among targeted HIV programs at varying budgets for 2023 to 2030.

	100% latest reported (2021)	50% optimized	75% optimized	100% optimized	125% optimized	150% optimized
Antiretroviral therapy (ART)	520,140	475,895	817,261	851,194	971,957	963,074
Prevention of mother-to-child transmission (PMTCT)	18,000	16,469	18,000	18,000	77,044	77,222
Opioid substitution therapy	259,701	237,610	259,701	259,701	259,701	259,701
Programs[1] for FSW	78,461	-	-	39,231	39,231	39,231
Programs[1] for MSM	173,777	-	-	86,889	272,069	430,781
NSP & PWID programs[1]	409,870	-	-	204,935	204,935	259,701
Total targeted HIV program budget	1,459,949	729,975	1,094,962	1,459,949	1,824,936	2,189,924

FSW, female sex worker; MSM, men who have sex with men; NSP & PWID, programs for people who inject drugs, including needle-syringe programs.

[1] Includes HIV testing and prevention services

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