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COST-BENEFIT ANALYSIS OF MEDICATION ASSISTED TREATMENT & NEEDLE-SYRINGE PROGRAMS IN GEORGIA

FINAL REPORT

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Prepared by:

Irma Kirtadze	MD, Principal Investigator, Addiction Research Center "Alternative Georgia"
David Otiashvili	MD, PhD, Addiction Research Center "Alternative Georgia"
Mzia Tabatadze	MD, MPH, Addiction Research Center "Alternative Georgia"

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ACRONYMS

AIDS	Acquired Immunodeficiency Syndrome
ART	Antiretroviral Treatment
BBSS	Bio-Behavioral Surveillance Survey
CBA	Cost-Benefit Analyses
CEA	Cost-Effectiveness Analyses
EHRN	Eurasian Harm Reduction Network
GEL	Georgian Lari
GFATM	Global Fund Fight AIDS, Tuberculosis and Malaria
GHRN	Georgian Harm Reduction Network
HBV	Hepatitis B Virus
HCT	HIV Counseling and Testing
HCV	Hepatitis C Virus
HIV	Human Immunodeficiency Virus
HR	Harm Reduction
MAT	Medication-Assisted Treatment
MOLHSA	Ministry of Labor, Health, and Social Affairs
NCDC	National Center for Disease Control and Public Health of Georgia
NSP	Needle and Syringe Program
OST	Opioid Substitution Treatment
PWID	People who inject drugs
PLWHA	People Living with HIV/AIDS
QALY	Quality-Adjusted Life Years
UNAIDS	United Nations Program on HIV/AIDS
USAID	The United States Agency for International Development
VCT	Voluntary Counseling and Testing
WHO	World Health Organization

BACKGROUND

Introduction

With the population of 3.7 million Georgia is situated in South Caucasus region. The HIV prevalence is low in general population (0.1%), however the estimated number of people living with HIV/AIDS (PLWHA) is around 7,000 [1]. The HIV/AIDS is largely concentrated among key affected populations. In addition, prevalence of hepatitis C virus (HCV) is relatively high in the general population (6.7%) [2] and picks to 50-70% among PWID [3]. Relatively high prevalence of problem (injection) drug use (49,700; 2.00%-2.04% among 18-64 year old population) [4] makes people who inject drugs (PWID) a critical target group for any efforts to control the epidemic in the country. Both the state and the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) provide funding for HIV prevention and treatment in the country. In 2014 total budget for NSP and MAT coming from the national budget was around 3.7 million GEL and GFATM provided around 5.2 million GEL for these programs [5]. Antiretroviral treatment of HIV/AIDS is universally accessible for all individuals in need. However, the late identification and diagnostics has been acknowledged as a major shortcoming. Coverage of HIV prevention programs among key affected groups has been increasing, but has remained below internationally recommended rates [5]. Since 2015 free of charge HCV treatment has been available for virtually any individual in need. This has been possible through the National HCV Elimination Program and support from the Gilead Sciences, Inc., a major manufacturer of anti-HCV medications.

The spread of HIV/HCV infections among PWID is a major public health concern globally, and in Georgia. Studies conducted throughout the developed and developing world have found that HIV/AIDS and hepatitis C virus (HCV) are some of the leading causes of death among PWID who share needles and engage in other unsafe practices [6]. Although declining, high risk injection behavior, especially while abroad, make Georgian PWIDs vulnerable to HIV/AIDS [3]. On the other hand, high-risk sexual behavior increases the bridging role of the PWID population and the possibility of HIV transmission to their sex partners.

It has been widely acknowledged that an “AIDS free generation” will not be possible without the scale up of HIV prevention, treatment and care for PWID [7]. Medication-Assisted Treatment (MAT), Needle and Syringe Programs (NSP), Antiretroviral Treatment (ART) and HIV Counseling and Testing (HCT) are key harm reduction interventions for PWID. The effect of these cost-effective interventions on HIV incidence results primarily from a reduction in risky behaviors [8, 9]. Despite this recognition, these interventions are not adequately scaled up in Georgia [5]. In addition, the Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM), a major international source of funding for HIV programs, has revised its funding priorities and has been withdrawing from Eastern Europe and Central Asia, including Georgia. Thus

permanent and continuous funding is crucial to ensure the sustainability of these programs, especially given the inevitable transition from international to national funding.

Needle and Syringe Programs in Georgia

Starting from 2003 the GFATM supported needle and syringe programs in Georgia and has contributed to their remarkable expansion in the country. Georgian Harm Reduction Network (GHRN) implements NSP through 14 harm reduction centers in different regions of Georgia, providing sterile needles and syringes, condoms, informational materials and educational interventions, case management, medical consultations and Naloxone ampules for overdose prevention [5]. Additionally, harm reduction services routinely involve peer driven interventions and voluntary counseling and testing on HIV, HCV, HBV and Syphilis for PWIDs and their partners. In 2014, the NSP served a total 20,544 PWIDs. GFATM remains the only funding source for these programs in the country. In 2013 a total expenditure on NSP was about 1,343,774 GEL, with expenses per client being 255 GEL [20]. In the National HIV/AIDS Strategic Plan 2016-2018 the government commits to taking over the cost of projects currently funded by GFATM. However, projected domestic contributions cover all programs except needle and syringe programs [10]. NSPs have been shown to be a safe and effective mean to reduce HIV transmission among PWIDs in Georgia [11], but so far have not been endorsed adequately in national legal and regulatory documents. It has been documented that strict drug policy and criminalization of drug use have negatively affected the access to this effective service and have contributed to risk-taking behavior of PWID [12].

Medication-Assisted Treatment in Georgia

Medication-assisted treatment (often referred as opioid substitution treatment (OST)) was introduced in Georgia in 2005 with opioid agonist methadone. Initially this treatment was funded by the GFATM only. Since 2008 the state has been providing financial support for MAT that significantly expanded access to treatment throughout the country. The MAT state program is based on a co-payment system. The cost of medication is covered by the state and patients make an out-of-pocket payment of 110 GEL per month as a contribution to the cost of service provision. The state program is free of charge to some eligible patients, such as HIV positive people and those living under the poverty line. Total expenditure on MAT in 2013 was 5,934,531 GEL (1,711 GEL per patient) out of which 995,419 GEL (16%) was provided by GFATM [20].

At the end of 2015 there were 18 sites operating throughout the country. In 2014 a total of 3,968 patients (of them 45 women) received medication-assisted treatment, out

of whom about one quarter received it at GFATM funded sites [5]. MAT programs offer dispensing of medication (methadone and Suboxon®), consultation with an addiction physician (narcologist), and individual drug counseling (psychotherapy). In limited cases group or family therapies are provided with the financial support of GFATM. Random drug testing of patients to monitor treatment outcomes is performed routinely once a month.

Existing Assessments on MAT & NSP in Georgia

We identified several economic studies that were conducted in Georgia with the support of UNAIDS, GFATM and USAID. The results generated from the study conducted in 2011 with the support of USAID assessed the potential for expanding coverage of MAT to more patients within the existing infrastructure and gave useful information to understand the costs of offering MAT services in Georgia [13]. According to the study findings, the unit cost per patient gradually declines as the number of patients treated at the facility increases, which is an important implication for policy planning and development. These results supported the planners and policy makers to make relevant decisions regarding the expansion of programs and appropriate cost allocations; the co-payment by MAT patients was reduced by 26.6% (from 150 GEL/month to 110 GEL/month) and coverage of treatment was further scaled up.

Another study evaluated cost-effectiveness of NSP in Georgia using a standardized model and software package, first developed for evaluation of NSPs in Australia and adapted for general application to any setting in a joint collaboration between UNAIDS and the University of New South Wales [11]. Findings of the study suggested that needle/syringe programs were effective and brought significant benefits to Georgian society in terms of preventing new HIV and HCV cases, reducing mortality and comorbidity related to these infections, and ultimately saving health care costs that otherwise were to be spent to provide relevant health services to people infected. The report provided conservative estimations on the direct benefits of implementing needle and syringe exchange programs in Georgia as it assessed the effectiveness of NSPs in averting HIV and HCV infections among PWID only; the study did not look at other possible benefits resulting from the prevention of mental, physical and social consequences of injecting drug use, as well as the benefits related to the prevention of HIV and HCV transmission to sexual partners and children of people who use drugs.

The USAID-funded Georgian HIV Prevention Project (GHPP) estimated the financial resource requirements to implement preventive programs or services for key populations including PWID, female sex workers (FSWs), and men who have sex with men (MSM) in Georgia [14]. The costing tool was designed to assist main stakeholders to calculate costs of the different intervention packages for key populations. The study presented unit costs of preventive interventions aggregated by target key population,

service delivery strategy, location, and experience of implementing organization.

Another study utilized a dynamic compartmental model to simulate the probability of HIV and HCV transmission and thereafter the natural history of these diseases in PWIDs and not-PWIDs aged between 15 and 65 years old in Georgia [15]. Researchers estimated the impact of different strategies on HIV and HCV transmission over 5, 10, 15, and 20 years (2013-2032). The strategies differed according to the level of single and combined interventions (namely NSP and/or OST, and/or HIV/HCV treatment coverage) and outcomes included projected cumulative number of new HCV and HIV infections and infections averted among PWID and in the general population, HCV and HIV prevalence, total costs related to interventions and HCV and/or HIV care, life years saved, and the incremental cost-effectiveness ratios (ICER), measured in USD per life year saved ($/LYS) over 5, 10, 15, and 20 years. The study concluded that a drastic reduction in the HIV and HCV epidemics by the next 5, 10, 15 and 20 years would not be feasible without increases of all combined intervention coverage such as NSP, OST and access to ART.

The last and most recent study presented findings from two types of assessments – a financial analysis of NSP and MAT services costs and a community-led quality of services assessment [16]. The assessments were conducted in six EECA countries: Belarus, Georgia, Kazakhstan, Lithuania, Moldova, and Tajikistan. The financial assessment offered extensive information on the annual cost of serving an individual client with NSP and OST services in each country.

RATIONALE OF THE STUDY

Historically, cost-benefit analyses (CBA) have enabled policy and program managers to make informed decisions about resource allocation for substance use related treatment policies, programs, and practices. NSP and MAT cost-effectiveness and cost-benefit studies are important analytical tools to understand what HIV investments have yielded, to determine whether the interventions averted new infections and AIDS deaths, and at what cost. They can support decision-making and the prioritization of intervention strategies with its overall goals of minimizing the burden of HIV/AIDS and maximizing health outcomes of PWIDs, to estimate the magnitude of the costs to society from substance use and the costs and benefits gained through effective prevention. This is particularly important given the planned withdrawal of GFATM from the country – currently a single major non-state funding source of HIV prevention programs among PWID in Georgia.

The overarching goal is to provide a broader base from which to understand the costs of HIV prevention programs for PWIDs such as NSP and MAT and the potential cost savings as a result of their implementation. CBA measures benefits and costs in monetary terms, which allows benefits from health care programs to be compared not

only with each other but also with programs in other areas [17]. CBA will help governmental officials, policy and decision makers understand and recognize MAT and NSP as an important health intervention that needs support from the state budget. Similarly it is hoped that civil society will use the report for advocacy purposes.

RESEARCH DESIGN AND EVALUATION METHODOLOGY

Aims of evaluation

Main objective of CBA is to provide policy makers and planners with insights into several key questions:

- What are the cost-benefits of NSP and MAT services using 3 different scenarios?
- Determine the most cost-beneficial scenario (which scenario results in the best cost-benefit ratio?).
- What are the costs and benefits of scaling-up MAT/NSP services?

Methods

This is a retrospective study that utilizes both descriptive and analytical components, quantitative cost benefit analyses that involves 4 steps:

- Determine costs – identifying and describing costs;
- Calculate benefits – attributing benefits (analyzing the contribution of the intervention to achieving the observed outcomes);
- Compare alternatives - comparing costs and benefits (analyzing the relationships between costs and benefits);
- Report and plan action – report writing and recommendations.

Given the above purpose and objectives, the methodology for this study was developed to facilitate quantification and comparison, in monetary terms, of the costs of MAT and NSP intervention programmes and the savings associated with averting new HCV and HIV infections, and therefore avoiding direct costs of HIV and HCV treatment. Savings in *other* health care and social service costs (resulting from infections averted) were not included in the quantification of benefits. We compared a base case scenario and at least three other scenarios.

In this study we did *not* collect any costing data and the analysis relied entirely on existing research and reports. An initial scan of available research highlighted that the most relevant and timely research comprised the cost-effectiveness analysis carried out for Georgia in 2015 and published in a report “Results on Cost Effectiveness Analysis, Georgia” (referred to as the Cost Effectiveness Report or CER) [15] and the harm

Reduction Unit Cost Tool developed by the USAID funded Health Policy Project in April 2014 [16]. Significant reliance was placed on these studies generally, but specifically with respect to costing data for programme interventions and the number of HIV and HCV infections averted.

In our analysis we used the estimated costs of the health interventions described in the three scenarios below and compare these to the quantifiable benefits associated with each scenario, expressed as cost savings. The study did not re-calculate or assessed other criteria or indicators such as quality or disability adjusted life years (QALY, DALY), partly addressed in the Mabileau CER report [15]. Primarily this study examined the economic implications of funding and implementing certain health programmes and associated potential savings over the medium to long-term period using net present value calculations.

The study period is 20 years starting in 2013. The period was aligned to the period covered by the most reliable data sets in the CER. After 20 years, the present value of any costs or savings is also considerably diminished.

The following tasks were completed and assumptions made as part of our approach:

- Available research reports were used to collect quantified data on HIV and HCV infections averted as a result of harm reduction interventions (MAT & NSP), the cost of Anti-retroviral Therapy, treating patients with HCV and the cost of implementing preventative interventions defined in the selected scenarios;
- In this study the baseline was as defined by the CER Baseline strategy[1] which described the baseline as the levels of coverage in 2013 of OST, ART, HIV/HCV screening and anti-HCV treatment. These values are described below and in Annex 1. It is important to note that the baseline did not reflect zero coverage and assumed, that the level of coverage will be maintained over the 20-year time period. Infections averted and additional costs in this study were therefore measured as *incremental* to the baseline. The baseline scenario was described as follows in the CER report:
    - 5% of PWIDs were on OST;
    - 6.3% having a 100% access[*] to NSP;
    - 90% of HIV-infected PWIDs were diagnosed;
    - 88% of HIV positive PWIDs who met ART criteria were on ART;

[1] Described in table1 and table 2 in section 5.4 and as the base case strategy in table 3 of section 5.5 of the CER.

[*] According to CER "coverage by the NSP assumed that PWID had a full needle-syringe exchange (*i.e.* 100% of their injections)".

- 27% of HCV-infected PWIDs were diagnosed;
- 0.001% of HCV-infected PWIDs were on new anti-HCV treatment;

- In the CER, nine scenarios (referred to as strategies) were defined over and above the base case. We selected three most likely intervention scenarios. Guiding for this selection was the cost effectiveness analysis but other criteria were also used. These criteria included feasibility; availability of evidence based data and primary goal to evaluate the benefits of MAT and NSP. As a result the following three scenarios were selected for further analysis in this report:
  - **Strategy 2** - Increase of NSP: only NSP coverage is increased from the 2013 level to 40% of PWIDs reached at 100%;
  - **Strategy 3** - Increase of NSP and OST: strategy 2) + increase of OST coverage from the 2013 level to 20% of PWIDs;
  - **Strategy 6**- Increase of NSP, OST, ART: NSP coverage is increased from the 2013 level to 40% of PWIDs reached at 100%; increase of OST coverage from the 2013 level to 20% of PWIDs, ART coverage is increased from the 2013 level to 90% of PWIDs (Intervention coverage increases are gradual over the total study period);
- The CER presents data values at 5-year intervals. In order to conduct the present value calculations, data were however needed for each year in the 20-year period. The available data points and the graph functions in Excel were used to generate the 'best-fit' curve and functions. From the graph functions, the annual values were calculated for infections averted.
- Harm reduction programme costs were based on unit costs calculated as part of the GFATM funded costing study referred to above [20]. Coverage percentages outlined in the CER scenarios were applied to target populations to calculate number of clients receiving harm reduction interventions. Average weighted unit costs per client per year were $240 and $1,372 for NSP and OST respectively. A linear progression was assumed to accommodate coverage percentages, which increased from the baseline to target coverage, described in the scenarios.
- All annual costs were inflated by the anticipated US dollar inflation rate of 1% given that all financial modeling and analysis was carried out in USD. A commonly used discount rate in the health sector of 3% was used to calculate the present values [18]. The exchange rate used to convert local currency costs to USD in the CER was 1.65. Any Dollar values used after 2013 were adjusted for inflation.

- The present value was calculated for programme costs incurred and for the savings associated with infections averted. The lifetime treatment cost for ART was based on published life expectancies[2] and then adjusted for the Georgian and PWID contexts. We assumed early initiation and a total of 32 years on treatment and a discounted lifetime cost of $22,334 in Georgia. Discounted HCV treatment costs were based on an assumption that all patients with sever cases of liver fibrosis had already been treated and that future treatments would comprise an equal split between patients on 12 week and 24 week treatment. The cost of *Harvoni* medication was based on the cost of generic medication or subsidized medication, and was estimated at $900 for 12 weeks of treatment. The product of the treatment costs and the infections averted were calculated for each year and then discounted back to the base line year. An Excel model was developed to perform the present value calculations.
- Once the net present values had been calculated for the different scenarios these were compared with each other and largely informed the final conclusions of this study.
- The output from the various scenarios and the final report were reviewed by technical experts for further input and validation of interpretation.

Data Sources

The evaluation draws on a combination of information sources:

- Literature relating to the effectiveness, benefits and costs of MAT and NSP interventions, including studies mentioned above.
- Data about the activities and outcomes of completed projects gathered through previously reported data, including final reports and project evaluation reports (where available);
- Additional data gathered from official correspondence with NSP, MAT and HIV/HCV treatment program managers and state agencies (HIV/AIDS strategic plan [10] and HCV strategic plan [19]);

All these data were utilized for the cost-benefit analyses allowing for triangulation and verification of obtained data, and for judgments regarding the costs and benefits of NSP and MAT programs.

[2] http://www.aidsmap.com/Life-expectancy-now-considerably-exceeds-the-average-in-some-people-with-HIV-in-the-US/page/2816267/#item2816269

Study Period

The analytical cost-benefit activity took place between March-July, 2016. Data used for MAT and NSP services were originated and provided in 2012-2013.

Ethical Considerations

No patient data were used during the course of this study. The study used only quantitative summative data of harm reduction and HIV/HCV treatment program performance and reports.

Reliability, Validity and Sensitivity

Sensitivity analysis has been conducted to ensure high quality results of evaluation study. After identifying the potential sources of data, several specific steps were taken to maintain quality control during data collection:

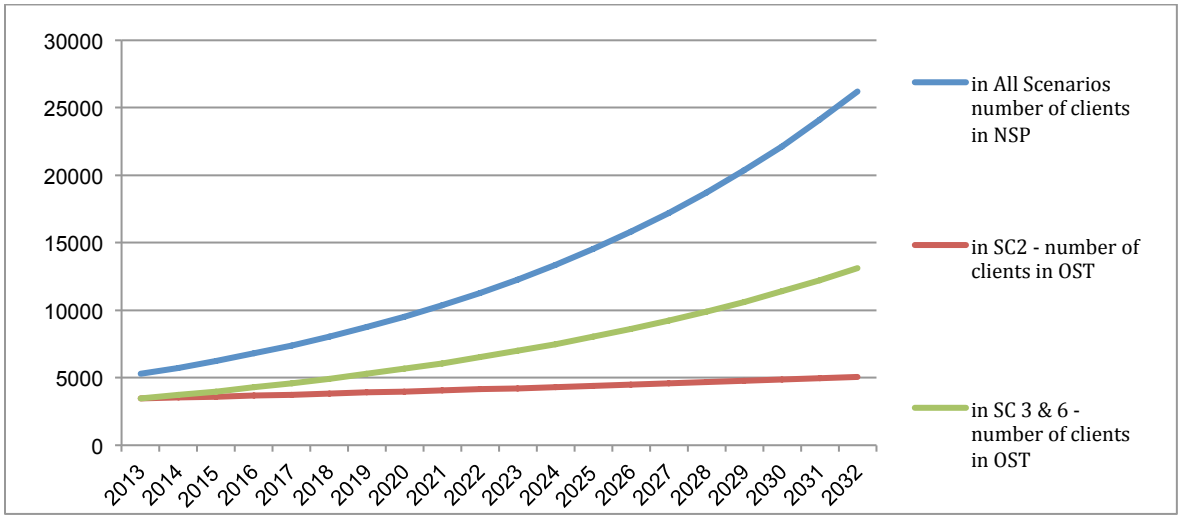
- Collection of detailed descriptive data of the context;
- Recording the source of particular information;
- Data management controls- an excel database created to record all quantitative and qualitative data.
- Uncertainty and sensitivity analyses were used to contribute to the assessment of accuracy and consistency of results of analyses.

RESULTS AND FINDINGS

Number of clients receiving NSP and OST

Using our excel model, and considering core parameters (Annex 1) and three scenarios described above, we generated an increase in MAT and NSP coverage for the next 20 years, starting from 2013. In each scenario number of NSP clients increases from 5,275 to 26,223 (by 40% from baseline). In scenario 2 an MAT coverage remains stable (5% of PWID are on MAT), however the actual number of clients served slightly increases due to assumption that the number of PWID in the country increases (Figure 1). Scenarios 3 and 6 envisage increase in MAT coverage from 3,468 to 13,111 which is significant encrease almost by fourfold from basecase scenario. Scenario 6 consider increase in MAT and NSP coverage, and increase in ART treatment from 2013 baseline value (88% of ART eligible HIV-diagnozed PWID are in treatment) of 740 individuals to 2,036 PWIDs in ART treatment by 2032.

Figure 1. Number of clients receiving NSP / OST

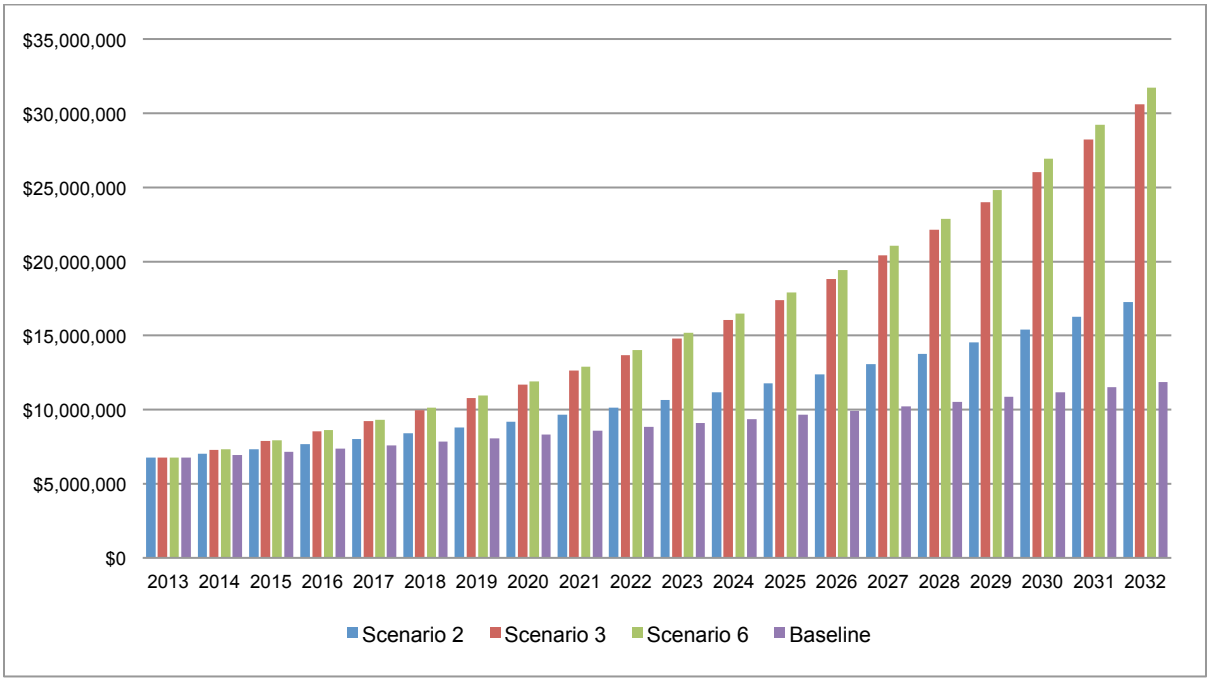


In all three scenarios the cost of intervention increases along the increase in coverage. Intervention cost includes the total costs of NSP and MAT. The least increase in the cost is associated with scenario 2 (Figure 2), where there is a 45% increase from baseline – up to $5.4 million by the year 2032. However, this scenario generates significant number of averted infections (Figure 3 & Figure 4). The cost of all three interventions over 20 year is presented in Table 1. The cost of intervention does not decline over time, as these interventions are ongoing, as this is not where a once-off intervention cost is incurred for each client.

Table 1. Total cost of interventions according to three different scenarios

Scenario	Total value $mil	Increase $mil	% Increase
Baseline	181.7		
2	219.2	37.57	21%
3	316.8	135.14	74%
6	325.5	143.82	79%

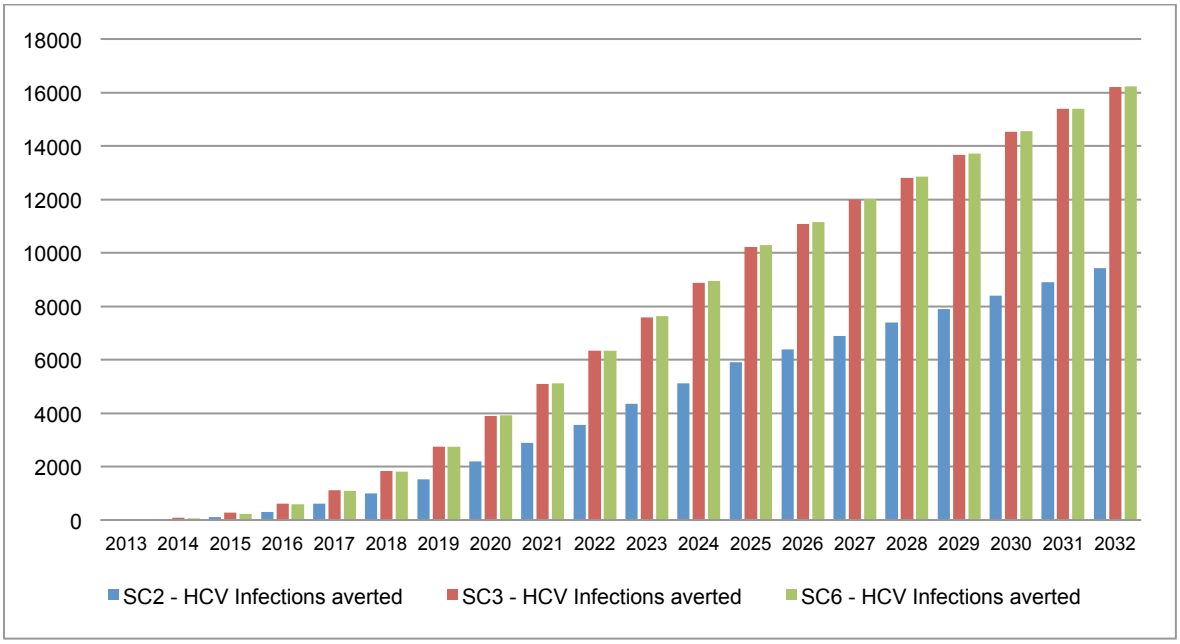
Figure 2. Total annual intervention costs in USD



Infections averted

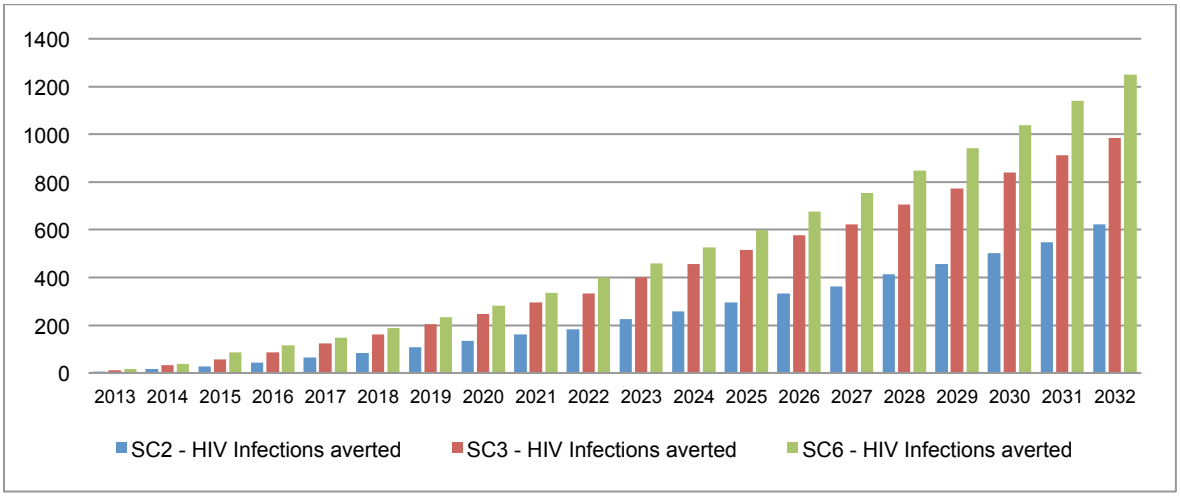
Infections averted were used as basis for calculating savings for HCV and HIV treatment, however we have very low HCV treatment coverage at baseline. Georgia HCV strategy does not quantify a specific coverage target for PWID but presents a 90% coverage target for HCV treatment by 2020 and indicated coverage of commercial sex workers (CSW), which we used (applied the same rate of treatment coverage for PWID, assumed treated PWID) to calculate infections averted. The coverage in 2020 is 60% and we assume it would increase to 70% by 2025 and would remain as such. As a result the total estimate for HCV infections averted and assumed treated is 9,422 for scenario 2, 16,294 for scenario 3 and 16,223 for scenario 6 (Figure 3). Increase in HCV infections averted over 20 years between scenario 2 and 3, and 2 and 6 is 6,872 and 6,801 respectively. In terms of HCV infection averted, there is almost no difference between scenario 3 and 6, which implies that increase in HIV treatment coverage has virtually no impact on HCV infections averted (Figure 3). The incremental net present value cost per HCV infection averted for scenario 2 is $2,559 while for scenario 3 and 6 the value is much higher at $5,371 and $5,712 respectively.

Figure 3. HCV Infections averted and assumed treated



In all three scenarios there is relatively small number of HIV infections averted when compared to HCV infections averted (Figure 4). Addition of MAT to scenario 2 (scenario 3) and then addition of HIV treatment (scenario 6) result in additional 362 and 265 HIV cases averted respectively. In scenario 6 the number of HIV infections averted increases due to increase in diagnosis and treatment rates of HIV among PWIDs.

Figure 4: HIV Infections averted and assumed treated



Net present value

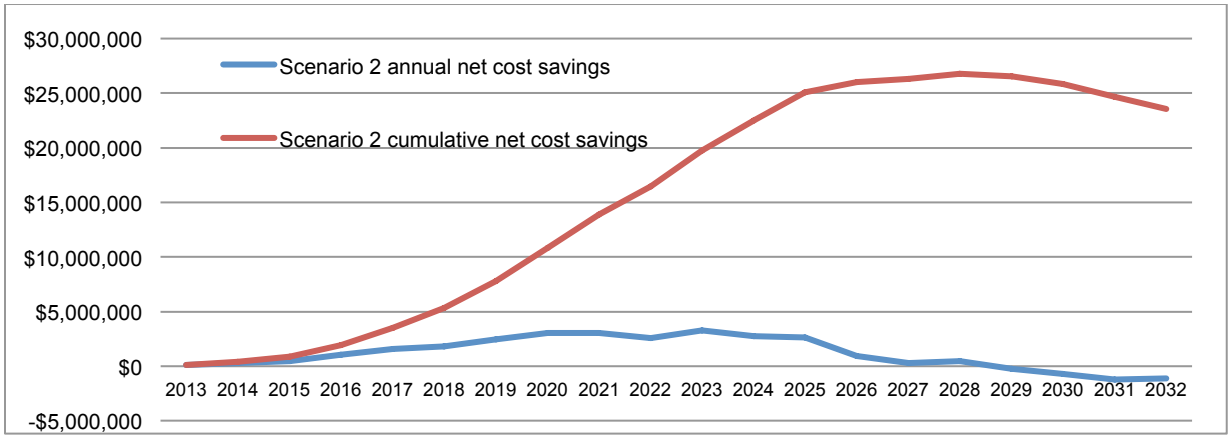
When we are weighing investment decisions, we typically want to know how much money we will save over and above our investment. It is also helpful to know what the return on our investment is in today's dollars. Net Present Value is a method for calculating the present value (that is, the value of cash to be received in the future expressed in today's dollars) of an investment in excess of the initial amount invested. The NPV for all three scenarios presented on a Table 2. The only positive value in this table is for scenario 2 with $18.6 million. This is the result of investing $24.1 million and avoiding $42.7 million otherwise to be spending on HIV and HCV treatment.

Table 2. Net present value for all three scenarios over 20 years

Scenario	Net NPV
2	$ 18,632,512
3	$ -4,347,228
6	$ -5,989,383

The implications of this exercise are that for SC 3 and 6 the total discounted cost of NSP and OST is greater than the savings associated with infections averted. This seems to result largely from the cost of OST where expenditure is not as efficient at averting new infections as in the NSP programme (see also above the cost per infection averted). The Figure 5 also highlights that as intervention coverage increases and stabilizes, and coverage for HCV treatment increases and then stabilizes, the annual incremental savings realized decline, which generates the negative net present value.

Figure 5. Scenario 2 - Discounted net cost savings per annum and cumulative



SENSITIVITIES

As we see from above graphs in terms of HCV infections averted there is no difference between scenario 3 and 6. However, in both these scenarios the number of HCV infections averted is higher than for the scenario 2. Accordingly the scenario 3 and 6 remain as expensive interventions to compare with the scenario 2 but in terms of cost-saving intervention scenario 2 is able to yield positive net present benefits. All these assumptions are truth for HCV treatment when the cost is not more than $900 USD. As soon as the cost of HCV treatment raises even by 10% all intervention scenarios give positive benefit, because the number of averted HCV cases yield the benefit in the future. To test sensitivity of our model on robustness we measured impact of 5% fluctuation in price and coverage: when the coverage of HCV treatment is increased by 5% (Table 4Table 5Table 6Table 7).

Impact of 5% fluctuation in coverage

- In the first example the coverage of HCV treatment is increased by 5%;
- This assumes 65% of infections would have been treated and 75% from 2020 onwards;
- The implication is that the discounted savings associated with increased treatment coverage in scenario 2 are increased by an amount of $2.4 million and the total NPV increases to $21.0 million.

Impact of 5% fluctuation in price

- In the second example the price of HCV treatment is increased by 5% but coverage is kept the same;
- The implication is that the discounted savings associated with increased treatment coverage in scenario 2 are increased by an amount of $1.6 million and the total NPV increases to $20.2 million;
- The NPV appears to be more sensitive to a 5% increase or decrease in HCV treatment coverage than a 5% fluctuation in the price of HCV treatment

Possible situation in which all scenarios generate a positive NPV

- In this example, the HCV treatment coverage in all scenarios is increased by 5% in 2020 and increases to 75% in 2025 and the cost of HCV treatment is increased by 20% from an average of $5,012 to $6,015.
- Given that we have use the lowest price available for *Harvoni* (at $900 for a 12 week treatment) this increase is still well below the actual average price currently being paid.
- In this example all scenarios generate a positive net present value but scenario 2 remains the most attractive with a NPV of $28.1 million (Table 3).

Table 3. Possible situation in which all scenarios generated a positive NPV

Scenario		Net NPV
2	$	28,074,181
3	$	1,890,702
6	$	271,198

Table 4. Sensitivity 1: HCV treatment coverage up to 60% in 2020 and 70% in the long run from 2025

Sc.	Net NPV	NPV incremental costs	NPV savings	HCV Infections averted	NPV costs per infection averted	NPV savings per infection averted	CB ratio*
2	$18,632,512	$24,111,917	$42,744,429	9,422	2,559.11	4,536.66	1.77
3	$-14,347,228	$87,038,159	$72,690,931	16,204	5,371.40	4,485.99	0.84
6	$-15,989,383	$92,667,031	$76,677,648	16,223	5,712.08	4,726.48	0.83

* Value of CB ratio less than one indicates a NPV investment value which exceeds the NPV saving

Table 5. Sensitivity 2: HCV treatment coverage up to 60% in 2020 and 70% in the long run from 2025 with 5% coverage and price sensitivity

Sc.	Net NPV	NPV incremental costs	NPV savings	HCV Infections averted	NPV costs per infection averted	NPV savings per infection averted	CB ratio *
2 (a)	$21,001,590	$24,111,917	$45,113,506	9,422	2,559.11	4,788.10	1.87
2 (b)	$20,293,364	$24,111,917	$44,405,281	9,422	$2,559	4,712.94	1.84
Difference with 2 above							
2 (a)	$2,369,077	$-	$2,369,077		-	251.44	
2 (b)	$1,660,852	$-	$1,660,852		-	102.50	

2 (a) Increase HCV treatment coverage 5% in 2020 and 2025
2 (b) Increase in HCV treatment price of 5% only

Table 6. Sensitivity 3: HCV treatment coverage down to 55% in 2020 and 65% in the long run from 2025 but HCV treatment costs of by 40%

Sc.	Net NPV	NPV incremental costs	NPV savings	HCV Infections averted	NPV costs per infection averted	NPV savings per infection averted	CB ratio*
2	$28,608,929	$24,116,281	$52,720,846	8,749	2,756.46	6,025.93	2.19
3	$2,899,436	$87,038,159	$89,937,595	15,053	5,782.11	5,974.73	1.03
6	$1,246,493	$92,667,031	$93,913,524	15,065	6,151.15	6,233.89	1.01

* Value of less than one indicates a NPV investment value which exceeds the NPV saving

Table 7. Sensitivity 4: HCV treatment coverage up to 65% in 2020 and 75% in the long run from 2025 and a 20% increases in prices

Sc.	Net NPV	NPV incremental costs	NPV savings	HCV Infections averted	NPV costs per infection averted	NPV savings per infection averted	CB ratio*
2	$28,074,181	$24,111,917	$52,186,097	10,097	2,388.03	5,168.48	2.16
3	$1,890,702	$87,038,159	$88,928,861	17,352	5,016.03	5,124.99	1.02
6	$271,198	$92,667,031	$92,938,229	17,373	5,333.97	5,349.58	1.00

* Value of less than one indicates a NPV investment value which exceeds the NPV saving

DISCUSSION OF LIMITATIONS

A number of limitations associated with this approach may impact on the final findings and recommendations but none are considered to be sufficiently material to invalidate the findings and final recommendations. The following are considered to be limitations:

- The study relies on forecasts of infections averted and future costs. All forecast are inherently uncertain and can be influenced by numerous factors, yet unknown or not quantifiable;
- We have relied extensively on the data and forecasts presented in the CER, the abovementioned costing study and other reports and do not have access to and have not conducted a detailed validation of the underlying assumptions and models. No fieldwork was carried out, especially with respect to the costing of interventions and treatment, and although unlikely, the impact of any unforeseen errors in these data will therefore be reflected in our calculations.
- We did not adjust the final costs according to the unit cost per patient, which gradually declines as the number of patients treated at the facility increases.

The approach used to this study restricts itself to the quantifiable costs and savings associated with the described interventions and the savings associated with treatment resulting from infections averted. Numerous other benefits may result from implementing the three scenarios described above, some of which may be indirect benefits and costs, which are difficult to quantify or even define. These may include for example societal benefits, reduced mortality and morbidity, reduced rates of imprisonment but also the possible opportunity cost of allocating more resources to these interventions, i.e. have we deprived *another* health intervention in the process of needed resources.

CONCLUSIONS AND RECOMMENDATIONS

Our study suggests that from the net present value perspective the intervention scenario 2 is more attractive, if compared to other two scenarios. This advantage over other scenarios mainly explained due to the relatively high cost of MAT programme, and relatively lower effectiveness of MAT in generating infections averted. The NPV of scenario 2 is significant and clearly indicates the NSP programme should be expanded rapidly for long term benefits associated with averting HCV infections and related treatment.

If policy and practical barriers are introduced to NSP programme and coverage not achieved this will impact significantly on NPV, i.e. less infections will be averted and more will have to be spent on HCV treatment.

REFERENCES

1. Centre for Infectious Disease, A.a.C.I. *HIV/AIDS Epidemiology in Georgia*. 2016 [cited 2016 26 July]; Available from: http://aidscenter.ge/epidsituation_eng.html.
2. Shapatava, E., et al., *Risk behaviors and HIV, hepatitis B, and hepatitis C seroprevalence among injection drug users in Georgia.* Drug Alcohol Depend, 2006. **82 Suppl 1**: p. S35-8.
3. Curatio International Foundation and Public Union Bemoni, *HIV risk and prevention behaviours among People Who Inject Drugs in six cities of Georgia: Bio-behavioral surveillance survey in Tbilisi, Batumi, Zugdidi, Telavi, Gori, Kutaisi in 2014.* 2015: Tbilisi.
4. Bemoni Public Union and Curatio International Foundation, *Estimating the Prevalence of Injection Drug Use in Georgia*. 2016, Bemoni Public Union: Tbilisi, Georgia.
5. Javakhishvili, D., D. Otiashvili, and M. Tabatadze, *Drug Situation in Georgia 2014*. 2016: Tbilisi.
6. Mathers, B.M., et al., *Mortality among people who inject drugs: a systematic review and meta-analysis*, in *Bulletin of the World Health Organization*. 2013, WHO: Geneva. p. 102-23.
7. Dutta, A., et al., *The Global HIV Epidemics among People Who Inject Drugs*. 2013, World Bank: Washington DC.
8. Dutta, A., et al., *Key harm reduction interventions and their impact on the reduction of risky behavior and HIV incidence among people who inject drugs in low-income and middle-income countries.* Curr Opin HIV AIDS, 2012. **7**(4): p. 362-8.
9. Wilson, D.P., et al., *The cost-effectiveness of harm reduction.* International Journal of Drug Policy, 2014. **26**: p. S5-S11.
10. Country Coordinating Mechanism of Georgia, *THE GEORGIAN NATIONAL HIV/AIDS STRATEGIC PLAN FOR 2016–2018*. 2015: Tbilisi.
11. Wilson, D., et al., *Evaluating the Cost-effectiveness of Needle-syringe Exchange Programs in Georgia*. 2012, UNAIDS Georgia: Tbilisi.
12. Otiashvili, D., et al., *Policing, massive street drug testing and poly-substance use chaos in Georgia – a policy case study.* Substance Abuse Treatment, Prevention, and Policy, 2016. **11**(1): p. 1-12.
13. Kirtadze, I., et al., *Assessing the Costs of Medication-Assisted Treatment for HIV Prevention in Georgia.* 2012, Futures Group, USAID | Health Policy Initiative Costing Task Order.: Washington, DC.
14. Georgia HIV Prevention Project, *Resource Requirements for Providing Preventive Interventions for Key Populations*. 2013, USAID funded GHPP: Tbilisi, Georgia.

15. MABILEAU, G., et al., *Intervention Packages against HIV and HCV infections Among People Who Inject Drugs in Eastern Europe and Central Asia: A Modeling and Cost-Effectiveness Study. Results on Cost-Effectiveness analysis in Georgia*. 2015, UNAIDS.
16. Eurasian Harm Reduction Network, *Road to Success: Towards Sustainable Harm Reduction Financing. First year of the Regional Program "Harm Reduction Works – Fund It!"*. 2015, EHRN: Vilnius, Lithuania.
17. Sloan, F. and C. Hsieh, *Health Economics*. 2012, Cambridge, Massachusetts The MIT press.
18. Goguadze, K., et al., *Costs of routine immunization services in Moldova: Findings of a facility-based costing study.* Vaccine, 2015. **33 Suppl 1**: p. A60-5.
19. Ministry of Labour, H.a.S.A.o.G., *Hepatitis C Elimination Strategy for Georgia*. 2016: Tbilisi, Georgia.
20 Georgian Harm Redcution Network: *Harm redcution National Report 2015.* " *Harm Reduction Works – Fund It!*" 2015, GHRN: Georgia, Tbilisi.
21 Curatio International Foundation & Bemoni Public Union. 2009. *"Estimating The Prevalence of Injection Drug Use in Five Cities of Georgia, Consensus Report."* Tbilisi.
22 Curatio International Foundation & Bemoni Public Union. 2012. "*Estimating The Prevalence of Injection Drug Use in Georgia.*" Tbilisi.

Annex 1 Key input parameters for CBA model

Parameters	Values		Reference
	2013 - HIV	2013 - HCV	
People who inject drugs	45,000		[22]
Period *(n) (periods of growth)*	19		[13; 20]
Growth rate in PWID	2%		Calculated based on [21&22] data*
Inflation rate (USD)	1%		Standard rate
HIV / HCV prevalence in PWIDs	3.45%	51%	[15]
% increase in HIV / HCV prevalence	0	0	[15]
% diagnosed	95%	27%	[15]
% with CD4 <350	57%		[15]
% of ART-eligible treated (among HIV-diagnosed)	88%	0.001%	[15]
HIV / HCV prevalence in PWIDs (CER)	1552.5	22950	[15]
# diagnosed	1474.875	6196.5	[15]
# with CD4 <350	840.67875	0	[15]
# of ART-eligible / HCV treated (among diagnosed)	739.7973	0.061965	[15]
% of HIV positive PWID treated	48%	0.000%	[15]

* Despite of availability of most recent data on size estimation of PWID (2016 year) we decided to use previous years (2009 & 2012) data to calculate the grow rate of PWID, as all the data used for input parameters are from previous years (2012-13).