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Benefit-Cost Analysis

Costs and benefits of Treatment as Prevention to reduce the transmission and disease burden of HIV/AIDs in Haiti

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COPENHAGEN CONSENSUS CENTER

Haïti Priorise
Un plan de développement alternatif

Costs and benefits of "Treatment as Prevention" to reduce the transmission and disease burden of HIV / AIDs in Haiti

Haïti Priorise

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Canada

Academic Abstract

Haiti is the poorest country in the American region and has one of the highest rates of HIV/AIDS infection in the region (1.35% prevalence). HIV/AIDS was the top cause of death by rate in 2005, but in the ten years following was overtaken by ischemic heart disease and cerebrovascular disease, and is now the third most common cause of death. However it remains the top cause of premature death, and the top cause of death and disability combined (IHME, 2016). Over the past decade, efforts to curb the epidemic have resulted in significant advancements. The rate of new HIV infections fell by 54% and more than half of Haitians living with HIV are accessing antiretroviral therapy. However, the sustainability of these investments can be called into question as total expenditure on HIV/AIDS services is almost exclusively funded from external sources and the total amount spent exceeds the national health budget.

The main driver of the HIV/AIDS epidemic is unsafe sex (IHME 2016) and interventions are required to reduce risk of transmission. Treatment as prevention (TasP) refers to HIV prevention methods and programmes that use antiretroviral treatment (ART) to decrease the risk of HIV transmission. The effectiveness of ART as a prevention tool is demonstrated in many different settings.

Our analysis estimates the economic rate of return from expanding this strategy in Haiti. This analysis estimates costs and benefits of expanding coverage of HIV/AIDS testing and treatment, and calculates an economic rate of return to investment. We present research conducted as part of the Haiti Priorise project, under the leadership of the Copenhagen Consensus Center.

We estimate costs and health impact of two hypothetical scenarios where coverage would be increased from current levels to reach 80% or 95% in 2018 and with such coverage maintained until 2036. The projected health outcomes are then translated into economic benefits and compared against the projected costs, in order to derive cost-benefit ratios.

Our estimates indicate that scaling up treatment to 80% or 95% coverage would avert around 20,000 and 35,000 deaths respectively during the period of 2018-2036, compared with a current-coverage scenario. Moreover, over 6,000 new HIV infections would be averted. Within the modelled scale-up, the provision of ART slows the rate at which the CD4 count is reduced, and results in significant gains in Healthy Life Years (HLYs) for the infected population.

When each HLY is valued at 3 times GDP per capita, the calculated benefit-cost ratio (BCR) is estimated at around 3.1 (5% discount rate; benefits valued at 3 x GDP per capita). Interventions will have a longer term effect beyond 2036 which, and if a longer time horizon was taken into account, BCRs could be higher.

Policy Abstract

Overview

Haiti is the poorest country in the American region and has one of the highest rates of HIV/AIDS infection in the region (1.35% prevalence). HIV/AIDS was the top cause of death by rate in 2005, but in the ten years following was overtaken by ischemic heart disease and cerebrovascular disease, and is now the third most common cause of death. However it remains the top cause of premature death, and the top cause of death and disability combined (IHME 2016). Over the past decade, efforts to curb the epidemic have resulted in significant advancements. The rate of new HIV infections fell by 54% and more than half of Haitians living with HIV are accessing antiretroviral therapy. However, the sustainability of these investments can be called into question as total expenditure on HIV/AIDS services is almost exclusively funded from external sources and the amount spent exceeds the national health budget.

Rationale for Intervention

The main driver of the HIV/AIDS epidemic is unsafe sex (IHME 2016) and interventions are required to reduce risk of transmission. We consider the globally recommended strategy of Treatment as prevention (TasP). This refers to HIV prevention methods and programmes that use antiretroviral treatment (ART) to decrease the risk of HIV transmission. The effectiveness of ART as a prevention tool is demonstrated in many different settings. TasP is a global recommendation by UNAIDS and the World Health Organization, and is also part of the Haiti national AIDS strategy. The current global policy states that there should be no CD4 criterion for ART eligibility.

We estimate costs and health impact of two hypothetical scenarios where coverage of a set of interventions in a TasP package would be increased from current levels (in 2017) to reach 80% or 95% in 2018 and be maintained at such levels until 2036. Our analysis adopts the provider perspective, meaning that we only estimate and report the direct costs associated with health service programme delivery from the point of view of the health provider (budget implications).

Implementation models follow current guidelines and practice with respect to where services are provided (outpatient care, a mix of public and private sector providers). We have not modelled financing mechanisms such as user fees given our point of view that out of pocket payments should be limited particularly for those struck with a chronic disease such as HIV/AIDS.

Projected health outcomes include deaths averted, new infections averted, and healthy life years gained in the scale-up scenarios compared with a current-coverage scenario. Within our model, the provision of ART slows the rate at which the CD4 count is reduced, and results in significant gains in healthy life years (HLYs) for the infected population. Each HLY is valued at 3 times GDP per capita.

Our estimates indicate that scaling up treatment with ART to 80% or 95% would avert around 20,000 to 35,000 deaths during the entire period of 2018-2036 (19 years). ART is effective in reducing transmission (preventing new infections) as well as increasing the longevity and the quality of life of those infected with HIV, which results in high numbers of deaths averted and HLYs gained.

The calculated benefit-cost ratio (BCR) is estimated at around around 3.1 (using a 5% discount rate). This means that for every dollar invested to expand the TasP strategy beyond current coverage, the resulting expected benefits are valued to be three times higher.

Summary Table

Single interventions		Benefits (New Present Value)	Costs (New Present Value)	BCR
Treatment as Prevention	80%	21,455,366,548	7,056,396,328	3.04
Treatment as Prevention	95%	36,676,541,077	11,740,016,921	3.12

Notes: All figures assume a 5% discount rate. The overall quality of evidence is rated as high.

Haiti has adopted a policy and vision of "getting to zero:" zero new HIV infections, zero discrimination and zero AIDS-related deaths. Maintaining and sustaining current coverage, and expanding this further, will be a challenge in a context where current HIV/AIDS expenditure exceeds the national health budget. Reported spending on AIDS was US$ 138 million in 2014 and US$ 128 million in 2015; compared to around US$ 109.76 million for the 2015/2016 national government health budget (HTG 6,622 billion). Benefits from HIV prevention and treatment materialize over the medium to long term and may not immediately be seen. Moreover, interventions targeting marginalized high risk groups may face resistance during national budget negotiations. It is therefore likely that external financial assistance will need to be continued to provide HIV/AIDS services in Haiti over the medium- to long term to ensure sustainable financing as people live longer on antiretroviral treatment and will require treatment for a longer period of time; as well as from an equity and human rights perspective.

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Acronyms

AIDS: Acquired immune deficiency syndrome

ART: Antiretroviral treatment

BCC: Behaviour change communication

CBA: Cost-benefit analysis

CBR: Cost-benefit ratio

BCR: Benefit-cost ratio

CD4: CD4 T lymphocytes (CD4 cells) in a sample of blood

WHO-CHOICE: World Health Organization programme for CHOosing Interventions that are Cost-Effective

GCEA: General Cost Effectiveness Analysis

HIV: human immunodeficiency virus

HLY: Healthy Life Year

HTG: Haitian Gourde

LiST: Lives Saved Tool for child and maternal health

PHA: People living with HIV/AIDS

PMTCT: Prevention of mother-to-child transmission of HIV

PNSM : Plan stratégique national multisectoriel de lutte contre le VIH 2018-2023.

REDES: Ressources et dépenses liées au VIH/SIDA

MSPP: Ministère de la santé publique et de la population

USD: US Dollar

VCT: Voluntary Counselling and Testing

Contents

1. Introduction

Haiti is the poorest country in the American region and is also considered a "fragile state" because of the low performance on human development indicators, low scores on governance due to chronic political instability and weak institutions. Moreover, the country has a high risk for emergencies caused by various natural disasters. Environmental, economic and political crises occur frequently.

Around two-thirds of the current population (11 million) are estimated to live in poverty. With 50% of the population below 23 years of age, the population is growing faster than the economy. Thus, gross domestic product (GDP) per capita is now lower than that of 20 years ago. Inequalities are high and increasing (Gini coefficient of 0.66 in 2012 vs. 0.61 in 2010) .[1]

Despite these challenges, overall population health has improved in recent years. Child health mortality dropped from 100.2 per 1,000 births in 1990 to reach 54.7 in 2013, and maternal mortality decreased from 670 per 100,000 births in 1990 to reach 510 in 2000 and was estimated at 380 in 2013. HIV/AIDS prevalence is now at 1,346 per 100,000 population (2013) vs 1,860 in 2001. Overall life expectancy has increased from 54 years in 1990 to reach 63 years in 2013 (WHO, 2016). However when compared to other countries in the region, overall mortality levels and morbidity from both communicable and infectious diseases remain high, as do nutritional deficiencies. Haiti's health indicators are at the level of economically comparable (low-income) countries, thus child and maternal mortality rates are four and five higher than the average rates in the Latin America and Caribbean region. The supply of health services remains limited and fragmented, with problems of accessibility and inequalities. The cycle of malnutrition / infectious and parasitic diseases fueled by chronic food insecurity has increased since 2010 with the emergence of cholera.

Current total health expenditure per capita is US$ 61.5 (in 2014 at average exchange rate).[2] Reports indicate that resources may not be effectively used. One of the challenges is the existence of vertical programs and the multiplicity of projects which poses challenges for the Ministry of Health (MSPP) to lead overall health sector governance processes. The share of public expenditure on health is less than 10% of total health expenditure. For the current fiscal year (2016/2017), the share of the public health budget, which has been continuously decreasing for 20 years, represented less than 5% of the national government budget despite the 15% target of the national health policy (2012). External funding is

[1] République d'Haïti-PNUD (2014).
[2] www.who.int/gho.

volatile with large fluctuations over time in response to various health crises (the peak being the post-earthquake 2010 period), resulting in limited sustainability of funding to strengthen the foundations of the health system. External funds tend to focus on the short term, do not address priority health needs and are not aligned with national priorities.[3] Moreover, the majority of external funds bypass the government, thereby limiting the strengthening of public institutions. Total per capita health spending has been on an upward trend because of a rise in private health expenditure, with direct out of pocket payments generally accounting for more than 50% of health expenditure.[4]

HIV/AIDS was the top cause of death by rate in 2005, but in the ten years following was overtaken by ischemic heart disease and cerebrovascular disease, and is now the third most common cause of death. However it remains the top cause of premature death, and the top cause of death and disability combined (IHME, 2016).

Among the many health challenges, HIV/AIDS receives a relatively large share of overall health sector resources. According to the latest published national health accounts (2012/2013), almost a quarter of current total health expenditure (22%) was devoted to HIV/AIDS. Reported spending on AIDS was US$ 138 million in 2014 and US$ 128 million in 2015.[5] This represents an amount that is larger than the 2015/2016 national health budget, (US$ 110 million).[6] It should be noted that out of the measured HIV/AIDS expenditure, 98% are of external origin and 2% from domestic public origin (where public spending is an estimation that refers to shared health system inputs such as infrastructure, health worker wages, etc.). External funds are mainly from the United States President's Emergency Plan for AIDS Relief/ PEPFAR (over 85%), and the Global Fund (around 10%). 97.5% of the funds are managed by international agencies and more than 50% are executed directly by bilateral and multilateral entities.

In 2015, estimated spending on HIV/AIDS was estimated at US$ 852 per PHA and US$ 11.7 per capita (MSPP/PNLS 2016, REDES rapport). Nearly half of these funds (47%) were spent on Care and Treatment whereas one-fifth was spent on Prevention (20%) and Program Management and Administration (18 %) respectively.

[3] MSPP de la République d'Haïti (2012). Politique nationale de santé. MSPP, Port-au-Prince. p.56.
[4] During post-crisis periods, external funding for health care plays an important role by reducing the need for household expenditure.
[5] MSPP/PNLS Haiti (2016). Rapport REDES 2014 et 2015 - Estimation du flux des ressources et dépenses liées au VIH/Sida. Port-au-Prince, Haïti. p.78) https://mspp.gouv.ht/site/downloads/Rapport%20Final%20REDES%202016.pdf
[6] HTG 6.62 billion

The number of patients on antiretroviral treatment increased from 54,625 in 2013 to 82,577 in 2016, equivalent to 55% of the estimated number of people living with HIV/AIDS (PHAs). In the context of preventing mother-to-child transmission (PMTCT) of HIV, the number of pregnant women receiving treatment in a single year more than doubled between 2008 and 2013 from 2,500 to 5,226 with coverage of treatment among pregnant HIV-positive women reaching 90% coverage in 2015. As a result of increased use of care and treatment services, the number of people dying from AIDS-related causes has decreased significantly from 7,637 in 2010 to 5,364 in 2015 (MSPP/PNLS Haiti, 2016).

The HIV/AIDS strategic plan for 2012-2015 was extended to 2018 and accompanied by the decision of the MSPP (in July 2016) to adopt the 90-90-90 strategy for detection and treatment. The 90-90-90 targets indicate that:

- By 2020, 90% of all people living with HIV will know their HIV status.
- By 2020, 90% of all people with diagnosed HIV infection will receive sustained antiretroviral therapy, and
- By 2020, 90% of all people receiving antiretroviral therapy will have viral suppression.

The national strategy aims to improve targeting of municipalities and priority sites, retention and adherence of patients on antiretroviral treatment, access to services of target populations (screening, condoms, and treatment), quality and effectiveness of services and strengthening community activities. The implementation of the strategy will rely heavily on private organisations and non-governmental organisations to provide health services through a number of networks.

The National Program to Combat STI / HIV / AIDS (PNLS) is supported by a large number of technical and financial partners (France, Health through Walls (HTW), International Office of Migration (IOM), Panamerican Health Organization (PAHO) / World Health Organization (WHO), Joint United Nations Programme on HIV/AIDS (UNAIDS), United Nations Educational Scientific and Cultural Organization (UNESCO), United Nations Population Fund (UNFPA), United Nations International Children's Emergency Fund (UNICEF), United States Government (USG), etc.). However, the funding received by international development partners has decreased in recent years.

With the post-2015 Sustainable Development Goals, countries are taking on a broad development agenda, where the Health Goal (SDG3) plays a key role for sustainable development. SDG3 includes a number of specific targets, where one target is to reduce the number of new HIV infections among the

uninfected population. Given the limited resources available in low-income countries such as Haiti, decisions need to be made carefully with regards to how to best invest available funding. This document presents the results of a Cost-Benefit analysis (CBA) for providing the globally recommended strategy of Treatment as Prevention in Haiti. Cost-Benefit ratios (CBR) are one type of evidence that can be used to inform policy discussions around priority setting. It should however not be the only one, since other criteria such as equity, feasibility, financial sustainability and acceptability will also carry important weight to inform decisions around resource allocation.

This paper is structured as follows: the Introduction section of the report describes the current HIV/AIDS programme in Haiti, recent challenges and successes. The Theory section explains how the cost-benefit analysis was conducted, including data sources and assumptions for information on costs and health benefits, and how health benefits were valued in economic terms. Outcomes are presented in the Results section. This is followed by sections on Discussion and Conclusions.

2. Theory

2.1 Objective

The objective of this study was to estimate the cost, benefits, and the relative return on investment from providing HIV/AIDS interventions in Haiti.[7] The theory underpinning this analysis is that policy makers will benefit from a comparison of different investment strategies in terms of the costs and anticipated gains. There are many different ways in which additional funding could be invested in Haiti, including both social sectors and those more directly linked to the productive economy, such as transport and energy. Currently, locally generated evidence on the value for money of making one investment versus another is not readily available and thus the current set of investments may not follow the most optimal pattern. By making information on the benefit-cost ratio available, decisions around priority setting can be better informed, and decision makers can be informed about the trade-offs of making one investment choice versus another.

2.2 Overall approach and scope of analysis

The overall approach taken is to project health impact and costs associated with scaling up test and treatment for HIV/AIDS. The projected health outcomes are then translated into economic benefits and compared against the projected costs, in order to derive benefit-cost ratios.

[7] The analysis presented here shares a common methodology with two other analyses conducted for the Haiti Priorise project: providing skilled care before and during birth, and prevention and management of childhood illness.

2.2.1 Interventions included

The main driver of the HIV/AIDS epidemic in Haiti is unsafe sex.[1] While preventive interventions are required to reduce risky behaviours, behavior change usually is slow to change and additional interventions are required to reduce risk of transmission from current behaviour. Moreover, treatment and care is required for infected populations to improve their overall health and well-being, to enable them to contribute to society, and to reduce the risk of them transmitting the infection to others.

We consider the globally recommended strategy of Treatment as Prevention (TasP). This refers to HIV prevention methods and programmes that use antiretroviral treatment (ART) to decrease the risk of HIV transmission. Antiretroviral treatment reduces the HIV viral load in the blood, semen, vaginal fluid and rectal fluid to very low levels ('undetectable'), thereby reducing the risk of onwards HIV transmission.[8] The effectiveness of ART as a prevention tool has been demonstrated in many different settings and is part of global recommendations by UNAIDS and the World Health Organization. TasP is also part of the Haiti national AIDS strategy. The current global policy states that there should be no CD4 criterion for ART eligibility.

The different components of TasP considered in the analysis are:

- Voluntary Counselling and Testing (VCT)
- Adults first line ART
- Adults second line ART
- Pediatric ART for children
- Preventing mother to child transmission (PMTCT) of HIV
- Cotrimoxazole for children

2.2.2 Analytical framework and Perspective

Table 1 illustrates the cost and benefit accounting framework used for this analysis. Additional detail on each component covered is provided in the sections below.

[8] World Health Organization (WHO) (2012) 'Antiretroviral treatment as prevention (TASP) of HIV and TB'

Table 1. Cost and benefit accounting framework used in analysis

Costs		Estimation of costs in the analysis
Non-market valued	• Patient health care seeking cost (transport, time lost in productive activity due to care-seeking) • Volunteer labour	Not included
Market-valued health sector costs	Direct costs related to intervention delivery: • Commodities: e.g., the drugs, vaccines, supplies and lab tests needed for each service. • Service delivery costs (inpatient bed days, outpatient visits) – which include operational costs and health worker time. • Programme costs (administrative costs for running the programme and ensuring quality of care). • Behaviour change communication • Supply chain costs and commodity waste	Costs are estimated using an inputs based approach (Quantities and Prices)
Benefits		Estimation of benefits in the analysis
Non-market valued benefits	Intrinsic health benefits: • Increased longevity • Increased wellbeing and quality of life • Increased social participation	Instrumental and intrinsic benefits are captured in a combined measure for the value of statistical life, estimated at 3 x GDP per capita per DALY
Market-valued benefits	Instrumental health benefits: • Increased employment (reduced absence due to illness and death) • Increased productivity (increased quality of human capital due to greater wellbeing) • Fewer days of work lost by family members caring for those who are ill	
	Savings: • Reduced expenditure on medical care (effect of preventive interventions)	Savings are estimated using an inputs based approach (Quantities and Prices)

The perspective taken for estimation of costs is to only include the direct costs incurred by the health system. We therefore do not include any indirect cost incurred by the households or individuals seeking care, e.g., for transport, lost income, etc. [9]

2.2.3 Time horizon

The analysis is conducted for a time horizon of 20 years, from 2017 to 2036. Costs and benefits are effectively captured for 19 years i.e., from year 2018 onwards, with year 2017 as the comparator (baseline).

2.2.4 Coverage scenarios

The analysis presented in this paper primarily considers an incremental scenario where coverage is scaled-up above current level of care. Coverage refers to the number of people in need who receive the services. A PMTCT coverage of 100% would mean that all women who need PMTCT services would receive them.

The counterfactual for the incremental analysis is the current level of coverage and the current epidemiology of the country. The costs and health benefits are compared to the current status quo. Results derived from the incremental analysis are given prominence in this report since the main policy context relates to whether the expansion of services from their current status presents value for money. We also condicted a so-called null scenario analysis, the results for which are presented in an annex. [10]

We analyse costs and benefits resulting from providing all interventions within the TasP package at two target coverage levels: 80% and 95%. The reason for this is to assess how benefit-cost ratios may vary across different target levels. In situations where the current coverage of an intervention is already above one of the target coverage levels, the outputs for the incremental analysis for that coverage level are zero.

2.2.5 Tools

The analysis was carried out using a recently developed tool: *Spectrum – General Cost Effectiveness Analysis (GCEA).* This tool is developed by the World Health Organization in order to support the

[9] An analysis of previous research undertaken for the Copenhagen Consensus processes in Bangladesh and Haiti demonstrated a wide variation in the extent to which household costs were incorporated.

[10] The "null scenario" is the counterfactual used for the standard WHO-CHOICE generalized cost effectiveness approach developed by the World Health Organization. In this fictional scenario, the coverage of interventions is set back to zero (0%). The epidemiology of the country is also adjusted accordingly, to a situation as if the intervention was not there at all. The costs and health benefits of providing an intervention are then compared to this "do nothing" scenario (see www.who.int/choice for more details).

incorporation of cost-effectiveness analysis into the widely used Spectrum platform of tools for priority setting and decision making.[11] Spectrum consists of several software models that are widely used for health projection modelling, including the Lives Saved Tool (LiST) for child and maternal health, and the AIDS Impact models for HIV/AIDS. UNAIDS regularly uses Spectrum for epidemiological modelling of the HIV epidemic, and supports countries to do Spectrum-based analysis for national HIV estimates. Having the option of conducting economic evaluation in Spectrum, using data that has been proessed by UNAIDS together with national institutions, is highly beneficial for countries.

2.3 Calculation of costs and benefits

2.3.1 Projecting increases in people reached

Costs and benefits are driven by how many people will receive an intervention. We project changes in coverage levels, which is then converted into numbers of people reached with the different health interventions. Each intervention is associated with specific assumptions around health outcomes such as impact on HIV infection rates and mortality rates.

Most recent data available on current coverage is used to determine the number of people reached in the current year (2017). In the scale-up scenario, the target coverage is immediately reached in year 2 (2018), and then kept constant throughout the analytical time period.[12] We estimate costs as the difference between the costs incurred in the scale-up scenario, and the cost incurred in the counterfactual scenario. Similarly, health outcomes in the scale-up scenario are compared with those in the counterfactual scenario.

2.3.2 Determining the population in need and baseline coverage

The Spectrum DemProj module includes demographic projections from the UN population medium variant. [13] We used these standardised projections as they are deemed more reliable than the Population projections from the Haitian Institute of Statistics (Institut haïtien de statistique et d'informatique (IHSI))[14] given that the most recent census in Haiti was carried out in 2003, and the overall weakness of the IHSI projections are widely acknowledged. Table 2 illustrates estimates used in the analysis for the epidemiological modelling (prevalence across population groups). The use of UNAIDS Spectrum models

[11] http://www.avenirhealth.org/software-spectrum.php
[12] In the counterfactual for the "null scenario" analysis, the coverage drops to zero in year 2.
[13] *https://esa.un.org/unpd/wpp/Download/Standard/Population/*
[14] http://www.ihsi.ht/

files implies that some simulation has gone into projecting epidemiological trends beyond the latest recorded data point.

Table 2. Prevalence and incidence data for the HIV/AIDS epidemic in Haiti

Indicator	Value	Source	2017 modeled estimates (UNAIDS Spectrum simulations)
HIV prevalence among adults aged 15-49 years	1.35%	WHO 2016	1.22%
HIV Prevalence among sex workers (SW) population	8.4%	2012 behavioral and biological surveillance study by Population Service International (PSI)	3.2%
HIV Prevalence among Men who have sex with men (MSM) and transgender populations	18.1%.	2012 behavioral and biological surveillance study by Population Service International (PSI)	11.75%
Estimated HIV incidence	83 per 100,000	Global AIDS Response Progress Report 2016	

Table 3 shows the assumptions used for the target population, population in need, and current (baseline) coverage of each intervention. The population in need reflects the current disease incidence, and determines the share of the target population that requires the intervention.

Table 3. Target population, Population in need, and Current coverage

	Target population	Population in need (%)	Current coverage (%)	Current coverage (estimated number of people that have been reached in baseline year)
Treatment as Prevention				
Voluntary counseling and testing	Adults 15-49 years	20***	21	1,198,298
PMTCT	Women in need of PMTCT *	100	100	2,150
ART for men **	Men needing ART *	100	59.3	12,045 (first-line)
ART for women **	Women needing ART *	100	66.6	16,165 (first-line)
Cotrimoxazole for children	HIV+ children *	100	37.9	964
Pediatric ART	Children needing ART *	100	79.7	972

* Values from country UNAIDS projection (validated by MSPP) ** Assumption used for ART elibiligity in the projection file is CD4 count of 999, which is basically Test and Start.*** Assume 1 test every 5 years

2.3.3 Determining at what level of the health system interventions are delivered

While evidence on effectiveness of interventions is not differentiated by level of care, the service delivery costs will differ depending on where services are delivered (section 3.3.5). We therefore apply certain assumptions related to at what levels of the health system the interventions are delivered (Table 4).

Table 4. Assumptions on delivery level for HIV/AIDS interventions

	Community	Outreach	Health centre	Hospital
Voluntary counselling and testing	25%	25%	25%	25%
PMTCT		20%	40%	40%
First line ART for adult men and women			50%	50%
Second-Line ART for adults			50%	50%
Co-trimoxazole for children			50%	50%
Pediatric ART			50%	50%

3.3.4 Estimating health impact

Health impact projections are derived from two modules within GCEA-Spectrum: AIM and GOALS.[15] Adjustments to epidemiology over time interact with the Demographic module (DemProj).[16]

The tool generates year-specific estimates of the proportion of the population that is HIV positive and at different CD4 levels, the population on ART, and AIDS-related deaths. These outputs are generated and compared for the different scenarios.

GOALS is a simulation model that calculates HIV transmission among and between different population risk groups (monogamous heterosexual couples, those with multiple heterosexual partners, female sex workers and clients, MSM, and people who inject drugs, on the basis of their behaviors (number of partners, contacts per partner, condom use, age at first sex, etc.,) and characteristics that influence transmission (stage of infection, male circumcision, STI infection, and use of antiretroviral therapy). The effects of the bio-medical interventions are based mostly on results from randomized control trials that directly measured the effect on incidence. The effects of the behavior change interventions are included both as direct effects on condom use, numbers of partners, and age at first sex. The effectiveness data used have been documented in a number of publications.[17] These are organized into impact matrices for each risk group, and reflect the anticipated effect of an intervention's coverage increase on a given behavior, such as condom use, number of partners, and age of sexual debutImpact of an intervention is calculated as the product of the increase in coverage and the impact matrix entry in order to estimate the reduction in a risky behavior (i.e. condom non-use).

[15] Stover et al (2017) Updates to the Spectrum/Estimations and Projections Package model for estimating trends and current values for key HIV indicators.

[16] The format of life tables in Demproj doesn't follow the same format as the life tables in the Copenhagen Consensus spreadsheet. The Spectrum Demproj file uses a 0-80 structure whereas the Copenhagen consensus template uses a 0-100 age life table. However an examination of the Life Epectancy tables reveals that these are very similar.

[17] See publications by Stover et al, as well as Schwartlander et al. in Reference list.

Quality adjusted life years for each scenario are calculated using the disability weights shown in Table 5, through the following calculation: Population in Group A,B,C,D *(1-disability weight). Healthy life years gained for the incremental scenario are calculated as the total QALYs from the scaleup scenario – total QALYs from the current coverage scenario.

Table 5: Disability weights used in the analysis

Group	Health state	Disability weight
A	HIV+, CD4 >=200	.221
B	HIV+, CD4<200	.547
C	HIV+, on ART	.053
D	HIV-	0

3.3.5 Estimating costs

We estimate four types of costs associated with each intervention/package:

- Commodities: e.g., the drugs, supplies and lab tests needed for each service.
- Service delivery costs (outpatient visits) – which include operational costs and health worker time.
- Programme costs: these include administrative costs for running the programme, as well as training and supervision.
- Supply chain costs and commodity waste: these costs are included as a percentage (%) mark-up on the commodity cost.

Commodities

Assumptions for the number of drugs and supplies required per service are provided through the OneHealth Tool cost assumptions, which are fully integrated into the Spectrum-GCEA. These contain default regimens that are based on standard WHO protocols and expert opinion. The intervention regimens include: 1) required drugs and supplies, and 2) number/length of outpatient and inpatient visits. While default regimens are embedded in the Tool, each input can be modified to represent a given country's context. Table 6 indicates the average commodity cost per intervention. More details can be found in Annex 1 or through consulting the OneHealth Tool cost assumptions document. [18]

[18] OneHealth Tool Intervention Assumptions Document
http://avenirhealth.org/Download/Spectrum/Manuals/Treatment%20Assumptions%202016%201%2010.pdf

Table 6. Average commodity cost and number of outpatient visits per intervention as used in the analysis for the Treatment as Prevention package (US$)

	Average commodity cost (US$)	Additional Lab costs (CD4, viral load, complete blood count	Average number of outpatient visits
Voluntary counselling and testing	1.2		2 per event
PMTCT	22		9 per pregnancy
ART (First-Line Treatment) for adult men and women	153.2	190	12 per year
ART (Second-Line Treatment) for adult men and women	427.6	190	12 per year
Cotrimoxazole for children	9.8		12 per year
Pediatric ART	117.7		9 per year

Health Service Delivery costs

As mentioned above, assumptions for the average number of outpatient visits required per service are based on standard WHO protocols and expert opinion. The costs for an outpatient visit differ by the level of care, and include shared costs such as health worker salaries, the running cost of the facility and equipment, and utilities such as water and electricity. We used the WHO-CHOICE modelled estimates for Haiti as the starting point (Table 7).

Table 7. Estimated cost per outpatient visit used in the study (US$ 2014)

Generic name of delivery level	Community	Outreach	First level clinic/ Health Centre	Hospital
Cost per outpatient visit (US$)/ public sector assumption	1.39	1.39	1.72	1.95
Cost per outpatient visit (US$$)/ private sector assumption	1.96	1.96	2.43	2.75
Average of public and private sector estimates	1.67	1.67	2.07	2.35

Notes to table 7. Costs for outreach are derived from the category "health centre without beds". Costs for first level clinic/health centre are derived from the category ""health centre with beds". Costs for Hospital based care are derived from the category of primary level hospital.

In order to validate the WHO-CHOICE estimates we examined existing studies carried out in Haiti on service delivery costs. For more details see Annex 2. A comparison of WHO-CHOICE estimates with the

locally derived estimates suggests that they fall within the same ball park. We used an assumption that 50% of services will be delivered through public sector facilities and 50% through privately managed facilities, and used the average of the WHO-CHOICE cost estimates (values in the last row of Table 7).[19]

Programme costs

Programme costs refer to costs that are incurred at an administrative level that is outside the point of delivery, and reflect a set of activities that are aimed at improving the quality of delivery or encouraging the uptake of services. These include activities such as training, supervision, and general programme management. The WHO-CHOICE project provides a set of default assumptions around the resources needed for an efficiently run programme implementing 10 interventions at full coverage. Using the WHO-CHOICE assumptions and price estimates for Haiti results in an average annual programme cost of USD (2014) 5.37 million (Table 8).

Table 8. Programme cost assumptions to run an efficient programme implementing 10 interventions at full coverage

Category	Estimated annual cost, thousands (USD 2014)	Scaled to number of interventions	Scaled to coverage target
Programme-Specific Human Resources	1,455	Yes	No
Training	489	No	Yes
Supervision	2,035	No	Yes
Monitoring and Evaluation	877	No	No
Transport	346	Yes	Yes
Communication, Media & Outreach	25	No	Yes
General Programme Management	140	No	No
SUM	5,367		

Source: WHO-CHOICE 2017 (www.who.int/choice)

To validate these estimates, we examined existing documents that project programme costs. For example the Immunization strategy costing for 2016-2020 includes a category of "Gestion du programme" which amounts to USD 5.64 million, which is close to the WHO-CHOICE default estimates. For comparisons with other available estimates see Table 9. The comparisons indicate that estimates of programme costs range widely. The reason for this may include the scope of work, the anticipated coverage levels to be attained

[19] Current health system data indicates that 47% of health facilities are private, 37% are public, and 16% ae mixed [Source : MSPP (2015). Liste des institutions sanitaires du pays. Port-au-Prince, Haïti. p.105].

in the years to come, the assumptions on effectiveness and quality of the programme, and sometimes budget projections being carried out to match the likely available resources (as opposed to aspirational estimates).

Table 9. Comparing WHO-CHOICE estimates with available estimates for programme costs (USD million)

WHO-CHOICE Defaults	Immunization costing[20] category of "Gestion du programme" (year 2020)	HIV/AIDS REDES (average of 2014-2015)	HIV/AIDS CCM under category of "Module 12. Gestion du programme"	SRH costing[21]
USD 2014	USD 2015	USD 2014/2015	Average years 2 and 3[22]	Average 2014-2016
5.37	5.65	24.97	2.13	0.91

In view of the above comparison, and the challenges entailed with comparing the different estimates for programme costs and what they refer to, we apply the standard WHO-CHOICE programme costs for this analysis, with an adjustment made only to the price of motorcycles for transport costs, which was adjusted from $1,827 to $5,000 (based on prices used for the cost projections of the 2016-2020 Immunization strategy). For more information on how the programme costs are incorporated into our analysis, see Annex 3.

Markup rates for supply chain costs and commodity waste

An increase in the number of people reached with the interventions will also incur a cost in terms of transporting greater amounts of commodities through the health system. We apply a mark-up rate to the value of commodity costs in order to approximate resource requirements for expanding the supply chain. A recent review by Sarley et al. (2010) reports estimates undertaken by various USAID | DELIVER PROJECT studies in different countries. Estimates range from 1 to 44% for different commodities and country

[20] MSPP/OPS-OMS (2016). Calcul des coûts du plan pluriannuel complet en faveur de la vaccination 2016-2020. Port-au-Prince, Haïti. Fichiel Excel.
[21] Costing du Plan Stratégique Santé de la Reproduction Et Planification Familiale 2013-2016. Costs extracted for IEC, Training, Supervision and M&E.
[22] Estimates include HR, but does not include costs for Training, which are included under other modules.

settings. Sarley et al. classify 49 countries into groups, with Haiti belonging to a group for which the generic model indicates that the mark-up rate is 30%.[23] We therefore apply a 30% rate.

Moreover, with respect to medicines that are stored but not used before their expiry date, data is lacking but we applied an overall assumption of 5% waste to supplies and commodities.

Table 10. Total average cost per intervention delivered - including direct commodity cost, direct service delivery cost, and 35% markup on commodities

	Community	Outreach	Health centre	Hospital
Voluntary counseling and testing	4.9	4.9	5.7	6.3
PMTCT		43.7	47.3	49.8
ART (First-Line Treatment) for adults			224.0	227.3
ART (Second-Line Treatment) for adults			580.8	584.2
Cotrimoxazole for children			37.6	40.9
Pediatric ART			171.7	174.2

Note. Costs for ART are per year

3.3.6 Converting health impact into economic benefits and deriving Benefit-Cost Ratios

Valuing health impact

Health impact is estimated in terms of healthy life years (HLY) gained. This is effectively the same as a DALY, but where DALYs as measured by Global Burden of Disease studies are properly speaking a loss measure and Healthy Life Years measured in cost-effectiveness analysis are a gain measure. To value benefits in monetary terms, the Healthy Life Years gained by year are multiplied by the year-specific estimated GDP per capita. There are numerous reviews available that discuss the valuation of health gains using so-called values of statistical life (VSL). Jamison et al (2012) noted that existing estimates for counties generate a range of VSL valuations that range between 2 to 4 times GDP per capita. The VSL estimations include both the intrinsic valuation of a healthy life (health and life having a value in its own right) as well as the economic contribution to society, including higher labor productivity. The methodology used here is the standard approach adopted by the Copenhagen Consensus analyses which present HLYs valued at 3 times GDP per capita.

In addition to attributing a dollar ($) value to the intrinsic value of health, healthier populations also bring additional benefits, including higher labor productivity and reduced spending on treatment. For the

[23] Sarley D, Allain L, Akkihal A. Estimating the global in-country supply chain costs of meeting the MDGs by 2015. Arlington, Va, USAID/DELIVER Project, 2009. Available at: http://pdf.usaid.gov/pdf_docs/PNADP080.pdf. See Table 5.

purpose of this analysis we assume that labor productivity gains are captured within the 3 times GDP per capita estimate.

Calculating Benefit-cost ratios

Costs are summed for the entire period of analysis and converted from US$ 2014 to HTG 2016 using data from IMF World Economic outlook April 2016, in order to be consistent with the valuation of health benefits in HTG 2016.

Estimates of costs and benefits were discounted at 3, 5 and 12% discount rate. Benefit-cost ratios (BCRs) were calculated by dividing the total benefits with the total intervention costs. This ratio estimates the return on investment, i.e., the economic benefits that would be realized for each dollar invested.

3. Results and Discussion

3.1 Direct benefits

Table 11 indicates the additional number of services that would be provided if expanding towards a coverage level of 80% or 95%. Direct benefits would include averting as much as 6,000 new infections and over 35,000 AIDS deaths (table 12) over the 19 year time frame. Table 12 also illustrates the gains in QALYs, which is used to derive Healthy Life Years gained, which are then valued in economic terms.

Table 11. Number of average annual additional number of people reached with services in scenarios with an increase in coverage to 80% and 95% target coverage, compared with a constant coverage scenario, (average for 2018-2036)

	Additional number of people reached, average by year			
Scenario	VCT	PMTCT	ART	Cotramoxazole for children
80% coverage target	7,899	78	15,174	259
95% coverage target	10,897	228	30,321	412

Table 12. Projected health outcomes, total 2018-2036

	Target coverage	New infections	AIDS deaths	New infections averted	AIDS deaths averted	Gain in QALYs
Baseline	current coverage maintained	10,290	65,284	N/A	N/A	N/A
Treatment as prevention (TasP) scale-up scenarios	80%	5,766	45,667	4,524	19,617	257,159
	95%	3,735	30,016	6,555	35,268	441,165

The TasP strategy will result in reduced deaths and disability of HIV+ persons on treatment, as well as a reduced viral load of persons on treatment. The reduction in viral load reduces transmission rates, thus leading to multiple outcomes: fewer deaths, lower disability, and smaller numbers of new infections.

3.2 Cost projections

As shown in Table 13, programme cost is a considerable cost driver, wheras service delivery costs make up a more modest share of estimated additional cost.

Table 13. Breakdown of costs for incremental scale- up of Treatment as Prevention, by type of input, US$ millions (US$2014 and HTG2014)

Target level	Commodities	Service Delivery	Supply chain	Programme cost	Total
80% Coverage Target, Absolute amount USD	5.4	0.6	0.9	0.5	7.4
80% Coverage Target, Absolute amount HTG	245.5	25.4	40.3	24.3	335.4
Percentage share of costs	73%	8%	12%	7%	100%
95% Coverage Target, Absolute amount USD	10.8	1.1	1.8	0.8	14.5
95% Coverage Target, Absolute amount HTG	490	49.8	80.3	37.6	657.7
Percentage share of costs	74%	8%	12%	6%	100%

The additional cost per capita to expand TasP is estimated at USD 1.2.

3.3 Benefit-cost ratios

Benefit-cost ratios are presented in table 14. Scaling up interventions to 95% coverage result in higher BCRs than 80% because benefits are greater as programmes go to scale.

Table 14. Benefits, Costs, and Benefit-Cost Ratios relative to expanding coverage beyond current coverage (incremental scenario), at a 5% discount rate

Target coverage	Benefits (New Present Value)	Costs (New Present Value)	BCR
80%	21,455,366,548	7,056,396,328	3.04
95%	36,676,541,077	11,740,016,921	3.12

Benefits are valued at 3x GDP. Costs and benefits discounted at 5%.

Table 15 provides results for three discount rates: 3%, 5% and 12%. Annex 4 also presents results for Benefit-Cost Ratios relative to a Null scenario. BCRs are higher when compared to a Null scenario because the (hypothetical) benefits are so much greater when increasing coverage from a (hypothetical) situation of zero coverage.

Table 15. Summary Table for Benefit-Cost Ratios, based on projected health impact relative to projected cost, at selected discount rates (incremental scenario)

Interventions	Discount	Benefit	Cost	BCR
Treatment as prevention (95%)	3%	45,667,064,265	13,927,730,727	3.28
	5%	36,676,541,077	11,740,016,921	3.12
	12%	18,844,109,292	7,133,709,632	2.64

Notes: Benefits valued at 3xGDP

The quality of evidence is discussed in section 3.5 below.

3.4 Discussion

Our analysis indicates that expanding the Treatment as prevention (TasP) strategy in Haiti could have a BCR of 3.1, when measured over a 19-year time period. HIV/AIDS investment cases from other regions have argued that investing $100 million in countries such as Kenya and Thailand could lead to gains of 3

to 4 times the investment, due to averted treatment expenditure and labour productivity gains.[24] While we did not explicitly value labour productivity gains, such results are in line with our findings for test and treatment.

A limitation of our analysis is that it doesn't compare TasP with other packages focusing on preventing risky behaviors, such as interventions targeting commercial sex workers and other high risk groups. However, given that preventive interventions take longer to avert infections and deaths, a preliminary scoping exercise suggested that such packages would have lower predicted BCRs in our model when considering outcomes over the next 20 years. The effect of incubation on HIV, and the time to death without treatment, (which can be 8-11 years), may result in limited impact within a twenty-year timeframe for preventive interventions. ART on the other hand is very effective at reducing deaths in the existing infected population, and averting new infections via reductions in viral load. This is not to say that preventive interventions shouldn't be expanded in the Haitian context, as they can play an important role in a fast-track strategy towards ending AIDS (Stover et al , 2016).

Haiti's HIV epidemic includes both substantial new infections in the general population, as well as high risk groups. Given this duality, it would still be important for the national HIV/AIDS programme to undertake preventive activities to address the epidemic; in particular to target marginalized and high risk groups. The case for investing in preventive interventions can be made based on other criteria than economic evauation, in particular preventing infections among marginalised groups from an equity perspective.

The Haiti multisectoral strategic plan for HIV/AIDS 2018-2023 discusses a number of implementation challenges. While knowledge of available HIV/AIDS services is relatively high, stigma surrounding the use of these services is an impeding factor. Acceptance and uptake varies across socio-economic groups. Various policy strategies will therefore be important to reduce stigma and ensure more people seek testing and treatment.

Wih respect to implementation challenges, our analysis adopts a generalized approach and has not looked at context-specific bottlenecks and how to overcome these (such as stigma and cultural beliefs). In reality, a number of factors will affect the outcomes of the program, such as:

[24] http://www.unaids.org/sites/default/files/media_asset/20131130_smart-investments_en_1.pdf

- People who choose to initiate treatment might reduce their use of other HIV prevention strategies because of the communication around TasP as effectively reducing transmission rates. It is therefore important to develop communication strategies to announce that TasP is not fully effective at preventing HIV transmission, and there will still be a need for other preventive interventions such as mass media and condom distribution.
- The development of an intersectoral approach remains a challenge; including support for non-medical interventions (nutrition, psycho-social, socio-economic support, etc.).
- Moreover, the health sector requires strengthening. For some TaSP services (e.g., PMTCT), a main implementation challenge for long term sustainability would be integration of HIV services into general health services.
- Finally, sustainable financing and reduction in dependence on external funding are key challenges for which there is currently no easy solution. It should also be acknowledged that a commitment to TasP can pose challenges for future funding for prevention activities unless a certain share of the budget is allocated specifically to prevention. If not, the need to maintain spending to keep people in care and treatment can reduce the funding available for prevention over time.

3.5 Quality of evidence

Overall limitations

Our model assumes an instantaneous jump to 80% or 95% coverage in year 2, which is obviously not meant to be realistic. The approach nevertheless provides an indicative estimate on the benefts and costs of implementing HIV/AIDS intereventions, which can be compared against other investment options.

Overall strength

Our analysis entails running a country-contextualized model to project the healthy life years gained, and then translate these into economic benefits. The GCEA-Spectrum approach can be completely customized to the local context, and thereby adds significant added value compared to alternative approaches that use pre-published unit costs derived from other settings for the resource needs. Moreover, the model offers transparency regarding the assumptions used and the cost components of each intervention, as opposed to using prior publications of cost estimates, where assumptions around cost and impact estimates may not always be clear to the reader.

Quality of benefit measure

The estimate of health benefits uses the Spectrum models (AIM, GOALS) which are reviewed by the UNAIDS Reference Group on Estimates, Modeling and Projections and is used by UNAIDS at global and country level to project changes in the HIV/AIDS epidemic. Historical trends and baseline data for the epidemic in Haiti have been reviewed jointly with a national team as part of the UNAIDS Estimates process. The Goals simulation model entries were similar vetted with a national team. Effectiveness estimates used in the model are reviewed by the UNAIDS economics modelling review group. We therefore have high confidence in the projection of health outcomes.

At the same time we acknowledge that simulating HIV/AIDS epidemiological trends with a dynamical model will never be a precise match for all years. In this case, the simulation model estimates for the current year (2017) are slightly lower than estimates based on surveillance (1.35% vs. 1.22%). We note that our absolute numbers for impact (new infections averted, QALYs gained etc), may be slightly underestimated due this discrepancy.

The valuation of health outcomes (QALYs) as HLYs follows a standard transparent approach based on QALY weights. The subsequent valuation of HLYs in economic terms follows the standard recommendation of the Copenhagen Consensus to value each HLY (or DALY) gained as 3 times GDP per capita. As shown in section 2.2.2, this is assumed to capture both intrinsic and instrumental values of health.

While we did not explicitly incorporate productivity gains, other studies indicate that people living with HIV may lose up to 5 days of productive work per month due to illness. Future extensions of the work presented here could consider modelling such productivity gains.

Quality of cost measure

Our model uses standardized WHO-CHOICE costs, because of the transparency of these in terms of separating out quantities from price assumptions. We examined available studies carried out in Haiti to contextualize assumptions. However, most standard assumptions were retained. Assumptions behind quantities of resource use are reported transparently, and quantities are reported separately from costs (e.g., number of outpatient visits per intervention; number of people reached per intervention). Such reporting aligns with principles of high quality economic evaluation.

Our focus on provider costs limits the scope of costs included, but this approach is consistent with many analyses in the field. We acknowledge that there is considerable uncertainty surrounding our estimates, including those related to the size of the epidemic, current coverage and the resource needs to provide quality HIV/AIDS services in a Haitian context.

Given the above, we have rated the quality of the estimates as high.

4. Conclusion

This paper estimates the resource needs required to expand HIV/AIDS service provision, and the associated social and economic benefits. Our analysis indicates that providing access to care and treatment for HIV infected patients demonstrate benefit-cost ratios of around 3.

Haiti has adopted a policy and vision of "getting to zero:" zero new HIV infections, zero discrimination and zero AIDS-related deaths. The national strategy has been successful in markedly reducing HIV prevalence and the rate of new infections in recent years. However, maintaining and sustaining current coverage, and expanding this further, will be a challenge in a context where current HIV/AIDS expenditure exceeds the national government health budget.

The issue of stigma remains central to the HIV debate in Haiti. Interventions targeting marginalized high risk groups may face resistance during national budget negotiations. It is therefore likely that external financial assistance will need to be continued to provide HIV/AIDS services in Haiti over the medium- to long term to ensure sustainable financing as people live longer on antiretroviral treatment and will require treatment for a longer period of time; as well as from an equity and human rights perspective.

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Annex 1

This annex provides an example of detailed cost assumptions for PMTCT commodities.

Table A1. Commodity assumptions for PMTCT

Drug/Supply	Percent receiving this aspect of the treatment	Note	Number of units	Times per day	Days per case	Units per case	Unit cost (USD)	Cost per average case (USD)
Testing								
Blood collecting tube, 5 ml	100	For taking blood sample	1	1	1	1	0.24	0.24
Gloves, exam, latex, disposable, pair	100		1	1	1	1	0.06	0.06
HIV rapid test kit	100		1	1	1	1	1.2	1.2
Syringe, needle + swab	100	For taking blood sample	1	1	1	1	0.05	0.05
Infant - Single dose nevirapine								
Nevirapine, oral solution, 10 mg/ml	24	2mg/kg immediately after birth	0.6	1	1	0.6	0.01	0.00144
Nevirapine, oral solution, 10 mg/ml	24	1 dose - 2 mg/kg - assume 3.5 kg baby	0.6	1	1	0.6	0.01	0.00144
Mother - Single dose nevirapine								
Nevirapine, tablet, 200 mg	24	200 mg at onset of labor	1	1	1	1	0.05	0.012
Mother - Dual therapy								
Zidovudine (AZT), capsule, 300 mg	24	600 mg a days starting in week 28	1	2	84	168	0.11	4.4352
Mother - Option A - Breastfeeding								
Zidovudine (AZT), capsule, 300 mg	20	twice daily - start at 14 weeks and end at delivery - mother	1	2	182	364	0.11	8.008
Mother - Option A - Non-breastfeeding								
Zidovudine (AZT), capsule, 300 mg	20	twice daily - start at 14 weeks and end at delivery - mother	1	2	182	364	0.11	8.008
Total cost								22.01608

Annex 2

This annex descrives the approach taken to validate the WHO-CHOICE cost estimates for an outpatient visit against local data available from existing studies carried out in Haiti on service delivery costs. These included:

- Analyse de Coûts du Paquet Minimum des Services de santé (PMS) d'Haïti 2011 (USAID) Santé pour le Développement et la Stabilité d'Haïti / Pwojè Djanm: Analyse de Coûts du Paquet Minimum (PMS) à Haïti, 2011 Cambridge MA: Santé pour le Développement et la Stabilité d'Haïti—Pwojè Djanm; Management Sciences for Health, 2012.
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As an illustrative example, the table below shows data extracted from the USAID (2011) study for selected interventions.

Table A2. USAID (2011) study, average standard cost, 100% coverage scenario *(Haitian Gourde (HTG) and USD)

	Consultation Prénatale, HTG	USD 2011	Vaccination < 5 years BCG, HTG	USD 2011	Match to delivery level in GCEA	Default 2010 cost in Spectrum GCEA (public sector)
Dispensaries ONG	77	1.90	13	0.32	Community	1.26
Zones Ciblées	102	2.52	14	0.35	Outreach	1.26
CSL ONG (Facility without beds)	79	1.95	9	0.22	health centre	1.56
CSL ZC	120	2.96	11	0.27	health centre	1.56
CAL ONG(Facility with beds)	90	2.22	10	0.25	health centre	1.56
CAL Zones Ciblées	77	1.90	11	0.27	health centre	1.56
Average (community and outreach level)	89.5	2.21	13.5	0.33		
Average (health centre level)	91.5	2.26	10.25	0.25		
Average (interventions combined) - community and outreach	51.5	1.3				
Average (interventions combined) - health centre	50.9	1.3				

**Taking only the cost of "Personnel technique" and "Coûts fixes par Service"*

The comparison illustrates a number of points:

- Facility based studies show a large variation in costs for different types of services
- Facility based studies show a large variation in costs between different delivery levels
- Based on a quick comparison, the WHO-CHOICE estimates fall within the same ball park as the locally derived estimates.

The above also illustrated how sensitive the cost assumptions are to which services are included in an average weighted package. To do such weighting is beyond the scope of this project. The comparison suggests that WHO-CHOICE estimates for service delivery costs can be used to inform the analysis.

Annex 3

Estimating programme costs

The programme costs are adjusted to reflect the number of interventions in the TasP package, which includes the following six interventions:

- Voluntary counseling and testing
- PMTCT
- Adults first line ART
- Adults second line ART
- Pediatric ART
- Cotrimoxazole for children

The standard WHO-CHOICE assumption is that a programme running at full capacity and with the resources shown in the table below can support the implementation of 10 interventions at a 100% coverage rate. If running with fewer than 10 interventions, or at a lower coverage rate, certain costs such as those related to human resources and vehicles are reduced. Another example is costs for in-service training and supervision where achieving lower coverage targets require fewer health workers to be trained, and less supervision efforts.

For the Null scenario analysis, every package is compared with a hypothetical "null" counterfactual – therefore the full programme cost estimated for that particular package is applied in the analysis.

Category	Estimated annual cost, thousands (USD 2014)	Costs are adjusted for the number of interventions	Costs are adjusted for the coverage target
Programme-Specific Human Resources	1,455	Yes	No
Training	489	No	Yes
Supervision	2,035	No	Yes
Monitoring and Evaluation	877	No	No
Transport	346	Yes	Yes
Communication, Media & Outreach	25	No	Yes
General Programme Management	140	No	No
SUM	**5,367**		

For the Null scenario analysis, every package is compared with a hypothetical "null" counterfactual of zero coverage – therefore the full programme cost estimated for the TasP package is applied in the analysis.

For the incremental scenario analysis, the programme cost is relative to current coverage. Therefore, only those components that are scaled with coverage are included in the TasP programme costs.

Below we present an example of scaling programme costs for the incremental scenario analysis to 95% coverage. The starting average coverage across interventions included in the package is 52.8%.

Category	Estimated annual cost, thousands (USD 2014)	Rule applied	Resulting value for incremental cost to increase coverage from 52.8% to 95%
Programme-Specific Human Resources	1,455	• Cost depends on the scope of the package • Same cost at all coverage levels	0
Training	489	• Same cost regardless of scope of package • Cost differs according to coverage level	205
Supervision	2,035	• Same cost regardless of scope of package • Cost differs according to coverage level	489
Monitoring and Evaluation	877	• Same cost regardless of scope of package, and for all coverage levels	0
Transport	357*		127
Communication, Media & Outreach	25		11
General Programme Management	140		0
SUM	**5,378**		**832**

Annex 4

Benefit-cost ratios for incremental coverage increase and relative to a Null scenario.

Coverage target level	BCR relative to expanding coverage beyond current coverage, presenged for three discount rates (3, 5, 12%)			BCR relative to a Null scenario, presented for three discount rates (3, 5, 12%)		
	3%	5%	12%	3%	5%	12%
80%	3.18	3.04	2.60	7.07	6.71	5.65
95%	3.28	3.12	2.64	7.25	6.88	5.79

Haiti faces some of the most acute social and economic development challenges in the world. Despite an influx of aid in the aftermath of the 2010 earthquake, growth and progress continue to be minimal, at best. With so many actors and the wide breadth of challenges from food security and clean water access to health, education, environmental degradation, and infrastructure, what should the top priorities be for policy makers, international donors, NGOs and businesses? With limited resources and time, it is crucial that focus is informed by what will do the most good for each gourde spent. The Haïti Priorise project will work with stakeholders across the country to find, analyze, rank and disseminate the best solutions for the country. We engage Haitans from all parts of society, through readers of newspapers, along with NGOs, decision makers, sector experts and businesses to propose the best solutions. We have commissioned some of the best economists from Haiti and the world to calculate the social, environmental and economic costs and benefits of these proposals. This research will help set priorities for the country through a nationwide conversation about what the smart - and not-so-smart - solutions are for Haiti's future.

For more information visit www.HaitiPriorise.com

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Copenhagen Consensus Center is a think tank that investigates and publishes the best policies and investment opportunities based on social good (measured in dollars, but also incorporating e.g. welfare, health and environmental protection) for every dollar spent. The Copenhagen Consensus was conceived to address a fundamental, but overlooked topic in international development: In a world with limited budgets and attention spans, we need to find effective ways to do the most good for the most people. The Copenhagen Consensus works with 300+ of the world's top economists including 7 Nobel Laureates to prioritize solutions to the world's biggest problems, on the basis of data and cost-benefit analysis.