Republic of Niger
Niger Allocative Efficiency and Financial Sustainability Study
Niger’s HIV response: Targeted investments for a healthy future

June 2014

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AFRICA

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Niger’s HIV response:

**Targeted investments for a healthy future**

Findings from the HIV allocative efficiency and financial sustainability study

June 2014
Niger’s HIV response: Targeted investments for a healthy future

Findings from the HIV allocative efficiency and financial sustainability study

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<th>Definition</th>
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<td>ANC</td>
<td>Antenatal care</td>
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<tr>
<td>ART</td>
<td>Antiretroviral therapy</td>
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<tr>
<td>ARV</td>
<td>Antiretroviral</td>
</tr>
<tr>
<td>BCC</td>
<td>Behaviour change communication</td>
</tr>
<tr>
<td>CD4</td>
<td>Cluster of differentiation 4</td>
</tr>
<tr>
<td>CFA</td>
<td>West African currency (franc)</td>
</tr>
<tr>
<td>CHLD</td>
<td>Children aged 0-14 years (Optima model)</td>
</tr>
<tr>
<td>CISLS</td>
<td>Coordination Intersectorielle de Lutte contre le SIDA (National AIDS Coordination Authority)</td>
</tr>
<tr>
<td>CPN</td>
<td>Consultation prénatale (antenatal care)</td>
</tr>
<tr>
<td>DALY</td>
<td>Disability adjusted life year</td>
</tr>
<tr>
<td>DHS</td>
<td>Demographic and health survey</td>
</tr>
<tr>
<td>e-MTCT</td>
<td>Elimination of mother-to-child transmission</td>
</tr>
<tr>
<td>FAD</td>
<td>Females aged 25-49 years (Optima model)</td>
</tr>
<tr>
<td>FOLD</td>
<td>Females aged 50+ years (Optima model)</td>
</tr>
<tr>
<td>FP</td>
<td>Family planning</td>
</tr>
<tr>
<td>FSW</td>
<td>Female sex worker</td>
</tr>
<tr>
<td>FYTH</td>
<td>Females aged 15-24 years (Optima model)</td>
</tr>
<tr>
<td>GAR</td>
<td>Gross attendance rate</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross domestic product</td>
</tr>
<tr>
<td>HCT</td>
<td>HIV counselling and testing</td>
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<tr>
<td>HDI</td>
<td>Human development index</td>
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<tr>
<td>IEC</td>
<td>Information-education-communication</td>
</tr>
<tr>
<td>IMF</td>
<td>International Monetary Fund</td>
</tr>
<tr>
<td>KFW</td>
<td>Kreditanstalt fuer Wiederaufbau</td>
</tr>
<tr>
<td>LRP</td>
<td>Low risk population</td>
</tr>
<tr>
<td>MAD</td>
<td>Males aged 25-49 years (Optima model)</td>
</tr>
<tr>
<td>MARP</td>
<td>Most at risk populations (also called Key populations)</td>
</tr>
<tr>
<td>MDG</td>
<td>Millennium development goal</td>
</tr>
<tr>
<td>MICS</td>
<td>Multiple indicator cluster survey</td>
</tr>
<tr>
<td>MIN</td>
<td>Mine workers (Optima model)</td>
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<td>MIG</td>
<td>Migrants and mobile populations (Optima model)</td>
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<tr>
<td>MINH</td>
<td>Maternal, neonatal and infant health</td>
</tr>
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<td>MOLD</td>
<td>Males aged 50+ years (Optima model)</td>
</tr>
<tr>
<td>MSM</td>
<td>Men having sex with men</td>
</tr>
<tr>
<td>MSP</td>
<td>Ministère de Sante Publique</td>
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<tr>
<td>MTCT</td>
<td>Mother-to-child transmission</td>
</tr>
<tr>
<td>MYTH</td>
<td>Males aged 15-24 years (Optima model)</td>
</tr>
<tr>
<td>NASA</td>
<td>National AIDS spending assessment</td>
</tr>
<tr>
<td>NDHS</td>
<td>Niger Demographic and health survey</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-governmental organisation</td>
</tr>
<tr>
<td>ONPPC</td>
<td>Office National des Produits Pharmaceutiques et Chimiques</td>
</tr>
<tr>
<td>OVC</td>
<td>Orphan and vulnerable children</td>
</tr>
<tr>
<td>PCR</td>
<td>Polymerase chain reaction</td>
</tr>
<tr>
<td>PDES</td>
<td>Economic and Social Development Plan (2012-2015)</td>
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<tr>
<td>PDS</td>
<td>Health Sector Development Plan (2011-2015) also HSS (Health Sector Strategy)</td>
</tr>
<tr>
<td>PEP</td>
<td>Post-exposure prophylaxis</td>
</tr>
<tr>
<td>PICT</td>
<td>Provider initiated counselling and testing</td>
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<tr>
<td>PLHIV</td>
<td>Person living with HIV</td>
</tr>
<tr>
<td>PMTCT</td>
<td>Prevention of mother-to-child transmission</td>
</tr>
<tr>
<td>PRI</td>
<td>Prisoner (Optima model)</td>
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<tr>
<td>Q1-5</td>
<td>Wealth quintiles 1 (lowest 20%) to 5 (highest 20%)</td>
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<td>RBF</td>
<td>Results based financing</td>
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This study was funded by the World Bank Group with UNAIDS support for two technical advisers. The views expressed in this report do not necessarily represent the position of the World Bank or UNAIDS.
Executive Summary (providing the main conclusions and full policy recommendations)

Niger has seen significant progress in economic development and in the reduction of extreme poverty. Economic growth was over 11% in 2012, thanks to oil, uranium and agricultural production. The percentage of people living on less than $1.25/day has reduced from 66% in 2005 to 44% in 2008, which means Niger scores above the sub-Saharan African average of 49% in 2008. Average income has increased from $586 in 2000 to $701 in 2012 (expressed as the GNI per capita in PPP terms, constant 2005 international $). The positive changes are mirrored in the improved life expectancy at birth, raising from 39.5 years in 1980 to 48.3 years in 2000 and 55.1 years in 2012.

Despite these encouraging statistics, people’s living conditions remain challenging. Food insecurity persists even in years when production yields a surplus. About 60% of households are only able to cover their food requirements for three months, and in periods of food shortages, half of the population suffers from malnutrition. The average duration of schooling of adults is a mere 1.4 years, despite massive expansion of the education system. As a consequence, Niger remains with one of the lowest literacy rates in the world.

The provision of health services is dominated by the public sector, with 829 Integrated Health Centres which are linked to over 2,000 health posts managed by community health workers. Higher level care is delivered by 33 district hospitals spread across the 42 health districts, nine regional public health departments with six regional hospitals, as well as several reference hospitals and maternity centres. Approximately 47% of the population live within five kilometres of a health facility, but in some of the rural health districts, access is much lower. In Niamey city, close to 100% of the population has good geographical access to public sector health provision, which translates into comparatively better service use statistics in the capital than elsewhere. Overall, health sector capacity is insufficient, compounded by the fast population growth leading to doubling of the population every 23 years.

In 2011, health spending accounted for 5.1% of GDP (Euro 225 million or USD 303 million), dominated by the public sector (57% of total) and private out-of-pocket spending (39% of total). External financing accounted for about one-third of all health spending (WHO, 2014). Spending on HIV care and treatment accounted for about 1.6% of total health spending, and 2.7% of public health spending in 2011, while HIV/AIDS was responsible for an estimated 1.4% of all Years of life lost in 2010 according to the Burden of Disease Study.

As Niger moves forward on its development path, it is an opportune time to review the scale and trajectory of the HIV epidemic, and the investment needs today to appropriately address the current and future burden of disease posed by HIV/AIDS. It is particularly relevant to explore how Niger can ensure HIV investments are of high-impact and sustainable, and how they can best support Niger’s overall health system and development priorities. Equally, it is important to explore how the Niger government can contribute its “fair share” to the HIV response, in agreement with the 2013 resolutions made by political leaders at the Abuja Summit: to step up the mobilization of domestic resources to strengthen the health system and ensuring diversified and sustainable financing for health.
The HIV allocative efficiency and financial sustainability study

The main objective of the study was to provide the Government of Niger with a comprehensive analysis on HIV financing needs and investment opportunities in the context of its HIV National Strategic Plan (NSP) 2013-2017, its health financing environment and health system development. Such an analysis supports decision-making on HIV policy options, investment scenarios and programmatic targeting and prioritisation. It also helps Niger make the case for investment for HIV and health impact, and provides estimates of health care savings thanks to investments.

This analysis was implemented by the World Bank in collaboration with UNAIDS based on a request for analytical support from the Government of Niger. The study involved a desk review of HIV- and health-related evidence, epidemic trends and financial modelling. The UNSW-WB Optima model (formerly Prevtool) was used for estimating optimal resource allocation during the NSP and the impact and cost-effectiveness of past HIV investments. A financial commitment framework was used to estimate longer-term costs and savings of the HIV program and the fiscal dimension of HIV in Niger.

In this executive summary, we summarize the main conclusions, insights and the policy recommendations emanating from this analysis.

1. Health and development challenges in Niger

**Conclusion:** The health transition in Niger is in its early stage with communicable diseases and poverty-related conditions dominating the disease statistics, while malaria and HIV/AIDS are the leading emerging diseases

In Niger, newborn, nutritional and maternal causes such as diarrheal diseases, lower respiratory infections, and protein-energy malnutrition as well as several communicable diseases including malaria, meningitis, measles and tetanus, remain the top drivers of health loss. Non-communicable diseases are a minor but emerging health issue, responsible for 18% of all DALYs according to the comprehensive international 2010 Burden of Disease Study.

Rapid demographic growth is a central issue in Niger’s development process. The rate of growth has hardly changed in the last 20 years and was at 3.9% in 2012. In rural areas, women give on average birth to 8.1 children, in urban areas, to 5.6 children. Women with secondary education have on average 3.1 fewer births than women without education, highlighting the profound role education plays in Niger’s demography.

HIV/AIDS has, together with malaria, however been the leading cause of emerging disease burden over the last 20 years. Compared to other African countries, the burden of HIV/AIDS is relatively small (see Figure 1, combining HIV/AIDS and TB), and is therefore a more manageable public health issue. Nevertheless, several top causes of local disease burden – iron deficiency anemia, malnutrition, TB and diarrhea – interact with the immunocompromised status of HIV-positive individuals and are likely to accelerate disease progression and morbidity. Within the context of such large scale health challenges in Niger, managing HIV well and integrated ways will help to contain the share of health financing.
2. HIV epidemic dynamics

**Conclusion:** The low grade HIV epidemic is in decline, but unless strong action is taken to intervene, there is a possibility that new economic-growth-related cofactors such as mining, urbanisation, economic development, and migration could result in increases in new infections in future years.

*Empirical data from HIV surveys* suggest a contracting HIV epidemic in Niger: HIV prevalence has decreased rapidly, both in the general population and in key populations. The modest HIV prevalence decreases in urban females may be linked to a combination of risk behaviours in towns (leading to new infections), and the relatively good access to ART (keeping HIV-positive women alive).

The stable HIV prevalence in prisoners speak of a sub-epidemic in correctional facilities with continuing high risk behaviours among prisoners and possibly the influence of ART provision on HIV prevalence levels. The cultural practice of circumcising males has spared Niger from a generalized epidemic, and will continue to reduce the HIV transmission probability from men to women (this analysis estimated over 200 million unprotected sexual acts to occur every year, or 90% of all sexual acts in Niger).

*Modelled epidemic trajectories* – which are developed using empirical HIV prevalence data – suggest that HIV transmission has declined sharply, form a peak level of 8,470 new HIV infections in 2000 to 1,450 in 2013 (Spectrum 2013). The Optima model predicts that the HIV incidence decline of the past will extend into the future provided that current HIV response is maintained that that there are no changes in exogenous factors that could influence HIV transmission dynamics (*Figure 2*, by sub-population).
However, the wider context of the HIV epidemic in Niger is changing:

(i) **Urbanisation**: Niger’s urban population growth: Niger’s epidemic has always been of an urban type, and the urban population is growing at 6.2% (significantly higher than the 3.9% nationally). Urbanisation is often linked to risk behaviours outside the controlling village context, to disrupted family life, poor living conditions and transactional sex for survival or for affording modern consumer goods, especially among young females.

(ii) **Rapid economic growth**: The changing wealth levels with economic growth at 11% -- economic growth is associated with better income levels and the availability of disposable income, which is among Niger’s men linked to buying sex (note that HIV is now concentrated in the wealthiest 40% of men).

(iii) **Mining sector developments**: The development of the petroleum and mining sector has already meant that SWs relocated from Niamey – where there is specialist HIV services available for them – to the mining zones and petrol fields. The availability of jobs, infrastructure development and growing economic opportunities encourage migration and mobility, which create risk contexts for HIV (survey data show a clear link between men’s sexual risk behaviours to mobility and being away from home).

(iv) **Low literacy**: All the while, a chief protective factor for HIV risks – school education - has shown stagnation in Niger, mainly due to the very rapid increase of children at school age. In 2012, HIV prevalence was lowest in the most educated population segment (secondary education or above) with only 0.1% of men and 0.2% of women HIV infected.

These changing factors could put HIV gains of the past at risk, if concerted HIV prevention efforts are not maintained.

**Recommended policy actions:**

1. The government must continue to undertake strategic HIV monitoring activities, especially in key populations at higher risk – this includes FSW, sex work clients in the mining areas and young urban females. Only if HIV prevalence is well tracked in these populations can the
risks of mining industries, urban and economic development be assessed and specific interventions be designed. There is a need for vigilance and for excellent strategic information on the epidemic dynamics. HIV prevalence in sex workers should be a key performance indicator of the HIV program.

2. Social sector investments, especially those in the education sector and in family planning/reproductive health, will greatly benefit the HIV agenda and should be seen as integral part of a broad and powerful response mitigating future HIV risks – improved literacy, better employment opportunities for females, reduced fertility and better reproductive health are all closely linked with the future trajectory of the epidemic.

3. Retrospective impact and cost-effectiveness of past HIV investments

**Conclusion:** Past HIV investments have contributed significantly to the decline in HIV incidence.

The impact of historical HIV expenditures on the prevention of new HIV infections was estimated using the Optima model. It was estimated that HIV spending from 2007-2012 averted close to 3,900 infections in these six years (Figure 3). However, the downstream effects of these prevented infections are much larger, since secondary HIV infections and further onward transmission were also averted. By 2035, the spending from 2007-2012 will have averted an estimated total of 12,600 infections, at a cost of Euro 3,500 (USD 4,700) per infection averted if only HIV program spending is considered, and Euro 4,600 (USD 6,200) if all HIV spending - including management and coordination costs - is included. This is slightly higher than some cost-effectiveness ratios in other countries (e.g. Vietnam HIV program USD 890-1200 per infection averted, MSM program Thailand USD 1,600-6,400), suggesting that it might be possible in future to implement the same programs for lower cost without compromising their effectiveness.

**Figure 3. Number of infections averted by historical HIV spending from 2007-2012, Niger (2007-2035)**

Based on the common understanding of how epidemics spread from core groups, second-order investment benefits are particularly high when HIV programs target high HIV incidence populations like FSWs. The modelling findings suggest that incidence reductions were indeed greatest in FSWs (from about 3.5% annual HIV incidence in 2000 to about 1.1% in 2012), but had knock-on effects in other populations like the sex work client populations and even low-risk populations. In the absence of any other major programs being implemented, it can be reasonably assumed that some of the HIV incidence reduction in FSWs after 2000 are attributable to the SIDA-3 program, however, no evaluation has been conducted of SIDA-3’s impact in Niger.

**Recommended policy action:**

3. **Strengthen capacity for the country to undertake analytical work on impact and cost-effectiveness of HIV investments through partnerships and capacity building** – Niger disposes of a large body of HIV monitoring data and needs to prioritize evaluation and learning in order to strive for high-impact, high-return HIV strategies in a resource-constrained health funding environment. Cost-effectiveness and return-on-investment data make powerful economic arguments for HIV investments, and improve our understanding of best investments in a changing epidemic context.

4. **Increasing the future impact of Niger’s HIV response -- “More health for the money” -- through more efficient allocations of funds to priority programs**

**Conclusion:** Niger’s HIV response can achieve more value for money; with the resources already committed until 2017, the country can achieve an estimated additional 12% reduction in HIV incidence if HIV resources are allocated optimally.

**Better allocation of HIV resources could increase the number of new HIV infections averted:** The modelling analysis on optimal resource allocation during the NSP period of 2013-2017 for best HIV incidence reduction was based on the amount of funding already acquired by end 2013 for the four remaining years of the NSP (annual average Euro 4.8 million or USD 6.5 million). Although this amount is lower than the 2012 expenditure (Euro 12.5 million or USD 16.3 million), the optimisation model predicts that an additional 12% reduction in new HIV infections could be achieved from 2014-2025, if resources were allocated differently than in 2012 (Figure 4).
**Figure 4. Cumulative infections over 2013-2025 that would result from different spending scenarios, Niger**

(no spending, a continuation of 2012 spending, and optimized spending at various budget levels relative to expected funds available 2014-2017)

This analysis recommends higher funding allocations for ART, PMTCT and FSW programs, and lower allocations for untargeted activities for the low-risk population (Figure 5). The rapidly increasing management costs forecast in Niger’s resource needs model are higher than inflation (currency inflation at 3% plus population growth at 4% combined). An efficiency of about Euro 1.7 million (USD 2.3 million) could be gained from 2014-2017 if management costs grew at inflation only. An approximate estimate on additional resource needs over the four years if the CD4 treatment threshold was raised to 500 was 12%, however, this would require more in-depth analysis using detailed program data, unit costs and assumptions on delivery models.

**An HIV incidence reduction of 50% is only feasible in the longer-term, according to this analysis.**

- Halving HIV incidence during the NSP period would be very costly. It is estimated that achieving this HIV prevention goal by end 2017 would cost Euro 24 million (USD 32.3 million) per year - 500% of the currently acquired budget of an average Euro 4.8 million (USD 6.5 million) annually from 2014-2017, with optimized program allocations.
- In contrast, halving HIV incidence by 2025 is more feasible. It is estimated that this would cost Euro 5.52 million (USD 7.42 million) per year - 115% of the average acquired budget of 2014-2017, and substantially lower than the total expenditure of 2012 of Euro 12.5 million (USD 16.3 million).

**Better program (technical) efficiency could save even more funds:** There is a large difference in ARV prices between the Global Fund procurement system and the government tender system. This is not causing much extra costs currently since most ARVs are purchased by Global Fund system, and only a small volume of ARVs is purchased via the government system (the small size of these orders is partly responsible for the higher pricing).
Sources: Spending data from NASA; Niger epidemic, demographic, behavioural and service data in the populated Optima model. Note: “Current” = 2012 spending pattern. OVC, blood, PEP, waste, and management costs were kept fixed. Condoms are part of the HIV intervention packages for the different populations. FSW = Female sex workers, MARPs = A combined group of prisoners, migrants, men having sex with men, uniformed security/defence personnel, mine workers and truckers, LRP= A combined group of general population females and males aged 15+ years.

Recommended policy actions:

4. **Strive towards better value for money in the HIV program, using epidemic and programmatic intelligence and analytical approaches to identify savings, efficiencies and higher-impact scenarios** – Niger is unlikely to be able to close its NSP resource gap of almost Euro 45 million (USD 60 million) for the four remaining NSP years. However, this analysis suggests that more impact can be obtained from optimal resource allocation across priority programs and data-informed geographical targeting. Resource allocation towards the highest risk population – female sex workers – undoubtedly provides value for money. Management and coordination costs need to be contained with integration of HIV and health administration where possible.

5. **Funding needs to be shifted towards ART, PMTCT and FSW programs, and away from untargeted activities for the low-risk population, with budget splits depending on total resource availability.** Based on empirical data and impact modelling, SW-related investment should be significantly increased to circa 4% of the annual HIV budget – this is likely to prevent an extra 7,000 new HIV infections over 10 years (with the already acquired NSP resources of Euro 4.8 million/USD 6.5 million annually).
6. Review the government procurement system for ARVs with the aim to gain efficiency – Although most ARVs are purchased through the Voluntary Pooled Procurement system currently, there is a need to ensure better ARV prices can be achieved in the Government tender system, as ARV needs grow with an increasing number of people on ART.

5. Geographical targeting of priority programs

**Conclusion:** Niger’s HIV response can capitalize better on targeting resources to areas of high HIV burden and to hotspots of transmission

As HIV epidemics contract, data-informed targeting of HIV interventions becomes of prime importance in order to continue to drive down HIV transmission. Although people on ART are overall less infectious (lower viral load), they represent a reservoir of HIV. This reservoir is growing annually as more people enter the ART program. Some resources must therefore be targeted towards maximizing viral suppression in the ART patient population (such as treatment adherence, drug resistance monitoring). This analysis estimated that within six years, the number of people living with HIV (PLHIV) in Niamey has increased from below 9,000 to about 12,000, partly due to ART improving the life expectancy of PLHIV.

As regards the geographical distribution of PLHIV, this study estimated that just over a quarter of them live in Niamey (circa 26% in 2012), and that over half of all PLHIV reside in either Niamey, Dosso or Tahoua. About 70% of PLHIV live in one of four regions in the South-West covering only a quarter of the country surface area. Agadez and Diffa probably had the lowest PLHIV numbers in 2012 compared to the other regions. In the scale-up of PMTCT, a phased approach may be recommended considering the regional distribution of PLHIV and the urban nature of the epidemic. Data support a PMTCT scale-up in a first phase in the South-West of the country and in towns.

With HIV prevalence at 17% in female sex workers compared to HIV prevalence below 1% in most populations, targeting of areas where sex work takes place is a prerequisite to success in HIV prevention in Niger (towns, petrol/mining zones, infrastructure construction areas, etc.). There is an estimated 2.3 million unprotected commercial/ paid sexual acts each year in Niger (compared to over 200 million regular sexual acts). Condom promotion has to address this programming gap first and foremost, given the disproportionate contribution of sex work to ongoing HIV transmission.

Epidemiological data from prisons suggest that there is increased HIV transmission in these settings. The targeting of HIV and health resources to prison populations remains important with HIV prevalence levels at 2.7% in prisoners. Concerning men who have sex with men (MSM), there is a lack of data to support service targeting. It is possible that better targeting of male sex workers could be a first step. The UNAIDS Investment Framework recognizes that targeting of key populations is done in a larger context of reduction of stigma and discrimination. The strengthening of an enabling environment is necessary to support the effectiveness and efficiency of program activities which can be affected by barriers to service use due to key populations’ social exclusion, marginalization and criminalization.

**Recommended policy actions:**

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7. **Shift resource allocations away from untargeted activities for the largely HIV negative population to the populations where HIV impact can be gained** – Most important target populations are all types of FSW, high-risk MSM, people on ART, PLHIV diagnosed but not yet on ART, prison populations, and pregnant women in areas of higher HIV prevalence. These targeted allocations should consider the necessary actions to improve access to services such as the reduction of stigma and discrimination and community mobilization.

8. **HIV testing and case finding must be targeted to places where yield is likely to be high** - such as in outreach activities and services for key populations, STI clinics, spouses of known PLHIV, malnutrition screening for infants. For efficiency, these HIV testing activities should be accompanied by capacity strengthening of health professionals on topics such as non-discrimination, informed consent, the obligation to treat, and confidentiality. Especially for key populations, it is important that health services are welcoming and supportive.

9. **Companies, especially those attracting migrant labour and those in the petrol/mining sector, should be required by regulation to provide a minimum package of HIV/health services to employees** – in some cases, companies should be required to support interventions in the surrounding communities.

### 6. Improving the implementation efficiency of programs for female sex workers

**Conclusion:** Sex work-related interventions have lacked focus and investment, despite their epidemiological, cost-preventing and humanitarian importance. The Implementation of FSW programs can improve so as to improve quality, coverage and reach.

An estimated 28,000 FSWs operate in Niger, but there is consensus that the real figure may be larger with clandestine and hidden SWs going un-counted (mapping in four regions merely counted 3,200 FSW, illustrating the challenge of understanding the true size of this heterogeneous population). With FSW 43 times more likely to be HIV-infected than females in the general population, the previous sections has made it clear that HIV prevention services must focus on these populations. According to expenditure statistics, less than 1% of HIV expenditure was for sex work-related interventions. Budget optimisation with Optima suggests that if about 4% of the annual budget could be spent on comprehensive, quality services for FSWs, Niger’s future HIV incidence, AIDS morbidity and mortality could be minimized and the Government’s HIV policy objectives could be achieved.

In the past, especially within the regional SIDA-3 project, FSW HIV prevention service provision and medical follow-up was provided through specialized, adapted services. One such service site has remained, in Niamey, and while integration and mainstreaming of services for key populations is a reasonable policy, it has not worked well in Niger. Only 41% of FSW in Niamey are enrolled in the “Suivi medical”, and these are predominantly foreigners who enrol for administrative purposes. The variation in FSW’s HIV prevalence in different geographical areas, ranging from zero to 31%, is largely unexplained, although proximity to Nigeria seems an important risk factor. A history of

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violence is associated with highly increased HIV risk (32%), and perpetrators can include the very officers who should protect FSW. Well over half of surveyed FSW are divorced (and others widowed or separated), pointing to sex work as a livelihood option for women lacking protection and family support.

Importantly, sex for money or gifts is not limited to FSW but may be frequent among other female key population members, as well as young females practicing transactional sex. Female defence and security personnel is many times more likely to be HIV positive than their male colleagues (7.7% versus 0.1%), and the same increased HIV risk applies to female teachers, prisoners and labour migrants. With male circumcision partially protecting men from infection, women experience much higher biological vulnerability to HIV. Circumcision among females (female genital mutilation, at 2% in adult females according to the NDHS 2012) can promote the spread of infections through the use of contaminated objects, and an increased risk of bleeding during sex can increase the risk of HIV transmission. The increased prevalence of herpes in women who have undergone female genital mutilation could also increase the risk of HIV infection.  

FSW data speak of the very rapid acquisition of HIV once females enter the sex industry, with street prostitution less safe than brothel-based sex work. Male sex work is little documented, but over half of surveyed MSM get paid for sex. MSM are the least understood key population in Niger. Some MSM are married, some identify bisexual. The MSM epidemic – of unknown scale - is not self-contained and MSM related transmission extends through sexual networks to the general population.

This analysis shows and concludes that more investment is required for SW-related interventions, with SWs being a population which is underserved currently. Such investment, preventing direct but also downstream infections linked to sex work, are expected to have a large impact on the future course of the HIV epidemic, as well as on the human and financial cost of AIDS.

Recommended policy actions:

10. In order to guide programming and targeting of SW interventions, better strategic information on FSW, female key population members and high risk (soliciting) MSM should be collected – the ongoing work on FSW mapping and site identification needs to be further strengthened towards a program science approach. More needs to be known about FSW typologies, the profiles of the venues they find clients, the profile of the hard-to-reach FSW, sexual risk behaviours including transactional sex among female defence and security personnel, female teachers, female prisoners and female labour migrants (through oversampling of females in bio-behavioural surveys and qualitative studies), as well as young urban women.

11. The government in partnership with the NGO and private sector should offer evidence-informed services which meet the specific needs of sex workers – an important part of improved service provision is demand creation among SW through various strategies like specially trained peer educators who can gain access to harder-to-reach SWs (who may have very high risks due to their young age, working conditions as clandestines, and lack of protection). The ongoing scale-up of SW interventions must work towards ambitious service targets which go beyond the numbers of SWs known at the outset, reflecting successful demand creation and outreach to the clandestines. Police and security forces have an important role to play in the implementation by ensuring the protection of SWs against

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3 Small sample sizes warranting more investigation and female oversampling in future BSS activities.
4 http://www.who.int/reproductivehealth/topics/fgm/health_consequences_fgm/en/
discrimination and acts of violence and hence contributing to their equitable access to all health services. Police and security forces must be sensitized on HIV and on their role in the response to the epidemic, including the handling of cases of sexual violence.

7. Improving the efficiency of implementing Niger’s antiretroviral treatment program through better integration with health services

**Conclusion:** Access to ART is insufficient and AIDS-mortality high; shifting resources to the ART program will reduce future AIDS deaths and disease, and new HIV infections

By the end of 2012, the estimated ART coverage was 13% in children and 51% in adults. This means that about 14,000-15,000 HIV infected Nigerians should be receiving ARVs but don’t. Men are more likely to miss out on treatment, their ART coverage is estimated at only 45% (57% in women). This is linked to very low HIV testing rates in men of 2-3%. There are demographics where HIV testing is particularly low despite elevated HIV prevalence levels: Men in Diffa and Dosso, and men above 30 years of age.

Low ART access leads to AIDS deaths. The rapid decline in HIV prevalence from 2006 to 2012 in particularly in urban men (1.3% to 0.5%), but also rural women and men (0.5% to 0.2%, 0.6% to 0.3%) is indicative of high AIDS mortality. In countries with high ART access and retention, HIV prevalence tends to stabilize or even increase, so although decreases in HIV prevalence are desirable, they should not arise from excessive AIDS mortality. Anecdotal evidence points to people accessing ART very late, especially men, who are less frequently in contact with health services. There may be challenges in retention of ART patients (no documentation identified), and ARV availability at decentralized level has not always been maintained (while there is a surplus of ARVs at central level). A large part of ART patients will experience food insecurity and malnutrition - the vicious cycle of no farming, no harvest - which can impair drug adherence and treatment success. According to Spectrum, an estimated 3,360 PLHIV died in 2012 due to an AIDS-related cause, and the total cumulative number of AIDS deaths in Niger up to end 2012 is estimated at 68,730.

The insufficient scale-up of the ART program and weaknesses in HIV case finding have to be seen in the context of Niger’s health system. Over half of all residents live outside the 5 kilometer catchment area of health facilities (however, in Niamey nearly all residents are within the catchment areas). Newborn, nutritional and maternal causes such as diarrheal diseases, lower respiratory infections, and protein-energy malnutrition as well as several communicable diseases including malaria, meningitis, measles and tetanus, remain the top causes of morbidity and mortality. Health sector capacity is insufficient, compounded by the fast population growth leading to doubling of the population every 23 years. However, AIDS (and malaria) are the leading emerging diseases in Niger according to the comprehensive international Burden of Disease Study, and therefore require attention.

The Optima analysis supports a 50% HIV budget allocation to the ART program (which includes ARVs, laboratory monitoring, psychological and nutrition support, out-patient and in-patient services), almost double from the 26% in 2012. While the roll-out of the ART program must be national, a phased scale up may be justified given the large concentration of PLHIV in four regions (circa 70% of PLHIV in the four regions covering a quarter of the country surface area).

**Recommended policy actions:**
12. More resources need to be shifted towards the ART program in order to optimize treatment impacts on HIV incidence and DALYs – allocating half of the budget to the ART program would allow investments in program infrastructure (like diagnostic equipment), human resources (including capacity building, task shifting activities), supply chain strengthening (including management information systems, decentralization of ARV prescription), patient and adherence monitoring through community-based health workers. ART program efficiency will be greatly improved through the closing of such resource gaps and better data along the ART cascade.

13. With more investment into the ART program, pre-ART services could be strengthened and innovated, and the treatment threshold could be raised to initiate more PLHIV on treatment especially men – diagnosing people as HIV positive and then losing them again until their health has seriously deteriorated is a great inefficiency, and contributes to ongoing HIV transmission. There are good practices documented internationally on linkage and retention in pre-ART care\(^5\) which can be applied in Niger’s context. Gradually switching from PMTCT options A and B to option B+ will further help scale-up ART.

14. Institute systematic monitoring of CD4 count at treatment initiation, separately for men and women, to track progress in implementation of the treatment policy (threshold 350 or potentially 500) – although CD4 capacity is still being strengthened (and represents a priority action), systematic recording of this key indicator on ART access must be initiated where CD4 counting is done at treatment initiation, and the indicator must be used for performance monitoring (an increasing CD4 count at initiation shows better and earlier access to treatment). For efficiency, it is important to resolve the technical bottlenecks associated with low testing numbers such as the capacity of handling of the test machines.

15. Provider-initiated counselling and testing must be selectively scaled up for HIV case finding – this concerns first and foremost the services for STI clients, where HIV yields are higher than in the general population (TB clients are already being tested for co-infection). Once a person is found HIV positive, the post-test counselling should focus on creating client commitment for periodic monitoring visits so that the person can be initiated on treatment in agreement with ART eligibility guidelines (a higher CD4 treatment threshold would enable the health providers to initiate more PLHIV earlier).

8. Improving the implementation efficiency of the prevention of mother-to-child transmission program through better integration with health services

Conclusion: Elimination of vertical transmission is up against poor health-seeking behavior of pregnant women and multiple health systems limitations

Approximately half of all new HIV infections are vertically transmitted from mother-to-child. Niger has committed to the elimination of mother-to-child transmission and to keeping mothers alive. This global goal requires significant scaling up of HIV services, accompanied by intensified sexual and reproductive health interventions, community mobilisation and rural service deployment, in Niger and elsewhere.

The challenges to reach virtual elimination of MTCT in Niger are considerable: the MTCT rate needs to be brought down from approximately 27% in 2013 to below 5%. Although Niger has seen good

\(^5\) http://www.aidstar-one.com/focus_areas/care_and_support/resources/report/PreART_Linkage.Retention
progress in the use of antenatal services (CPN1 at 83%) and assisted deliveries (29%), and had 651 PMTCT sites in 2012, less than half of pregnant mothers in need of ARVs received the drugs in 2013. Diagnosis of exposed infants is almost inexistent at about 1%. There are many missed family planning opportunities, which are also missed opportunities to reduce vertical transmission of HIV. Over a third of all non-users of FP have visited a health facility in the past 12 months, but they have not discussed FP during that visit. These missed FP opportunities are especially worrying in women aged 30-44 years (elevated HIV prevalence compared to younger women), and women living in Niamey (female HIV prevalence 1.5%).

The success of PMTCT in Niger relies heavily on improving pregnant women’s demand for maternal and neonatal health services. The causes for the high numbers of those lost-to-follow-up are multiple and complex. Many women are dependent on their husband’s approval to seek and obtain health services as well as transportation to health facilities. Cultural reasons can prevent both men and women from perceiving pregnancy as a “disease” state that warrants the intervention of health care providers. The stigma of being HIV positive can prevent women from getting their HIV test results or obtaining the treatment for themselves or their baby. The cost of accessing antenatal care and assisted delivery, even if limited to the cost of transport or a lost day of work, can be overwhelming, especially if the perceived benefits are limited. One field study on maternal health services in Niger reports that staff attitudes towards patients were often demeaning.6

The Government has reviewed the PMTCT situation in detail and identified inefficiencies, constraints and priority actions. One of the main delivery solutions pursued concerns the community level, where a scheme of female health workers (“médiatrices communautaires”) has been used, for instance in Arlit district. The recent positive Rwanda experience with 15,000 community health workers suggests that investing in linking people to services provides direct health outcomes. Community based workers and community networks can play a role in information, education, demand creation, mobilisation and provision of simple services.

The optimization analysis suggests that increased investment in PMTCT will help minimize new HIV infections, AIDS deaths and disease. Spending 18-20% of the HIV budget on PMTCT instead of 11% as in 2012 will lead to best reductions in vertically transmitted infections and avert the maximum of DALYs. It is estimated that an extra 1,400 vertical HIV infections could be averted over 10 years of the currently acquired NSP resources were allocated optimally. Using the Option B+ PMTCT regimen could help simplify the service cascade and improve the uptake of PMTCT by removing the need for CD4 counting for treatment initiation. By decreasing the number of interactions necessary with the health system, it theoretically helps to scale-up PMTCT (and would directly contribute to ART targets). The simplified infant prophylaxis protocol and a unified regimen that can be used for the entire adult population, would simplify procurement and supply chain management.7 Of course, switching to Option B+ also entails significant financial and organizational investments that need to be thoroughly assessed and costed.

**Recommended policy actions:**

16. Shift more HIV resources to PMTCT, as per the optimization analysis, and use these resources to strengthen systems which are shared between PMTCT, maternal health and family planning - progress in PMTCT largely relies on progress in the provision of maternal,

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newborn and child health (MNCH) and family planning. Unless more women use ANC and delivery services, PMTCT cannot be scaled up significantly. Therefore PMTCT resources must contribute to this broader effort of building better services and greater demand. A particularly promising shared resource is community-based health workers (médiatrices) with tasks such as the identification of risk pregnancies and the accompaniment of women, children and families enrolled in treatments (PMTCT regimens, ART, FP, TB, etc.). The Malawian experience has shown that peer support and defaulter tracking are important for minimizing loss-to-follow-up, as are extended counselling and ongoing support of women, and effective use of the patient monitoring data.  

17. Use the understanding of the barriers, bottlenecks and inefficiencies of the current PMTCT intervention to make strategic investments including phased introduction of the B+ option – More work needs to be done on evaluating demand creation strategies in MNCH and FP, bearing in mind that intervention effects will be heterogeneous (e.g. by literacy level, pregnancy order, previous experience of service use). Regular quality monitoring of services is essential to retain women during antenatal care and throughout their reproductive years. PMTCT option A should be completely phased out for the more effective option B. Pilots of the B+ regimen - a promising option in settings with scarce CD4 cell count testing capacity and high fertility – should be conducted with systematic and ongoing reviews of retention using medical record data. Option B+ needs to be fully costed, including the community-based activities deemed necessary to make the life-long treatment of HIV-infected mothers work over time.

18. The PMTCT program must increase its integration at all levels – this study found that PMTCT services would benefit from a higher level of integration with other services and initiatives especially at community level, in order to improve service access for women, easier referral, follow-up between services and increase efficiency across the PMTCT cascade. The supervision of health services also needs to fully integrate PMTCT into the broader supervision visits. Finally, an improved and integrated supply chain management for ARVs and for HIV test reagents is required to ensure ANC clients can be diagnosed for HIV and treated at all PMTCT sites without interruptions due to shortages.

9. Financing the future HIV response in Niger

**Conclusion:** There is not sufficient funding for implementing the national HIV strategy, but the total funding needed is not as much as anticipated, provided that funds are allocated to the most allocatively-efficient programs, implemented in the most technically efficient ways, and integrated within broader health systems.

Even if HIV resources were allocated optimally (as suggested in 2), then a financing gap would remain. For Niger’s NSP, the Government’s anticipated financing gap stands at Euro 44.9 million (USD 60.4 million) for the remaining period of 2014-2017. This implies that only 35% of the total NSP-projected funding for the four years 2014-2017 was committed from either internal or external sources by December 2013. But, if funding was most optimally allocated, the Government might not need this amount of funding in the future.

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In the past, the financing of the HIV response has been dominated by external funding, accounting for almost 90% of HIV spending from 2007 to 2011. The most important sources of external support in recent years have been the Global Fund, UNICEF, the Government of Germany (Kreditanstalt für Wiederaufbau KFW) and World Bank. In 2012, the share of external funding declined to 67% and public spending was dramatically increased through a World Bank IDA loan, which is counted as Government of Niger funding. The average costs of the national HIV response (2007-2012 data) was Euro 9.7 million (USD 12.6 million), or 0.24% of GDP, but there were large fluctuations between years.

Annual spending under the provisional NSP budget and the 2012 resource needs model is projected to increase steeply from Euro 10.5 million (USD 14.1 million) in 2014 to Euro 20.2 million (USD 27.2 million) in 2017. The scaling-up of HIV prevention and treatment envisaged under these provisional investment plans would result in a steep decline in HIV incidence and mortality, with an increasing number of people on ART. The decline in HIV incidence would make a substantial contribution to containing the long-term costs of the HIV program. It is estimated that one new HIV infection in 2013 results in future costs of about Euro 2,500 (USD 3,400). This cost will vary with the level of mortality on ART. HIV incidence declines from 2013-2017 alone would result in reduced long-term spending commitments equivalent to a saving of Euro 6.3 million (USD 8.4 million). The estimates in this analysis imply that – in addition to the obvious health and social gains – the financial savings achieved by the increased HIV investments as per current NSP would offset about one-third of the additional costs of the scaling-up of prevention and treatment efforts. While the costs of the national HIV response as per NSP are projected to increase in absolute terms, the costs are expected to peak at 0.29% of GDP in 2017, and decline to 0.22% of GDP in 2030.

Private out-of-pocket health spending is relatively large, considering the low level of wealth in Niger. In 2011, health spending accounted for 5.1% of GDP (Euro 225 million or USD 303 million), see Figure 6, dominated by the public sector (57% of total) and private out-of-pocket spending (39% of total). Out-of pocket spending accounted for 95% of household health spending. About one-third of all health spending in Niger is externally financed (lower external dependency than HIV spending).

**Figure 6. Health expenditure by source of financing, Niger (1995-2011)**

In 2011, spending on HIV care and treatment accounted for about 2.7% of public health spending (1.6% of total health spending), which is a considerable share given the many competing financing
needs in Niger’s health sector. A recently completed World Bank Group report on financing for development post-2015\(^\text{10}\) points to four foundational pillars of development financing: domestic resource mobilization; better and smarter aid; domestic private finance; and external private finance.

**Recommended policy actions:**

19. **Review the NSP budget in the light of this analysis and the acquired HIV funding** – it is recommended that budgets shifts are made in order to ensure financing of high impact interventions. The Government should use 2014 to plan for budget shifts, identify savings and alternative financing mechanisms. The Government needs to plan for a gradual decrease in funding of HIV interventions which have low epidemic impact.

20. **Evaluate alternative funding sources especially those which generate permanent resource streams and leverage the private sector** – the feasibility and potential revenue of additional resource streams should be investigated, for instance: Better private sector mainstreaming (comprehensive HIV/AIDS workplace programs by HIV business coalition members); Exploring further growth of the existing social health insurance where appropriate, to create fiscal space by shifting expenditure from Government budget (almost 3% of Niamey residents are already members of a SHI); reinforced public sector mainstreaming, and other measures. The RBF scheme planned for the health sector represents an important opportunity to ensure the financing of ARV-based interventions and to stimulate both demand and supply for these interventions (see Burundi experience).

21. **With the burgeoning private sector creating tax revenue (but also new or increased risk contexts), Government should consider re-investing a percentage of these fiscal revenues in HIV and health programs** – this process has started, and the present analysis shows the importance of a predictable and sustained resource base for HIV services. Niger already instituted an airline levy, but other modalities of innovative financing to increase domestic financing could be examined in the context of the sustainability of the HIV response.

22. **Integrate HIV/AIDS in any future health schemes, such as Results Based Financing (with PMTCT and ART in the essential service package), or any future Universal Health Coverage scheme** – While HIV/AIDS is not a leading cause of burden of disease in Niger, it is nevertheless a leading emerging cause and services must be available which manage HIV/AIDS and co-morbidities like poor nutritional status in an integrated manner. A vertical approach to HIV is ineffective in such a context and HIV and health investments must be made in a concerted and integrated way.

23. **When advocating for HIV and health investments, the Government of Niger should consider the HIV epidemic potential within the context of the unfolding demographic and socio-economic changes** – epidemic drivers and co-factors like rapid growth of urban populations, increased labour migration and high fertility may erode some the epidemic gains of the past, and the country cannot be complacent regarding HIV/AIDS.

Section 1. Introduction

What is the context of this analysis?

Niger’s morbidity and mortality statistics are still dominated by communicable diseases while there is until now a relatively low burden of disease attributable to non-communicable diseases. The macroeconomic situation is seeing positive developments, however, there remains a large part of the population living in poverty (56% living on less than $1.25/day in 2008). The majority of the population has poor access to health facilities (53% living beyond 5 kilometres of services). Almost 40% of all health spending is out-of-pocket, despite the low income levels of most people.

Despite Niger being a low HIV prevalence and comparatively low HIV/AIDS burden country, HIV/AIDS is an emerging and significant cause of DALYs since recent years - see Figure 2.

- The only other rapidly growing cause of DALYs between 1990 and 2010, next to HIV/AIDS, was malaria.
- TB remains a public health problem, however, latest WHO statistics show a falling trend with incidence in 2012 at 104/100,000.

Figure 7. Shifts in leading causes of DALYs in Niger (1990-2010)


11 https://extranet.who.int/sree/Reports?op=Replet&name=%2FWHO_HQ_Reports%2FG2%2FPROD%2FEXT%2FTB-CountryProfile&ISO2=NE&LAN=FR&outtype=pdf
In 2011, HIV/AIDS consumed an estimated 2.7% of public health spending (2011 data) and has therefore become a significant cause for health expenditure in Niger.

At the international level, the HIV funding landscape - and indeed the paradigm of HIV financing - have changed.

- After a decade of unprecedented HIV investments, external HIV financing has plateaued while domestic resources are increasingly expected to sustain and scale-up national responses.\(^{12}\)
- In the course of the last three decades, it has become apparent that structural factors – like poverty, limited livelihood options, inequality and violence – as well as health system limitations, help drive and sustain the HIV epidemic, and undermine the effectiveness and scale-up of proven HIV interventions.\(^{13}\)
- At the same time, HIV investments have been found to have spill-over effects well beyond HIV and having contributed to health sector strengthening and non-HIV outcomes.\(^{14}\)
- As a consequence, the current discussion has shifted from whether an investment is within (or beyond) the remit of the HIV program, to a broader view on the multiple interactions between HIV, health and development outcomes.
- Future international efforts post-2015 will increasingly be directed towards achieving the highest attainable health outcome in equitable ways, through universal coverage approaches. Embedding HIV responses effectively into broader national priorities are thought to further encourage domestic ownership and sustainability.\(^{15}\)
- This report adopted some of these new insights by relating Niger’s HIV response and financing to the health sector context and financing, and by including the DALY\(^{16}\) metric in the optimal HIV resource allocation modelling.

Why is this analysis needed?

Although HIV is not the major burden of disease, it is an important emerging source of disease burden. Better implementing, integrating, and allocating resources has the potential of saving time and money, and freeing up resources to address other key development challenges in Niger.

Niger’s HIV response is heavily dependent on external funding

- Niger has been heavily reliant on international support, with 95% in 2009, 93% in 2010 and 2011 and 67% in 2012 of HIV program funds covered by external finance (the decrease in 2012 is largely due to the World Bank loan)
- The main international funding source has been the Global Fund, however, in 2012, only 18% of Niger’s HIV expenditure was supported by Global Fund compared to 37%-51% in the three preceding years


\(^{13}\) Remme M et al. (2014), Financing structural interventions: going beyond HIV-only value for money assessments. AIDS, 28:425-434.


\(^{15}\) “Global Health 2035: a world converging within a generation” conference, 16 Jan 2014, New York.

\(^{16}\) DALY (Disability adjusted life years) is a metric which allows comparison across diseases. One DALY can be thought of as one lost year of “healthy” life. The method uses disability weights, discounting and age weighting.
Niger may face shortfalls in HIV funding during the NSP period

- The African Union Special Summit in Abuja in July 2013 led to a renewed commitment by the Member States to take decisive action in the elimination of HIV/AIDS by 2030, through increased access to prevention programs, by eliminating mother-to-child transmission of HIV while keeping mothers alive and honouring the earlier “Abuja Commitments”17
- In line with the commitments to take HIV services to scale, Niger’s NSP 2013-2017 envisages service scale-up to meet ambitious HIV service coverage targets, however, the already acquired funding falls well short of estimated resource needs
- Niger’s Global Fund support is based on the Transitional Funding Mechanism until 2015, and KFW funding is only assured until 2014. The World Bank support project 2012-2016 focuses its investments in specific geographical and service areas (prevention of HIV among sex workers and their clients, HIV testing and treatment, PMTCT, as well as management and coordination of the HIV response, and piloting output-based financing of HIV services).

Although HIV incidence has fallen, AIDS care and support costs are considerable in a health system with multiple investment priorities

- In 2011, health spending accounted for 5.1% of GDP (Euro 225 million/USD 303 million), and about one-third of all health spending was externally financed (WHO, 2014).
- Spending on HIV care and treatment accounted for about 2.7% of Niger’s public health spending in 2011.
- There is a continuous stream of new HIV infections and it is estimated that Niger had 46,910 people living with HIV in 2012 (Spectrum, 2013) and spent Euro 3.38 million (2.22 billion CFA / USD 4.41 million) on HIV/AIDS treatment in the same year
- The elimination of mother-to-child HIV transmission, a global goal, requires significant scaling up of HIV services accompanied by intensified sexual and reproductive health interventions, community mobilisation and rural service deployment.

The time is right to make the case for smart and sustained investment into Niger’s HIV response in ways that strengthen, are integrated with and complement Niger’s broader health priorities

- Globally the notion of “shared responsibility” in funding the HIV response has gained momentum. While the Global Fund has restructured its grant making mechanisms towards strategic investment for maximum impact, political leaders have agreed to step up the mobilization of domestic resources to strengthen the health system and ensuring diversified and sustainable financing for health (July 2013 Abuja summit).

The New Funding Model of the Global Fund is designed to make a bigger impact on the three diseases, to improve the predictability of funding and to reward ambitious vision. Funding eligibility is determined by a country’s income level and official disease burden data. The level of allocations are predetermined based on disease burden, income levels and other criteria such as previous grant performance, impact, increasing rates of infection, absorptive capacity, and risk.18

- In 2012, Niger has already increased its investment in HIV, spending three times more on HIV than in the previous five years combined.

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17 In April 2001, heads of state of African Union countries met in Abuja and pledged to set a target of allocating at least 15% of their total annual budget to health. At the same time, they urged donor countries to “fulfil the yet to be met target of 0.7% of their Gross National Product as official Development Assistance to developing countries”.

In a global environment of economic stagnation, Niger’s economic growth was over 11% in 2012, thanks to oil, uranium and agricultural production (IMF data). The country’s 2012 fiscal revenues increased relative to 2011. As part of Niger’s current economic strategy, the government intends to create fiscal space for development spending (IMF, April 2013). The new national HIV strategy emphasizes the need for diversified revenue streams to finance the growing HIV response bill, but much of this may depend on whether HIV/AIDS prevention, treatment and support are deemed smart investments.

What were the objectives of the analysis?

The overarching objective is to provide the Government of Niger with a comprehensive investment case analysis on HIV financing needs and investment opportunities in the context of burden of disease priorities, health financing and health system strengthening, in order to inform a HIV response which is efficient, impactful, cost-effective, and financially sustainable.

The specific objectives are:

- Understand the broader health priorities and health financing landscape
- Within the health priority context, estimate the impacts, cost-effectiveness and returns of investment of past HIV expenditure
- Review the evidence around HIV implementation efficiency and in which areas efficiency gains could be made and costs saved, or scope increased without compromising quality
- Provide an integrated analysis of how HIV financing can be allocated in the best way during the current NSP to minimize HIV incidence and AIDS morbidity and mortality and reach the epidemic/health impact targets of 2017
- Link the evidence on allocative and programmatic efficiency and intervention effectiveness with an analysis of financial sustainability of the HIV response, based on domestic fiscal resources and the evolving availability of external funding
- Determine the long-term financial consequences and savings of HIV interventions in Niger and the potential future health care costs saved through different policy scenarios, in order to guide policy-makers.

The analysis using the Optima model (see below) posed the following questions:

1. What is the cost of meeting Niger’s 2017 coverage targets?
2. How much money is required with optimal allocation among the basic programs to reduce HIV incidence by 50% in the mid-term?
3. With the available 2014-2017 budget, what is the optimal allocation among the basic HIV programs for best reduction in HIV incidence and DALYs over that period, including follow-on effects until 2025?
   a) Could accelerated ART scale-up contribute to the 2017 goal?
   b) Could a change in PMTCT protocol to B+ contribute to the 2017 goal?

What methods were used?

- Desk review of available data and literature, comprising of HIV resource tracking data (NASA), National health account data, macroeconomic data, HIV prevalence and sexual behaviour reports, Spectrum estimations, data from the Resource Needs Modelling, reports on key populations, HIV policy documents and HIV program implementation data.
• Application of Optima (formerly Prevtool), a mathematical model developed by the University of New South Wales and the World Bank for estimating HIV incidence in sub-populations; HIV impact, cost-effectiveness and return on investment of HIV spending, as well as optimal resource allocation to achieve best results in preventing new HIV infection and HIV-related morbidity and mortality. - see Annex 1 for details.
• Implementation of a financial commitment analysis, which has three building blocks: an epidemiological component, a costing framework for projecting the costs of the national response to HIV, and an economic framework to estimate the costs incurred by new infections. The epidemiological component is harmonized with Spectrum for consistency. The costing framework serves to project the costs of the national response to HIV/AIDS, with the numbers of people receiving HIV/AIDS services based on the epidemiological estimates and specified coverage rates. Unit costs are informed by past expenditure patterns (as documented in the NASA report), budget data, and data from the Resource Needs Model - see Annex 2 for details.
• Monetary amounts were expressed in Euros, using the fixed exchange rate of 1 Euro = 655.957 CFA, and using 503.1 for CFA/USD.

How are the study findings presented in this report?

• The Executive summary presents the main findings by theme and provides the full conclusions and recommendations emanating from this analysis. The recommendations fall into eight areas: 1) Epidemic dynamics, 2) Impact and cost-effectiveness of past HIV investments, 3) Impact gains through better allocative efficiencies, 4) Geographical targeting of priority programs, 5) Improving the efficiency of programs for female sex workers, 6) Improving the efficiency of the antiretroviral treatment program, 7) Improving the efficiency of the prevention of mother-to-child-transmission program, and 8) Financing the future HIV Response in Niger
• Section 1 (Introduction) presents the context and rationale of the analysis, the objectives and the methodological approach taken
• Section 2 (Development context, health priorities and health system challenges in Niger) summarizes the economic and human development situation, national development policy framework, health spending, burden of disease data, as well as the provision and reach of health services.
• Section 3 (The state of the HIV epidemic) reviews the epidemic situation, course and drivers, and the distribution of HIV across population strata. It gives a brief characterization of the key populations with population sizes and locations and comments on risk factors and vulnerability. It presents model estimations on HIV incidence and sources of new infections.
• Section 4 (HIV financing, HIV services and programs and their efficiency) reviews the data on HIV expenditure and sources of funding and what these investments have brought in terms of HIV program development and scale-up. It looks at service integration and linkage, unit costs and service utilisation.
• Section 5 (Impacts from past HIV expenditures and best resource allocations in the current strategic plan period) presents modelling results of the HIV impact and cost-effectiveness of six years of HIV investments in the period 2007-2012. It then presents modelling results on optimized resource allocation until 2017 with scenarios for best HIV incidence reduction and maximum number of DALYs averted. The analysis assumes various amounts of total HIV resources available while taking savings from possible efficiency gains into account.
Section 6 (Financing needs and fiscal space implications of HIV investments) presents results from the fiscal model applied to Niger. It summarizes financing needs and gaps until 2017, the HIV prevention and mortality impacts of investments under the current NSP, and the longer-term fiscal effects of HIV investments.
Section 2. Development context, health priorities and health system challenges in Niger

What is the state of economic and human development?

Macroeconomic situation

Niger is one of the poorest countries in the world with a largely agrarian and subsistence-based economy frequently disrupted by extended droughts common to the Sahel region of Africa

- Niger is vast, landlocked and arid, covering an area of 1,267,000 km². The closest port is the Port of Cotonou about 1,000 km away. Thus, most of Niger’s foreign trade is over land, and the main transport corridors are Benin, Togo and Côte d’Ivoire via Burkina Faso.
- The economy rests on the agro-pastoral sector (40%) and the tertiary service sector (43%).
- After a year of food shortages, economic activity recovered in 2010 due to good harvests. A new period of drought interfered with growth in late 2011, but growth was sustained by sizeable investments in the mining and oil sector.

Following the trend in the region, Niger has benefitted from positive economic growth and increased fiscal revenues thanks to new mineral resources

- Over the past decade, extractive industries have fuelled economic growth in Africa with continuous demand from China pushing export prices. In 2011, Africa’s production accounted for three-quarters of the world’s platinum supply, half of its diamonds and chromium, up to one-fifth of gold and uranium supplies. New explorations reveal larger reserves than previously known and keep attracting additional foreign investment.
- The IMF reported economic growth at over 11% in 2012 for Niger, thanks to the coming on-stream of an oil project, higher uranium production and a rebound in agricultural production. Over the next 5 years, average real GDP growth is projected at 6.3% annually (and at 3.1% for GDP per capita) – see Table 1.
- The 2012 fiscal revenues increased relative to 2011, but due to weaknesses in customs and oil revenue, were expected to fall short of program targets (IMF, April 2013).

GDP per capita is on an upward trend, and inflation below 3%

- In 2013, per capita GDP is at USD 440, or Euro 330.
- Despite the fluctuations in farm production, inflation on the average was under control and at 2.1% below the regional limit of 3%.
- IMF and World Bank (2013) suggest that Niger faces a moderate risk of debt distress. Public debt has declined since 2006 due to restructuring arrangements obtained from the creditor members of the Paris Club as part of the Heavily Indebted Poor Countries Initiative and the Multilateral Debt Relief Initiative. In recent years, however, public external debt has increased, reflecting the financing of large resource extraction projects.
- As part of Niger’s current economic strategy, the government intends to create fiscal space for development spending, while tackling revenue weaknesses and implementing multiple measures to rebuild government deposits, implement structural reforms, improve financial development and maintain debt sustainability.

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The political and administrative context is characterized by a multiparty system and decentralisation.

- There are 10 major political parties, with a president elected by popular vote and a prime minister appointed by the president. The new constitution was adopted in October 2010.
- Niger has established a process of decentralisation which has transformed the former administrative structures in the regions (Départements, Arrondissements) and created Communes for better local governance.
- The country is now subdivided into eight administrative regions, 36 Départements and 266 Communes of which 52 are urban and 214 rural.

Human development

The Nigerien population, estimated at 17.13 million inhabitants in 2012, continues to grow at a very rapid pace at 3.9% (average intercensus 10-year rate) with a total fertility index of 7.6 children per woman in 2012.

- The rate of demographic growth was virtually unchanged in the last 20 years. At that rate, the population is expected to double every 23 years.
- In rural areas, women give on average birth to 8.1 children, in urban areas, to 5.6 children (NDHS 2012). Zinder and Maradi have exceptionally high indices with 8.5 and 8.4 births per women, respectively. Women with secondary education have on average 3.1 fewer births than women without education.
- 23% of births are spaced less than 24 months (NDHS 2012).
- Women have their first child on average at 18.6 years of age, which is on average 2.9 years after entering the first union.

Poverty levels are improving while living conditions remain challenging

- The World Bank poverty indicator shows a positive trend in poverty reduction, with a poverty headcount ratio at $1.25 a day going from 65.9% of the population in 2005 to 43.6% in 2008 and putting Niger above the average in sub Saharan Africa (49.2% in 2008). However, living conditions remain challenging.
Recurring food crises mean that many households especially in rural areas are severely affected by under-nutrition

- Food insecurity persists even in years when production yields a surplus. About 60% of households is only able to cover their food requirements for three months. In periods of food shortages, half of the population suffers from malnutrition.
- The situation is often dramatic for children under the age of five: about four of ten children have chronic under-nutrition and one of ten suffers acute under-nutrition. During the 2009-2010 food crisis, some 7.1 million people needed food assistance.
- The principle challenge to be met consists of transitioning from a situation of cyclical management of recurring food crises to more structural responses, particularly through the “Nigeriens nourishing Nigeriens” (3N) initiative, for promoting sustainable food security and agricultural development.

Urban centres are growing and standards of housing and living are mostly inadequate

- The urbanization rate has risen from 16.3% in 2001 to 17.5% in 2005 and to 20.4% in 2010. The city of Niamey had 1.3 million inhabitants in 2011, almost double the number of 2001 (708,000). An estimated 57% of the urban population is in Niamey.
- The annual growth rate in urban areas (6.2% per year) is about twice the growth rate for the population as a whole. If the current trend continues, the urban population will represent more than 40% of the total population by 2030.
- The last ten years were marked by progress made in establishing the institutional and legal framework for urban development in a context of decentralized management. However, major challenges remain in the area of urban planning, housing and habitat.

Sustainable access to drinking water has increased, but remains a challenge especially in rural and periurban areas, and there is considerable under-investment in sanitation facilities in towns

- The percentage of Niger’s population using a potable water source increased from 22.3% in 1992 to 50.1% in 2008 (National Survey on Budget and Household Consumption).
- Coverage of drinking water needs increased gradually to 66.5% in 2011, a level still well below the MDG target of 80% set for 2015.
- The principal constraints in this important sector are low investments, insufficient maintenance efforts, and water of poor quality or at great depth in some areas.
- More generally, there is an enormous unmet need for the supply of hygiene and sanitation services including garbage collection and disposal of rainwater and wastewater.

Radio is the only medium to reach a significant proportion of the population

- 42% of men and 36% of women listen to the radio at least once a week (61% of urban men and 53% of urban women) (NDHS 2012)
- 53% of men and 59% of women are not using any of the main media (radio, print, television) regularly (63% of rural men and 66% of rural women)

Niger’s 2012 human development index (HDI) is at 0.304, taking the 186 rank in this global comparison (UNDP, 2013). The index is a composite statistic of education, life expectancy, and income indices to rank countries for their advancement in human development. Niger’s HDI has gradually increased from below 0.2 in 1980 to exceed 0.3 by 2010.

HDI/Education: Niger’s education system has seen a massive expansion, but the average duration of schooling of adults is only 1.4 years which negative impacts the human development rank.  

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21 www.citypopulation.de
At the basic cycle 1 level, the number of pupils increased from 210,000 in 1979 to 1,901,115 in 2010. The gross attendance rate (GAR) has risen to 76% in 2010/11 with a large disparity between boys (85%) and girls (67%) and between urban (99%) and rural (70%) settings.

At the basic cycle 2 level of instruction, the GAR decreases especially for girls (about 18% in 2010), and there are large disparities between Niger’s regions.

Attendance also remains low in the secondary cycle. The GAR was 4% in 2010, with 5.3% for boys and 2.5% for girls (average GAR for the countries of the sub-region was 16% in 2006).

In the NDHS 2012, 80% of females and 60% of males had no education, and only 8.5% of females and 19.5% of males had entered or completed secondary school.

Niger’s literacy levels have been stable at an extremely low level, due to low school enrolment and low teaching quality with the minority of teachers appropriately trained

- In 2012, 42% of males and 14% of females were classified as literate (NDHS 2012). In rural areas, only 32% of males and only 7% of females were literate (70% and 45% in urban areas, respectively). Niger has one of the lowest literacy rates in the world.
- Girls’ limited access to and retention in the educational system minimizes their opportunities in economic life and decision-making.
- There is an urgent challenge of stimulating demand among vulnerable groups (girls, women, rural residents, etc.), promoting quality instruction particularly through policy, human resources management, adaptation of teaching programs, and gradual establishment of suitable school infrastructures (IMF April 2013).

Life expectancy at birth: this indicator, the health component of the HDI, shows a positive trend over the last 30 years

- In 1980, life expectancy at birth was 39.5 years in Niger. This has increased to 48.3 years in 2000 and 55.1 years in 2012.

Average per capita income (the economic component of the HDI) has shown a positive evolution but remains at modest levels

- According to the UNDP database, average income has increased from $586 in 2000 to $701 in 2012 (expressed as the GNI per capita in PPP terms, constant 2005 international $). The Gini index measuring income inequality, was 34.6 in 2008, similar to Togo and Algeria.
- Two recent poverty profiles indicated that poverty affects rural areas more than urban areas, and is more pronounced among the female population. In addition, the phenomenon takes on an endemic dimensions in the Maradi, Dosso, and Tillaberry regions. Although the depth and severity of poverty, as well as social inequities, declined slightly in recent years, they still remained at high levels.

National development policy framework

There are three principal strategic documents relevant to Niger’s future HIV investment strategy and broader social sector development: the Sustainable Development and Inclusive Growth Strategy (SDDCI NIGER 2035), the Economic and Social Development Plan 2012-2015 (PDES), and the Health Sector Development Plan 2011-2015 (PDS).

The PDES, adopted in September 2012, is the frame of reference for interventions under the government’s medium-term development agenda and is aligned with the MDGs.

- It capitalizes on goals and progress attained in implementing the Accelerated Development and Poverty Reduction Strategy, the sectoral strategies, and ministerial action plans.

• The PDES is the basis for the execution of important structural projects, including the Kandadji hydroelectric dam, the exploitation and processing of coal from Salkadamna mines, and investment in transport infrastructure.
• Improvements in rail and road will link Niger better to its neighbour countries and reduce isolation. For the transmission of HIV, such progress can put Niger’s successes in reducing the epidemic at risk – through creating hotspots where infrastructure is constructed, and through intensifying movement of people between low HIV prevalence areas and areas of higher HIV prevalence.

A core objectives of the PDES is the improvement in the standard of living by reducing inequalities and the growth of the middle class.
• This class is regarded as the most active part of the population in terms of available skilled labour and increased domestic demand, in particular household consumption.
• However, epidemic statistics also show that it is the wealthier segments of the populations where HIV takes hold first. This is likely to be associated with the presence of disposable income which can be used for pleasure-seeking including commercial sex.

The Health Sector Development Plan 2011-2015 (PDS) adopted in January 2011, has at its overall objective to contribute to the improvement of the population’s health status and to striving towards the attainment of the health-related MDGs.
• The PDS is based on a detailed analysis of the gaps and weaknesses in the public health sector. The insufficient coverage of quality SRH services is identified as a major shortfall, and urgent improvements for services of family planning, maternal health, immunisations, integrated management of the sick child, nutrition and PMTCT feature prominently.
• HIV prevalence is a key outcome indicator in the PDS results framework (target level <0.7% which has been achieved in 2012 and needs to be maintained).
• PMTCT is presented as a high-impact intervention for both maternal/newborn health and child health, with a 2015 coverage target of 65%.
• ART coverage targets are 30% for children and 75% for adults with advanced infections, and 30% for pregnant women identified as sero-positive.

How much is spent on health and where does the money come from?
• In 2011, health spending accounted for 5.1% of GDP (Euro 225 million or USD 303 million), dominated by the public sector (57% of total) and private out-of-pocket spending (39% of total) – Figure 3.
• According to the NDHS 2012, only 2% of men and women are covered by some medical or social insurance, however, 10% of women in Agadez and Niamey Regions report having medical/social insurance.
• Out-of-pocket spending accounts for 95% of household health spending.
• External financing accounted for about one-third of all health spending (WHO, 2014).
• Spending on HIV care and treatment accounted for about 1.6% of total health spending, and 2.7% of public health spending in 2011.
According to the PDS, the government intends to develop alternative health financing mechanisms including the promotion of social health insurance ("mutuelles de santé") and social welfare support for the elderly and destitute.

The free provision of some services are enshrined in laws: paediatric services for children aged 0-5 years, prevention (family planning, antenatal care), services for patients with cancer, TB and HIV/AIDS, and caesarean section (kit payable). Minimum and maximum amounts for service fees are also regulated.

In three regions, child delivery at health facilities is also free of charge (UNFPA support). In four regions, services for sex workers are free (World Bank support).

What are the health priorities?

Burden of disease

Communicable, newborn, nutritional and maternal causes such as diarrheal diseases, lower respiratory infections, and protein-energy malnutrition remained the top drivers of health loss in Niger (IHME/WB).

However, in a comparison with 46 Sub-Saharan African countries, Niger has seen much progress in burden of disease indicators and regional ranking – see Figure 4 (left and middle, note that rank 1 is best, rank 46 worst).

Niger remains the country in the whole region with the lowest percentage of DALYs attributable to non-communicable diseases (only 18%), however, the STEPS study results suggest a rapid increase in hypertension and diabetes in the past few years (PDS p29).

Despite progress, Niger had in 2010 very poor rankings in the regional comparison for years of life lost due to meningitis, measles, tetanus, diarrheal diseases and lower respiratory infections.

The country had, in the regional comparison, relatively better rankings for road injury, interpersonal violence, diabetes, self-harm, chronic obstructive pulmonary disease, and HIV/AIDS.
What is the provision and reach of health services in Niger?

Niger has a policy approach focused on primary health care in particular at the district health system.

The provision of health services is dominated by the public sector (Health Sector Strategy, HSS), with

- 829 Integrated Health Centres managed by a nurse and linked to a total of 2,160 health posts managed by community health workers
- 33 district hospitals, spread across 42 health districts
- 9 regional public health departments with 6 regional hospitals, 2 regional maternity reference centres and 7 mother-child centres
- 3 national reference hospitals and a national maternity reference centre, of which 3 are in Niamey and one in Zinder

Approximately 47% of the population lives within 5 kilometres of a health facility (Figure 5)

- In rural areas, transport costs arising from medical emergencies in remote areas are a considerable challenge.

Service provision by male nurses is regarded to be a barrier to females using health services.

- However, according to the MOH Human Resources Development Plan (2011-2020), an increasing percentage of health workers are female - 75% of those working aged under 35 years, and 85% of those still in training.
The provision of health services is significantly limited by infrastructure and resource constraints - the following selected coverage levels were reported in 2011:

- The geographical coverage of the provision of basic health care was estimated at 71% (HSS)\(^\text{23}\)
- The treatment of malnutrition was estimated at 22% (HSS annex 1)
- Ante-natal care consultation CPN4+ was reported at 26%
- Anti-parasite treatment of pregnant women was estimated at 21%
- Detection and treatment of syphilis during pregnancy was reported at 6%
- Assisted delivery was at 29% in 2012 (plan eTME)
- Management of neonatal infection was at 11%
- Diagnosis and treatment of STIs was reported at 37%
- Directly observed treatment supervision for TB was at 58%

The prevalence of modern contraceptive use has increased by about 1% every 5 years among women living in Niamey, in the other urban zones, and in the rural areas, but remains low (NDHS 1998, 2006, 2012)

- Overall prevalence of modern contraceptives was at 11% in 2012, and 12% in women in union. In urban areas, it was 27% and in rural areas 10%. Regionally, it was highest in Niamey (32%) and lowest in Tahoua (6%).
- Women procured their modern contraceptives mainly from public sector Integrated Health Centres and health posts, but also from public and private sector pharmacies and mobile chemists (especially the pill); condoms play a very minor role in contraception with less than 0.1% of women in union reporting using condoms for contraception (DHS 2012)
- The majority of users of the pill use products that are socially marketed.

30% of all women in union aged 15-49 express demand for family planning (FP), of which just under half (14%) is satisfied (contraceptive use) and just over half (16%) is not satisfied (unmet need) (NDHS 2012)

\(^{23}\) This indicator does not include HIV-specific services like PMTCT, ART and HIV testing
• In 2012, there were about 3.1 million women aged 15-49 years in union (married or cohabiting), and an estimated 930,000 consider themselves in need of FP.
• An estimated 498,000 women in union have an unmet FP need (estimations based on NDHS 2012).
• 55% of women and 59% of men have heard a message about FP on the radio in the last month (only 41% of rural women) (NDHS 2012).

There are significant missed opportunities in health care contacts with non-users of family planning (NDHS 2012):
• 86% of non-users of FP report not having spoken about FP in the past 12 months, neither with a community health worker nor a clinic staff member.
• 36% of all non-users of FP have visited a health facility in the past 12 months, but they have not discussed FP during that visit (missed FP opportunity) – see Figure 16 (dotted areas).

These missed FP opportunities are also missed opportunities to reduce vertical transmission of HIV (PMTCT prong family planning) - see Figure 6 (dotted orange areas show strata with higher HIV prevalence). Risks may be higher in:
• Women aged 30-44 years (elevated HIV prevalence compared to younger women, and many women grand multiparous with five or more births).
• Women living in the city of Niamey and the other urban areas/towns (female HIV prevalence 1.5% and 0.7%, respectively).
• Women in the regions of Niamey and Diffa (female HIV prevalence 1.5% and 0.8%, respectively).

**Figure 11. Non-users of Family Planning: Contact with Providers, Niger (2012)**

Source: NDHS 2012 Table 5.12 and 15.4.
Section 3. The state of the HIV epidemic

What has been the historical course and scale of the epidemic?

- **Niger’s HIV epidemic is contracting.** HIV prevalence data of the general population and key populations at higher risk suggest that the epidemic has become more concentrated over the last ten years. HIV prevalence levels have been decreasing in almost all surveyed populations (Figure 7). Sentinel surveillance data from antenatal care services corroborate the contracting nature of the epidemic, with HIV prevalence in pregnant women declining from 1.7% in 2009 to 0.9% in 2012.

**FIGURE 12. HIV PREVALENCE BY POPULATION, NIGER (2002-2012)**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FSW</td>
<td>25.6</td>
<td>20.9</td>
<td>17.3</td>
</tr>
<tr>
<td>Prisoners</td>
<td>2.8</td>
<td>2.7</td>
<td>2.7</td>
</tr>
<tr>
<td>Military</td>
<td>3.8</td>
<td>1.6</td>
<td>0.4</td>
</tr>
<tr>
<td>Migrants</td>
<td>1.0</td>
<td>1.1</td>
<td>1.3</td>
</tr>
<tr>
<td>Military workers</td>
<td>1.3</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Truckers</td>
<td>1.8</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Females 15-24</td>
<td>0.8</td>
<td>0.5</td>
<td>0.1</td>
</tr>
<tr>
<td>Females 25-49</td>
<td>1.9</td>
<td>0.83</td>
<td>0.52</td>
</tr>
<tr>
<td>Males 15-24</td>
<td>0.3</td>
<td>0.1</td>
<td>0.0</td>
</tr>
<tr>
<td>Males 25-49</td>
<td>1.3</td>
<td>1.1</td>
<td>0.57</td>
</tr>
</tbody>
</table>


- **The epidemic trend is decreasing in both urban and rural areas** (Figure 8). HIV prevalence has declined least in urban females who are five times more likely to be HIV positive than females living in rural areas (most HIV prevalence contributed by Niamey-based females). ART may play a role in female HIV prevalence elevated especially in Niamey where there are six ART treatment centres. In 2012, there were nationally 40% more females on ART than males (Rapport annuel ULSS 2012, T8, page 21).
Niger shares national borders with several countries reporting higher population HIV prevalence levels: Nigeria, Mali, Benin and Burkina Faso. The first three of these countries also report higher prevalence levels in female sex workers (UNAIDS 2013 global report and aidsinfo.com, statcompiler for DHS data, UNGASS 2012 country reports). Interactions via cross-border traffic and mobile populations will impact the HIV epidemic dynamics in Niger.

Near-universal male circumcision at over 99% contains the epidemic (male circumcision data from 2006 DHS). The chief role of male circumcision in reducing the transmission of HIV from females to males has been established beyond any doubt. The case of Niger support the claim that very high levels of male circumcision prevent a generalized epidemic despite high risk sexual behaviours and vulnerability of its people. HIV infections stay largely with females due to low transmission efficiency to their male partners, attributable to male circumcision.

HIV incidence has, according to model estimations, decreased over time from the peak level of 8,470 new HIV infections in 2000 to 1,447 in 2013 (Spectrum 2013). This had led to reduced HIV prevalence, which is determined by the incidence of new HIV infections and by AIDS-related mortality.

Until recently the decreasing HIV incidence has been accompanied by high AIDS-related mortality due to low access to ARV treatment (Figure 9).

- Since 2004, ART coverage has been scaled-up and in 2012 reached 51% coverage in adults and 13% in children below 15 years of age (Spectrum 2013).
- In 2012, an estimated 3,360 PLHIV died due to an AIDS-related cause, and the total cumulative number of AIDS deaths in Niger up to end 2012 is estimated at 68,730. High AIDS-related mortality is also suggested by the successive DHS data, where a large part of prevalent HIV cases in the 2006 survey is no more present in the respective age cohort in the 2012 survey (see also Figure 11).
- Conditions like iron deficiency anemia and malnutrition and diseases such as diarrhea and TB (see graph in Executive Summary) can be expected to accelerate progression to AIDS and death among untreated people living with HIV.
How is HIV distributed in the population of Niger?

- The two key populations which continue to have elevated HIV prevalence are female sex workers (FSW) and prisoners.
- Overall HIV infections are concentrated in certain segments of the female population: In female sex workers, female members of key populations at higher risk (including female prisoners), and specific demographics of females in the general population (see below). The body of epidemiological data suggest that male circumcision is likely to prevent transmission events from HIV infected females to males (including from FSW to their clients).

Female sex workers

- Niger has an estimated 28,000 FSW who are concentrated in urban and industrial zones such as mining areas and petrol fields (SSG 2011). Despite declining HIV levels in FSW, the prevalence differential between FSW and females in the general population is still large (17.3% versus 0.4%, see Figure 7). In 2011/12, HIV infection was 43 times more likely in FSW than in females in the general population, indicating the high exposure to unprotected sexual acts of FSW and their high susceptibility to HIV infection.
- Survey data suggest large regional variation of HIV prevalence in FSW. In 2011, levels were highest in female sex workers surveyed in Tahoua and Maradi (31%), followed by Agadez (23%), Zinder (21%) and Niamey (19%). Sex workers in Dosso and Tillaberi were found to have below-average HIV prevalence levels (16% and 12%), and there were no HIV infections diagnosed in the 71 FSW surveyed in Diffa (also 0% in the 2009 survey).
- FSW get infected rapidly once they join the sex industry. FSW below 20 years of age were as likely to be HIV infected as older FSW (p=0.98) and FSW with less than one year of sex work experience had the highest HIV prevalence of all respondents in the 2011 survey — see Figure 10. A 2010 study (CISLS, Cartographie sites prostitutionelles et MSM, 2010) indicates that younger FSWs tend to work in the street, while brothels (maison closes) tend to include women up to 50 years of age. The number of clients also appears to differ according type of
site with bars and restaurants having the highest proportions of sex workers reporting >20 clients a day.

- The average duration in sex work is 3 years with 41% working from 1 to 4 years and 28% working over 4 years.\(^{24}\)
- **The majority of women in sex work are divorced** (63%, 2010 mapping study). Some women are driven into sex workers after becoming widowed, divorced or separated.

**FIGURE 15. HIV PREVALENCE BY FSW AGE AND BY DURATION OF SEX WORK, NIGER (2011)**

<table>
<thead>
<tr>
<th>HIV prevalence (%)</th>
<th>15-19 years</th>
<th>20-24 years</th>
<th>25+ years</th>
<th>&lt;1 year</th>
<th>2 years</th>
<th>3 years</th>
<th>4+ years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of FSW</td>
<td>16.4</td>
<td>17.6</td>
<td>17.4</td>
<td>21.4</td>
<td>17.2</td>
<td>18.3</td>
<td>13.1</td>
</tr>
<tr>
<td>Duration of sex work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: SSG 2011, Table 4.6b and annex 13.

- **Reported violence is strongly associated with HIV infection.** In 2011, FSW reporting violence had a HIV prevalence of 32% whereas those not reporting violence had 14% HIV prevalence. Reported use of drugs and/or alcohol did not show an association with HIV status.

**Prisoners**

- **There are approximately 11,600 prisoners in Niger’s corrective institutions.** It is reported that 3.2% are female.\(^{25}\) The average duration of prison stays is 1-2 years. Prisons represent a risk context for HIV, TB and other conditions, one official source reports inadequate ventilation, overcrowding and deaths from AIDS, malaria and TB.\(^{26}\)
- **HIV prevalence in prisoners has remained stable over the last decade.** Levelling off at 2.7-2.8%, it has not followed the decreasing epidemic trend seen in other key populations. In Niamey, 6.0% of prisoners surveyed in 2011 were HIV infected, and 4.3% in Diffa, reminding us that localized epidemics can get ignited in risk settings like prisons.
- **HIV knowledge have consistently been low in prisoners and may be decreasing** (2011 SSG). A history of STIs is associated with HIV infection.

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\(^{24}\) Animas-sutura- SongES – RENIP. Résultats de l’étude de cartographie des sites Prostitutionnels de la communauté urbaine de Niamey, 2013.


MSM and male sex work

- **Homosexuality is not socially accepted in Niger and sexual relationships between men are therefore hidden.** There are no epidemiological data available on MSM in Niger. Mapping and estimation activities on MSM have estimated the numbers of MSM in individual regions: Circa 200 MSM in Tahoua, circa 150-200 MSM in Zinder, and 89 MSM in Niamey including in bars, brothels and cinemas (Animas 2013). About 10 MSM were identified in Maradi but could not be interviewed.

- **In one survey, a high proportion of sampled MSM said they were involved in commercial sexual activities (2010 data, MSM identified through snowball sampling).** In 2010, 64% of interviewed MSM said they receive payments from male sexual partners. There is a proportion of MSM who identify as bisexual, and some are married, which links any MSM related HIV transmission to the female population.

Other key populations including sex work clients

- **HIV in FSW client populations:** Periodic surveys in have also been carried out in teachers, truckers, mine workers, labour migrants and the military (see Figure 1 for HIV prevalence data). In all males of the key populations combined, HIV prevalence was **0.8%** in 2011 (24 infections in 2,943 men with bio-behavioural data). This level of 0.8% can be considered as the HIV prevalence of “sex work clients”.

- **HIV in female members of key populations:** In all females of the key populations combined (excluding FSW), HIV prevalence was **1.7%** in 2011 (7 infections in 405 females with bio-behavioural data).

- **Female members of the key populations have significantly higher HIV prevalence than male members.** However, female key population samples are small:
  - Military: 7.7% (F – 2/26) versus 0.1% (M – 1/746)
  - Labour migrants: 2.9% (F – 1/35) versus 1.0% (M – 6/600)
  - Prisoners : 3.6% (F – 2/55) versus 2.6% (M – 14/548)
  - Teachers : 0.7% (F – 2/289) versus 0.0% (M – 0/226)

- **In men, sexual risk behaviours and use of FSW are linked to being away from home, having disposable income and mobility (DHS 2012).**

- **Overall, few men report in a survey that they have paid for sex** - 1.3% of men aged 15-59 years report ever having paid for sex, and 0.5% say they did in the last 12 months (NDHS 2012). A history of paid sex is more frequent in men living in Niamey (4.6% ever paid for sex), divorced or separated men (3.0%), wealthiest quintile of men (2.9%), men living in Tillaberi region (2.8%) and men with secondary or higher education or living in an urban area (both 2.7%).

General population

- **HIV prevalence has declined in almost all of the 5-year age groups defined by the DHS and in 2012 remained highest in women in their thirties and early forties (up to 0.8%) and in men in their late thirties and forties (up to 1.0%) – see Figure 11.** Some of the prevalent HIV cases in these older age groups will be attributable to ART provided to individuals with advanced HIV infections. Some HIV positive women will have a history of sex work, given the demographics of FSW, and the turnover of women in the sex industry.

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The age and sex pattern of HIV infection reflects the pattern of age mixing in sexual relationships in Niger. Very few young men are infected, compared to young women (who tend to have much older partners/spouses).

**Figure 16. HIV Prevalence by Age Group, Niger (2002, 2006, 2012)**

It is estimated that just over a quarter of all People living with HIV are in Niamey (an estimated 26% in 2012), and that over half of all PLHIV reside in either Niamey, Dosso or Tahoua (based on the regional population numbers and the regional HIV prevalence levels 2012 – see Figure 12). Two regions have seen a rise in PLHIV numbers since 2006: Niamey and Dosso. It is estimated that Tahoua had the largest decrease in PLHIV numbers and that Agadez and Diffa have the lowest PLHIV numbers in 2012 compared to the other regions.

**Figure 17. Numbers of People Living with HIV by Region, Niger (2006, 2012)**

Sources: Care report 2002, NDHS 2006, NDHS 2012 (prelim)

• **Key demographics with elevated HIV prevalence are** (bracket: HIV prevalence DHS 2012):
  - Female residents of Niamey (1.5%)
  - Females who are divorced/separated (1.7%), or widowed (3.2%)\(^{28}\)
  - Females away from home at least 1 month per year (1.1%)
  - Females reporting no sexual partner in past year (1.7%)
  - Females with sexual inception at age 20 years or above (1.7%)
  - Males reporting no sexual partner in past year (1.1%)
  - Individuals with primary education compared to no or higher education (F1.3%, M1.0%)

• **The changes in HIV prevalence between 2006 and 2012 in different population strata of education, wealth and economic activity suggest a rapidly changing epidemic situation** (Figure 13). Even in the stratum of highest education, HIV prevalence has declined sharply in females and males, presumably through a combination of lower HIV incidence and high AIDS-related mortality (the scale of the ART program was small until circa 2009).


![HIV prevalence by socio-economic strata, Niger (2006, 2012)](chart)

Sources: DHS 2006 and 2012.

Where do new HIV infections occur?

**Incident infections by age and sex**

- Niger’s epidemic is fuelled by both vertical and sexual transmission. In 2013, it is estimated that 709 new HIV infections occurred in children through mother-to-child transmission, and 738 new infections in adults (Spectrum 2013) – see Figure 14.

- Estimated HIV incidence is similar in males and females, but young females and older males have slightly higher incidence due to the age pattern of sexual mixing.

\(^{28}\) Note that in the 2010 FSW survey, 63% of FSW reported being divorced and 4% were widows.
Incident infections by sub-population

- Using Optima and stratifying the population by demographic, epidemiological and behavioural characteristics into 14 sub-populations, annual new infections in each sub-population were estimated (Figure 15). In 2012, MTCT and new infections in adults aged 25-49, migrants and FSW accounted for an estimated 80% of HIV incidence. The largest single contributor to new infections was MTCT.

Graph shows estimated new HIV infections per year.

Source: Spectrum 2013 (revised version)

Source: Optima application Niger, January 2014
Incident infections by location

There are no direct estimates of the geographical distribution of HIV incidence available, however, there are clues as to where HIV transmission may be occurring.

- The geographical distribution of PLHIV suggests that there may be an important share of HIV transmission occurring in the South-East of the country - in 2012, an estimated 70% of PLHIV lived in one of four regions in the South-West covering only a quarter of the country surface area (Niamey, Dosso, Maradi, Tahoua) – Figure 16. If untreated, the infectiousness of PLHIV at a more advanced stage of HIV/AIDS can support onward transmission to sexual contacts.

**Figure 21. Concentration of the HIV burden by region, Niger (2012)**

(PHLV density is given per km\(^2\): \(\geq 0.3, 0.1-0.29, 0.01-0.09, \text{et}<0.01\))

- The contribution of FSW to ongoing HIV transmission (Figure 15), the geographical distribution of sites of sex work (Figure 17), and the evidence of an urban HIV epidemic (Figure 8), all support the notion that the urban and industrial zones of Niger remain areas of elevated HIV transmission. In 2013, sex work sites were mapped and characterized in four regions to improve the understanding of hotspots of sex work-related HIV transmission. Over 3,200 FSW were counted in the 498 identified sites.
**FIGURE 22. SEX WORK-RELATED HOTSPOTS OF TRANSMISSION, NIGER (2013)**

In 4 regions, 498 sites of sex work were identified.

Sources: Cartographie de prostitution, Animas, 2013. #FSW = number of females sex workers
SECTION 4. HIV financing, HIV services and programs and their efficiency

How is the HIV response financed, and what has been spent for the different HIV services and programs?

National spending on HIV and AIDS is well documented in NASA reports covering the years 2007 and 2008 (CISLS, 2009) and 2009-12 (CISLS, 2013), summarized in Table 2.

Over six years, the costs of the national response to HIV amounted to Euro 58 million (USD 78 million), corresponding to an annual average of Euro 9.7 million (USD 12.6 million), or 0.24% of GDP, over this period, but fluctuates dramatically on an annual basis

- There is no clear trend in HIV/AIDS-related spending – it declined by almost one-half between 2007 (Euro 11.4 million/USD 14.8 million) and 2010 (Euro 5.9 million/USD 7.7 million), but has increased steeply since, and has attained the highest level observed so far (Euro 12.5 million/USD 16.3 million) in 2012.

The financing of the HIV response has been dominated by external funding, accounting for almost 90% of HIV spending from 2007 to 2011.

- However, much of the increase in HIV/AIDS spending in 2012 was accounted for by public spending (up by Euro 3.4 million/USD 4.5 million) largely due to the new World Bank loan, while external funding declined by Euro 1.4 million/USD 1.8 million.
- Consequently, the share of external funding has declined to 67%, while public funding accounted for 30% of total spending in 2012.
- The most important sources of external support have been the Global Fund (29% of total funding in 2007-12), UNICEF, and the Government of Germany (Kreditanstalt für Wiederaufbau, KFW), and from 2012 onwards the World Bank loan (2012-2016).
- Looking ahead, there is – as per 1 January 2014 - some uncertainty regarding the level of support Niger can obtain from the Global Fund. The current agreement with KFW is expiring in April 2014, and at the time of writing only USD2.6 million in Global Fund commitments towards the national HIV/AIDS response remained undisbursed.

At least since 2009, most HIV/AIDS services are delivered through the public sector (about two-thirds of all spending), while the private sector accounted for about one-quarter, and international NGOs for one-tenth of the total in 2009-2012.

- The domestic non-public sector as implementer largely reflects prevention spending financed by the Government of Germany (Kreditanstalt für Wiederaufbau) delivered through Animas-Sutura. 29

In 2009-12, most HIV prevention spending was devoted to condom social marketing and distribution (37%), prevention of mother-to-child transmission (19%), voluntary counselling and testing (15%), and measures targeting young people (13%).

- Only 7% of prevention spending was targeting “accessible risk populations” and 1% was devoted to sex workers

29 Animas-Sutura is an NGO and social marketing organisation established with KFW support. It has become an instrument in the implementation of the national population policy and HIV strategy. Its objective is to distribute condoms and other contraceptives in a way that makes them accessible country-wide.
Expenditure for sex work programs has been low and fluctuating, with the majority of funding coming from international sources (1.9% in 2009 and 0.9% in 2012 of total prevention spending). This raises questions regarding allocative efficiency since HIV prevalence among FSW has historically been and remains very high. There is also a question of sustainability and ownership with the very large decline of SW investment (65%) between 2007 and 2008 when the regional bilateral cooperation project SIDA-3 came to an end.\(^{30}\)

**Table 2. HIV/AIDS-related expenditures, Niger (2007-2012)**

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>7495.3</td>
<td>6420.7</td>
<td>5377.9</td>
<td>3862.3</td>
<td>6897.5</td>
<td>8216.8</td>
</tr>
<tr>
<td><strong>Prevention</strong></td>
<td>2507.3</td>
<td>1473.1</td>
<td>2089.8</td>
<td>1796.8</td>
<td>3719.5</td>
<td>3791.8</td>
</tr>
<tr>
<td><strong>Treatment and Care</strong></td>
<td>2420.1</td>
<td>1770.2</td>
<td>1440.6</td>
<td>687.0</td>
<td>1920.8</td>
<td>2226.7</td>
</tr>
<tr>
<td><strong>Social Mitigation</strong></td>
<td>296.3</td>
<td>327.6</td>
<td>402.9</td>
<td>292.8</td>
<td>130.1</td>
<td>130.9</td>
</tr>
<tr>
<td><strong>Management, Coordination, Support</strong></td>
<td>2271.7</td>
<td>2849.7</td>
<td>1444.6</td>
<td>1085.7</td>
<td>1127.1</td>
<td>2067.5</td>
</tr>
<tr>
<td><strong>By source of financing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Public domestic sources</strong></td>
<td>286.9</td>
<td>253.5</td>
<td>37.2</td>
<td>53.0</td>
<td>200.5</td>
<td>2443.9</td>
</tr>
<tr>
<td><strong>External sources</strong></td>
<td>6247.9</td>
<td>5352.1</td>
<td>5134.7</td>
<td>3583.3</td>
<td>6434.3</td>
<td>5493.7</td>
</tr>
<tr>
<td><strong>Multilateral and Bilateral</strong></td>
<td>5689.3</td>
<td>4693.2</td>
<td>4469.1</td>
<td>2833.1</td>
<td>5777.8</td>
<td>4918.9</td>
</tr>
<tr>
<td><strong>o/w: GFF/IMF</strong></td>
<td>1500.3</td>
<td>1288.3</td>
<td>2757.1</td>
<td>1216.9</td>
<td>2556.2</td>
<td>1494.0</td>
</tr>
<tr>
<td><strong>o/w: UNICEF</strong></td>
<td>105.8</td>
<td>99.9</td>
<td>142.2</td>
<td>133.9</td>
<td>1479.6</td>
<td>953.9</td>
</tr>
<tr>
<td><strong>International NGOs</strong></td>
<td>556.1</td>
<td>658.8</td>
<td>665.6</td>
<td>750.1</td>
<td>656.5</td>
<td>574.8</td>
</tr>
<tr>
<td><strong>Private sources</strong></td>
<td>960.5</td>
<td>815.1</td>
<td>206.0</td>
<td>226.0</td>
<td>262.7</td>
<td>279.2</td>
</tr>
<tr>
<td><strong>By implementing agency/sector</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Public sector</strong></td>
<td>2553.1</td>
<td>2693.7</td>
<td>3498.0</td>
<td>1904.8</td>
<td>4624.6</td>
<td>5600.7</td>
</tr>
<tr>
<td><strong>Private sector</strong></td>
<td>3841.1</td>
<td>2657.2</td>
<td>1157.6</td>
<td>1312.8</td>
<td>1775.0</td>
<td>2109.0</td>
</tr>
<tr>
<td><strong>International NGOs and Other</strong></td>
<td>1101.1</td>
<td>1069.7</td>
<td>722.3</td>
<td>644.7</td>
<td>497.9</td>
<td>507.2</td>
</tr>
<tr>
<td><strong>Total spending (percent of GDP)</strong></td>
<td>0.37</td>
<td>0.27</td>
<td>0.21</td>
<td>0.14</td>
<td>0.23</td>
<td>0.25</td>
</tr>
<tr>
<td><strong>o/w: Public domestic sources</strong></td>
<td>0.01</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
<td>0.01</td>
<td>0.07</td>
</tr>
<tr>
<td><strong>Total spending (Euro million)</strong></td>
<td>11.4</td>
<td>9.8</td>
<td>8.2</td>
<td>5.9</td>
<td>10.5</td>
<td>12.5</td>
</tr>
</tbody>
</table>


**What HIV services and programs have been scaled-up?**

Niger’s HIV prevention services have had a focus on reducing unprotected heterosexual acts and the risk of vertical transmission during pregnancy and birth.\(^{30}\)

- Homosexual transmission has had less focus. Although there is evidence that sexual transmission between male partners happens, there are no adapted services for MSM of any coverage and scale offered to date.
- HIV transmission through injecting drugs has so far not been regarded as a public health issue and there are no specific services developed. Drug trafficking and transport is occurring and first consultations have been held (e.g. in Agadez) on the threat of emerging illicit drug use in Niger.

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Services for sex workers and their clients

Since the end of SIDA-3 in 2007, a regional bilateral cooperation project, medical follow-up of sex workers has been the responsibility of national STI reference centre (Centre National de Référence des IST). The service delivery approach essentially consists of community-based activities (peer education, condom distribution), linkage to health facilities (STI, HCT), medical follow-up of SWs, and communication activities with SW clients. Actual implementation has until recently been patchy and lacking scale:

- It is not known what program coverage has been achieved – in 2008, an estimated 75% of SW were reached with some prevention activities, in 2011, an estimated 54% were reached with activities (SSG 2011). It is also not known what ART coverage has been achieved among HIV-positive SWs.
- There is no comprehensive, defined standard package with Standard Operating Procedures, which can be applied and quality-assured in all parts of the country (except peer education among SWs, which is well defined in terms of content and delivery modalities 31)
- Services planning in the past has not been based sufficiently on strategic information (such as SW migration, the character of sites and the dynamic nature of hotspots)
- Services have been irregular and some adapted services have abandoned their specific service focus on SWs (the only adapted service remaining was the Centre National de Référence des IST, which ensured the medical follow-up of SWs.
- SWs have to pay fees for their medical card and for each consultation even at the adapted service centre. The consultation fee increased from FCFA 200 to FCFA 1,500, however, this was overturned in the four World Bank- supported regions where consultation is now free for SWs.

Only 4 of 10 Niamey sex workers are linked into the medical follow-up program, consisting of screening and treatment services at a health centre. 32

- The monthly medical monitoring service is only provided for SWs in Niamey. The majority of sex workers accessing the services are foreigners i.e. non-Nigerien.
- Barriers to using services cited by respondents of the mapping study are non-proximity of the health centre, poor reception, slowness of services, and lack of privacy. An additional barrier cited anecdotally in the study related to the need to re-purchase a medical log book after a missed appointment.
- Key informants emphasize that a key challenge is that the vast majority of FSW are clandestine, not known to the authorities and difficult to serve and protect.

The country has started to systematically define and describe SW sites and SW typologies, which represents indispensable strategic information to tailor services to the locality and needs.

- SW venues and sites are33 bars, “buvettes”, tourist camps, night clubs, restaurants, markets, hotels, “maison closes” and the street.
- SW below 30 years of age tend to work in the street, while “maison closes” tend to include women up to 50 years of age.
- The number of clients differs according to type of site with bars and restaurants having the highest proportions of SWs serving >20 clients a day.

Sex workers’ condom use has multiple determinants and barriers

32 Animas-sutura- SongES – RENIP. Resultats de l’etude de cartographie des sites prostitutionnels de la communuaute urbaine de Niamey. 2013
33 CISLS. Cartographie sites prostitutionelles et MSM.2010
• **Client refusal is the chief reason for unprotected commercial sex** – client refusal was responsible for 85% of all unprotected sex acts in a 2010 SW study in Niamey. This level of client refusal of condoms emphasizes the need to augment risk perception among higher-risk men (SWs in Maradi report that 65% of clients refuse condoms; 72% of SWs accept to have unprotected sex with clients refusing condoms).

• SW characteristics like age, time involved in sex work, education and affiliation to venues determine motivation to use condoms and their self-efficacy in defending their wish to use condoms.

• **Condoms are often available, but not always** - 86% of SWs in a recent mapping study say condoms were always available.

• The type of sex partner predicts condom use – condom use is highest with commercial partners and lowest with boyfriends (about 23% of SWs report using a condom at every sexual act) and this differential indicates a need for risk counselling of SWs.

SW interventions appear to represent significant scope for strengthening to achieve scale, coverage and impact.

- Few Nigerien SWs benefit from the full combination package of services.
- With higher HIV prevalence observed in SW sites bordering with Nigeria - due to the associated migratory activities and presence of SW client populations – targeting resources to these SW sites seems especially promising.
- Program monitoring also requires strengthening in order to inform management, foster learning and contribute to evaluation activities.

**Condom promotion and distribution services**

Condom promotion has been a focus for many years for the prevention of HIV and STIs, with free distribution condoms, socially-marketed and commercial condoms being made available.

The following results can be summarized:

- Condom use is only significant in commercial (ca. 87% use across several surveys) and casual acts (ca. 40% use across several surveys), they are virtually not used in regular partnerships (ca. 3% use), and play a very minor role in FP.

- **There are an estimated 2.32 million unprotected commercial sex acts per year in Niger, which represent the top priority for condom targeting** (see Table 3). It is also estimated that there are over 3 million unprotected casual acts, which are a second priority for condom promotion activities for HIV and STI prevention.

- Young men increasingly report condom use in casual sex – 38% in 2006 (DHS) and 66% in 2011 (SSG) (very few young females report casual sex).

- Condom use data from key populations suggest more could be done to make sex safer: Among those reporting 2 or more partners, 40% of prisoners, 45% of migrants, 51% of military, 43% of miners and 64% of truckers reported condom use at last sex (SSG 2011).

- **Reported condom use among sex workers has been 85-95% in recent years with paying clients**, however, it was only 64% with “petits amis” (cartographie PS/HSH), who may often

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be men in regular partnerships with women of low risk behaviour, and therefore link these inadvertently to higher risk sexual networks.

**TABLE 3. ESTIMATED PROTECTED AND UNPROTECTED SEXUAL ACTS, NIGER (YEAR)**

<table>
<thead>
<tr>
<th></th>
<th>Est. total acts</th>
<th>Est. % protected</th>
<th>Est. protected acts</th>
<th>Est. unprotected acts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regular acts</strong></td>
<td>210.46 m</td>
<td>3%</td>
<td>6.31 m</td>
<td>204.14 m</td>
</tr>
<tr>
<td><strong>Casual (non-regular) acts</strong></td>
<td>5.47 m</td>
<td>40%</td>
<td>2.19 m</td>
<td>3.28 m</td>
</tr>
<tr>
<td><strong>Commercial (paid) acts</strong></td>
<td>17.91 m</td>
<td>87%</td>
<td>15.58 m</td>
<td>2.33 m</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>233.84 m</td>
<td>10%</td>
<td>24.08 m</td>
<td>209.75 m</td>
</tr>
</tbody>
</table>

Sources: Estimated values based on reported condom use data (2012 DHS, 2011 SSG), the size of sub-populations (census data) and estimated sexual frequencies by type of partnership.

**Social marketing of condoms has been initiated in 2003 and has led to:**
- At least 44 wholesalers who provide condom outlets with social marketing condoms units
- “Foula” condoms dominate the market, Animas-Sutura have distributed 30 million “Foula” condoms, which are sold in packets of 3 for FCFA 75
- Targeted condom marketing and distribution along transport axes through kiosks and mobile vendors
- Integrated promotion and sales with socially-marketed malaria and RH commodities (distribution of oral contraceptive “Sutura” since 2010)

**There are certain limitations to the scale-up of condom program activities:**
- Many adults don’t agree with condom promotion for youth aged 12-14 years – only 32% of adult females and 48% of adult males show supportive opinions (about half in urban areas)
- In pro-natalist societies, there are often cultural and perception barriers to condom use.
- In health facilities, condoms are often stocked as FP commodities and since the demand for condoms as contraception method is very low, these condoms can expire at clinic level instead of getting distributed for HIV/STI prevention.
- Distribution especially to remote areas, through the public health system (free condoms) or the commercial channels (SM condoms) remains a challenge in a vast country with at overall weak push and pull factors for condom distribution.

**Services for the Prevention of Mother-to-Child Transmission**

In 2011, Niger committed itself to accelerate progress in PMTCT with the goal of virtually eliminating new paediatric HIV infections by 2015. The e-MTCT strategy for 2013-2015 presents a clear analysis of the bottlenecks and details a series of action to reduce the MTCT rate of 27% in 2013 (2013 revised Spectrum data) to less than 5% in 2015. Key results to date are:

- Moving from 7 PMTCT pilot sites in 2003 to 651 PMTCT sites\(^{37}\) in 2012

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\(^{37}\) A PMTCT site means PMTCT service provision in an Integrated Health Centre, a hospital, maternity or any other health facility
• Increase of assisted deliveries – a SRH objective – to 29.3% in 2012 (up from 18% in 2006), which can help women accessing PMTCT offered in maternity care
• Increased attendance of the first prenatal visit (CPN1=83% up from 46% in 2006), however, CPN4 below 26% in 2012 which severely limits PMTCT uptake
• In 2012, 47% of pregnant women in need received ARVs through the PMTCT program (revised Spectrum 2013; of 2847 mothers in need, 1334 received ARVs of which 895 option A and 439 option B)
• Diagnosis of exposed infants almost inexistent at about 1%.
• The “husband school/écoles des maris” tested with UNFPA assistance for SRH purposes, and its scale-up includes PMTCT - this program is expected to help address some of the challenges in PMTCT scale-up since access to assisted delivery is largely dependent on their husband’s approval.

The roll-out of PMTCT service offers is in some agreement with epidemic evidence

• Niamey – where DHS-female HIV prevalence is highest – had reached the highest coverage of PMTCT sites in 2012 (roll-out to 89% of eligible health facilities) (e-MTCT strategy 2013)
• Diffa – with second highest DHS-female HIV prevalence and third-highest ANC HIV prevalence – had reached 82% roll-out to eligible health facilities
• Tillaberi – with low DHS and ANC female HIV prevalence – had slowest PMTCT roll-out of 44%; Zinder also had relatively slow roll-out at 71% and relatively lower DHS and ANC female HIV prevalence, and Agadez’ roll-out was at 76%, commensurate with its average female HIV prevalence level
• However, Dosso – with highest ANC HIV prevalence of 1.3% - had only reached 70% roll-out
• Tahoua – with second highest ANC HIV prevalence of 1.1% - had only reached 71%
• Maradi – with 0% DHS-HIV prevalence and <1% ANC HIV prevalence – had reached a high roll-out of 85%

The efficiency of existing PMTCT sites is constrained by numerous organizational, technical and financial challenges

• Even though 176 new PMTCT sites were created in 2011 within existing integrated health centres, the number of pregnant women tested for HIV decreased that year due to a 6 months shortage of testing kits and reagents.
• Scale-up of PMTCT services suffers from limited and uneven availability of human resources /trained professionals, and the insufficient number of CD4 and PCR diagnostic tools.
• The high rate of utilization of CPN1 (83%) is explained by the additional benefits of this visit: registration of the birth in the administrative system, receipt of mosquito net for malaria prevention. Subsequent attendance of pre-natal care is successively lower.
• Renewed efforts to provide free delivery assistance has raised utilization, but it is still too low and also affects the follow up of HIV-exposed infants (in 2012, only 1% or 669 children out of 5117 received the ARV treatment they needed, revised Spectrum data).
• The “PMTCT cascade” is illustrated in Figure 18, showing the massive effect of poor utilization of facility-based antenatal and delivery services has on PMTCT coverage.
Program inefficiencies and bottlenecks have been diagnosed (presented in the e-MTCT strategy) and a series of action identified to address them (Table 4 provides a summary). The two main avenues to further scale-up PMTCT are:

- Improve access to treatment through integration and decentralization of services, delegation of ART prescription to primary care providers and improvement of technical platform (for PCR and CD4 count).
- Achieve community mobilization with a strong focus on the participation of men (potentially via generalization of the “écoles des maris”) to facilitate higher uptake of services by women, improve continuum of care and reduce the number of lost to follow up.

### Table 4. Key gaps and bottlenecks at each step of the PMTCT cascade and actions identified in the e-MTCT strategy, Niger

<table>
<thead>
<tr>
<th>PMTCT cascade</th>
<th>Current status</th>
<th>Bottlenecks identified</th>
<th>Actions identified</th>
</tr>
</thead>
</table>
| Improve ANC uptake | CPN1 > 85%, CPN 1-4 < 45%. | Cultural barriers, low quality of services provided | • Improve support from community networks including men (école des maris)  
• Improve services via decentralization of tasks and better supply chain management |
| Improve HIV testing | Less than 40% coverage | Lack of trained personal, weak coverage of technical platform for CD4 count, limited number of prescription and follow up centers | • Improve technical platform  
• Improve patient services through increased capacity of health care providers and support from PLHIV networks.  
• Accelerate decentralization and task delegation at district level of prescription sites as well as CD4 counts.  
• Improve supply chain management for treatments and testing materials. |
| Improve CD4 testing and process to launch treatment | Less than 25% of HIV positive women are under ARV treatment | | |

Sources: Data from NDHS 2012, PDS, Sentinel surveillance/Spectrum 2013; Illustration by authors
PMTCT cascade | Current status | Bottlenecks identified | Actions identified
--- | --- | --- | ---
Improve uptake of assisted delivery | Less than 30% of pregnant women benefit from delivery assisted by trained professional | Cultural barriers | • Scale-up experience of Arlit district where community mediators facilitated access to PMTCT  
• Promote implication of men in SRH/HIV services, in particular via extension of the école des maris.

Improve follow up of exposed children | CPoN=24 % | Lack of communication between the different actors (PMTCT-maternity-prescription site) | • Implement follow-up process of mother and child from screening to post delivery  
• Involve PLWHIV and communities (women, traditional and religious opinion leaders)

Improve early diagnostic for children | Almost nonexistent | Lack of materials (only one PCR machine currently available and located in Niamey)  
Lack of providers qualified for newborn follow-up  
Lack of integrated database to ensure follow-up and transfer between structures/sites | • Improve technical platform (e.g. PCR equipment)  
• Accelerate decentralization and task shifting at district level for ARV prescription  
• Integration of services with maternal and infant health services to ensure early diagnosis

Improve follow up at 18 months | Very low diagnosis for exposed infants (< 10% of children under ART) | | •

Source: e-MTCT strategy 2013, MOH

**HIV counselling and testing services**

The health sector offers HIV counselling and testing (HCT) in integrated health services, in PMTCT sites, blood transfusion centres and sites for TB testing and treatment. In 2008, there were 172 HCT sites in the country. The following results can be summarized:

**Annual HIV testing is 4-5 percentage points higher in females than males**

- HIV testing is reported by 7-8% of females and by 2-3% of males (NDHS 2012) – the higher testing rates in females are due to PMTCT –related HCT. **Figure 19** shows strata of men with high HIV prevalence and low HCT rates. Such analyses can inform better geographic targeting and promotion of HCT services (e.g. men resident in Dosso and Diffa) and demographics for demand creation (e.g. older men).

- **Key populations have overall higher testing rates**, with 76% of the sampled FSW, 61% of military, 46% of miners, 41% of prisoners, 39% of truckers and 28% of migrants reporting testing (2011 SSG).

- In 2012, the Government allocated dedicated resources to **provider-initiated counselling and testing** (PICT) demonstrating the intention to target HCT to individuals who are a) already in contact with the health sector, and b) may provide high yields of HIV-positive individuals, especially when applying PICT to STI and SRH services for adults, and child malnutrition screening.
A proportion of women and men who have accepted HIV testing fail to obtain the test result, especially those living in poverty

- Overall, 11% of females don’t receive the test result, but this is elevated in women in the three lowest wealth quintiles (>15% don’t receive the result) and also in those without school education and living in rural areas (NDHS 2012).
- Although men undergo HIV testing less often, they appear more likely to obtain the test results with only 5% not receiving the result. Failure rates are highest in Dosso and Maradi (>10%) and in the lowest wealth quintile (25%, small sample size).

There are reports of stock-out of HIV test reagents at service level

- According to key informants, stocks at central level are sufficient, but there are reports of stock-outs from the decentralized level (e.g. in Maradi region).
- The system of ordering commodities at decentralized level is not working well, and the cold chain has seen challenges.
- There are efforts to strengthen the supply chain logistics for HIV test reagents (and ARVs) with committees at central and regional level (the “comités d’approvisionnement”) and specific funding to improve the cold chain.

ART services

Public sector ART provision started in 2004 and was gradually scaled up. ARVs are provided pre-of-charge in the public health sector. The change in national ART treatment policy in 2010 meant that the number of eligible adults “in need” doubled and relative coverage decreased (change from CD4200 to CD4 350 treatment eligibility). The following results can be highlighted:

- In 2012 there were 15 sites providing ART services with 11,182 adult and paediatric patients on the register – see Figure 20.
- ART coverage was 13% in children and 51% in adults in 2012 (57% in adult women and 45% in adult men), based on Spectrum estimates of ART need, and statistics on ART provision in the program.
ART retention is 70% at 12 months, 65% at 24 months and 59% at 60 months (2013 program statistics). This is lower than the WHO-reported LMIC average of 86%, 82% and 72%, respectively (WHO 2013 progress report).

- Retention is similar among male and female ART recipients, and between adult and child recipients (2013 program statistics).
- Confirmed deaths among ART patients is 3.9% at 12 months, 5.4% at 24 months and 7.7% at 60 months (loss to follow-up 26%, 30% and 33%, respectively).

Estimation of drug needs suffer from weak routine data and are often based on program targets instead of actual service data.

- Supervision documents suggest that in several sites, statistics are not updated or deaths of ART patients not reflected in the statistics.
- Needs of ARVs, other medicaments and inputs are estimated annually by the APPR group technically supported by SOLTHIS. Incomplete data from the ART sites make this exercise difficult, however, attempts are made to understand the number of new initiations, those lost to follow-up, mortality and actual consumption from each site, with the largest volume of data coming from the Niamey-based ART sites.
- The resulting estimates are weak and not supporting correct drug procurements, with overestimations leading to wastage and underestimations causing shortages.
- Data collection and sharing for informing procurement needs to be strengthened urgently with better data on ARV consumption and the treatment cohorts from each site.

Human resource constraints affect the performance of the ART program negatively

- Only 3 of 8 regions have a pharmacist for the management of the inputs into the ART program (ARVs, other drugs and consumables).
- Personnel in the pharmacies at the decentralized level is insufficiently trained or qualified and this affects the daily management of the supply chain as well as a full understanding of the drug needs of the treatment cohort.

The procurement of ARVs is centrally managed which allows a harmonized approach to drug procurements according to identified needs. However, the purchase itself of ARVs, other drugs and inputs is not harmonized.
The ONPPC (Office National des Produits Pharmaceutiques et Chimiques) coordinates all procurements on behalf of the Global Fund, other financial partners and the government.

The process of buying ARVs is not unified: Global Fund orders go through the Voluntary pooled procurement (VPP) service while government-financed orders use a tender process.

Proforma invoices reveal a large differential in drug prices between these two purchasing mechanisms, and between international prices as per Clinton Initiative.

ARV drugs purchased through the government system cost twice as much as the prices endorsed by the Global Fund, the Clinton Initiative and WHO.

For instance, the cost of one pack of 60 tablets of 3TC/AZT/NVP (150/300/200 mg) costs 11 260 FCFA as per ONPPC proforma invoice (Euro 17.15), compared with Euro 8.59 as per Clinton Initiative. The median cost reported by the Global Fund for West and Central Africa (period 2005-2012) for the same pack of tablets is Euro 8.74 (interquartile range Euro 7.36 – 10.58) or 5 735 FCFA (4830 – 6943)\(^{38}\)

The cost of 60 3TC/AZT (150/300 mg) has a proforma invoice price of Euro 13.01 compared to Euro 6.75 as per Clinton Initiative.

Other comparisons show the same pattern: 60 NVP 200 mg: Euro 4.40 versus Euro 2.30, 120 LVP/r Euro 59.17 versus Euro 24.16 (ONPPC compared to Clinton)

The ARV distribution systems are minimal and sometimes leads to storage problems and ARV shortages at the sites.

ONPPC is responsible for storage and distribution of ARVs, other drugs and reagents (and has a specific contract with CISLS to ensure the delivery of these commodities to the regions).

There are at times challenges with cold storage of goods at central level. Three refrigerated vehicles are being financed by the Global Fund to reduce ONPPC’s reliance on the cold chain of partners.

At decentralized level, there are issues with the number of depots (only two, in Tahoua and Zinder), which means that all other ART sites need to be serviced directly by the central level every 3 months. Due to delays in the reporting of treatment data and drug requirements, ARV stock-outs have been experienced at the treatment sites. This can occur at times when the central depot is over-stocked.

Storage conditions at decentralized level can be sub-optimal, which can affect the quality of the products.

The “Comités d’approvisionnement” at central and decentralized level are put in place to remedy the supply chain problems, and the information system by the Global Fund for HIV, TB and malaria, supported by Solthis, will further support the adequate stocking and availability of ARVs and reagents for ART provision.

Comparison of selected unit costs of HIV services

The bottom-up costing exercise of the Resource Needs Model in 2012 provides an insight into unit costs, which can be compared to other countries using the same methodology (Table 5).

For some services, the unit costs are higher than for the comparison countries Togo and RDC: The service package for SW and MSM is costed at a higher level in Niger.

Costs for HCT provision, STI treatment and examination of a woman in PMTCT services are lower in Niger compared to the other countries.

\(^{38}\) In USD, this is 11.40 per pack (interquartile range USD 9.60 – 13.80), as per the Aidspan report “Procurement cost trends for Global Fund commodities: Analysis of trends for selected commodities 2005-2012”, Aidspan working paper April 2013.
First line ARV costs are higher in Niger than Togo but lower than RDC (PMTCT and ART services), however, second line ARVs are significantly more expensive in Niger.

### Table 5. Comparison of Some Unit Costs of HIV/AIDS Services (Euro)

<table>
<thead>
<tr>
<th>Services</th>
<th>RNM Niger</th>
<th>RNM Togo</th>
<th>RNM RDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevention</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost per SW service package</td>
<td>59.8</td>
<td>22.2</td>
<td>22.2</td>
</tr>
<tr>
<td>Cost per MSM service package</td>
<td>59.8</td>
<td>22.2</td>
<td>54.5</td>
</tr>
<tr>
<td>Cost per STI episode treated</td>
<td>7.7</td>
<td>11.5</td>
<td>9.2</td>
</tr>
<tr>
<td>Cost per HCT client</td>
<td>3.8</td>
<td>10.7</td>
<td>32.2</td>
</tr>
<tr>
<td>Cost per women examined in PMTCT</td>
<td>3.8</td>
<td>6.1</td>
<td>-</td>
</tr>
<tr>
<td>Cost per pregnant women treated with ARV</td>
<td>46.8</td>
<td>34.5</td>
<td>76.7</td>
</tr>
<tr>
<td>ART</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual cost first line</td>
<td>166.4</td>
<td>109.7</td>
<td>189.4</td>
</tr>
<tr>
<td>Annual cost second line</td>
<td>913.5</td>
<td>628.2</td>
<td>289.2</td>
</tr>
</tbody>
</table>

1 Euro = 655.957 CFA (fixed), 1 USD = 503.1 CFA.

### IEC/BCC services

IEC/BCC activities are designed to increase risk perception and improve the use of HIV prevention methods and services such as condoms, HCT, PMTCT and STI care.

IEC and BCC have been targeted at young people in primary and secondary schools and to youth in out-of-school settings for HIV and STI prevention purposes.

IEC/BCC activities resulted in the following levels of knowledge, norms and behaviours relating to sexual behaviours:

- Among youth aged 15-24, 46% of females and 65% of males cite condom use as a means to prevent HIV infection (NDHS 2012)
- 65% of young females and 80% of young males know that limiting sexual contacts to one HIV negative partner reduces the risk of HIV
- 54% of young females think that it is justified for a woman to refuse sex with her spouse if she knows he has sex with other women, and 66% think it is justified for a women to ask for condom use if she knows her spouse has an STI
- However, most women marry early, have much older partners and little or no school education - it is therefore questionable whether they are in a position to negotiate safe marital sex
- Among 15-24 year olds, only 0.2% of females and 1.1% of males report having had 2 or more sex partners in the past 12 months, and 1.3% of young men report having paid for sex
- [the median age at first sex is 16 years for females and 23 years for males (self-reported NDHS data 2012)]

### To what extent are HIV services integrated or linked?

The authorities are aware that linkage and integration are important, and strategy documents state the need for integrated supervision activities and better integrated monitoring and reporting. At the
same time, linkage and referral systems are being discussed and proposals for improvements have been made. But, this is not a comprehensive look at integration, which encompasses (a) intra-provider linkages (i.e. integration of services by one provider during one patient consultation), (b) intra-facility integration, which encompasses linkages between services, by different providers, at a facility, and (c) inter-facility integration, which is about referrals between facilities. At each health facility (and stand-alone HIV-service-providing facility), the question should be asked about how intra-provider, intra-facility and inter-facility integration can be optimized. In summary, the following observations can be made:

**General integration of and linkages with HIV and health programs:**

- Social marketing of condoms is integrated with malaria and RH commodities through joint marketing and common sales channels under the direction of Animas-Sutura
- Free child delivery services have raised the assisted delivery rate and have indirectly helped to raise PMTCT coverage
- The roll-out and promotion of PICT helps targeting HCT (which is very important in a low grade HIV epidemic), and provides opportunities to linking clients to prevention, treatment and care services (functional linkages between HCT and pre-ART/ART is a priority for getting PLHIV into treatment earlier)
- The offer of selected free-of-charge health services by the public sector (especially family planning, antenatal care) holds great potential for increasing the use of HIV and SRH services
- Integration of HCT into child malnutrition screening works (3-4% of children found HIV+, suggesting that such targeted HCT is an important way to improve HIV case finding among children and eventually increase paediatric ART coverage)
- Community-based agents (such as the “médiatrices communautaires”) and community-based organisations can help link people to health services and hold great promise in a country where 53% of people live outside the 5 km catchment area of health facilities. Priority tasks of such community workers should include the identification of risk pregnancies and the accompaniment of women, children and families enrolled in treatments (PMTCT regimens, ART, FP, TB, etc.). In Malawi, peer support and defaulter tracking were important for minimizing loss-to-follow-up of women on ART, as were extended counselling and ongoing support of women, and effective use of the patient monitoring data. The Rwanda experience with male and female health workers at community level demonstrates the importance of mobilisation and demand creation at grassroot level.
- Full integration of the regional HIV coordination into the health sector’s coordination structures will support the integration agenda and increase sustainability of both HIV coordination and HIV interventions at decentralized level (delays in resource flow have disrupted HIV coordination in the past).
- Linkage and joint monitoring between public and the private service providers is poor despite the country’s strategy of a multisectoral approach to HIV/AIDS. For instance, 8% of men and women in Agadez have a medical insurance from an employer, and 3% of men and 6% of women in Niamey, but private sector HIV service provision is not being reported in the national statistics.

**Linkages between a package of services for sex workers:**

Although it is more difficult to link a package of HIV services for sex workers to general health service delivery, the different components of FSW programs – the bedrock of Niger’s HIV response – can and need to be better integrated, in the following ways:

- Accessible STI services as a bedrock of ensuring an entry point to service provision for FSW
- The link between community-based activities for SW and the adapted services at facility level is weak with insufficient collaboration between peer educators and clinic staff, this also applies to the link between VCT services and care/treatment.
- Structural interventions need to be linked to a comprehensive service package for SWs to address stigmatisation and discrimination which currently limit service use (this also applies to male SWs).
- Integrated HIV workplace interventions, especially in mining and oil companies, are seen as important complementary activities to make sex work safer by providing targeted HIV prevention services to employees (who may be involved in commercial sex due to their income and living situations).
- The integrated services for migrants (OIM-Niger) are considered a useful model for delivering HIV and STI services in an integrated way to key populations by key stakeholders in the national HIV response.

**PMTCT:**

- A strategy of rolling out PMTCT into all the 857 Integrated Health Centres is being pursued (eTME plan), which is underpinned by the global and regional plans of virtual elimination of vertical transmission (despite low HIV prevalence in the general population and correspondingly high costs per vertically transmitted HIV infection averted).
- Government documents emphasize the weak integration of maternal, neonatal and infant health services (MNIH), SRH, FP, ART and PMTCT services (this includes supervision, i.e. visits by district cadres for supervision purposes miss to include PMTCT services adequately).
- This weakness leads to missed opportunities of offering the complete service package, including ARV-based interventions, to HIV+ women and children at the same time and in the same place.
- The linkage of community based activities targeting men, in order to increase utilisation of antenatal care - and hence PMTCT - services has been piloted (“école des maris”) and this is locally regarded as a promising intervention particularly for FP and PMTCT.
- The screening of HIV-exposed infants at 6 weeks is infrequent due to lack of integration of this activity into the treatment of the HIV-positive mother (and the underlying problem of very low assisted delivery rates).
- The importance of linking FP, PMTCT and child survival efforts in Niger cannot be overstated. International experience has shown that “wanted pregnancies” benefit from better follow-up in terms of antenatal care with direct implications on utilisation of PMTCT (pers comm. Karusa, UNAIDS).
SECTION 5. HIV investments: Impacts from past expenditures and best resource allocations in the current Strategic Plan period

Impact of historical HIV expenditures

Using Optima, the impact of past HIV investments was estimated by comparing the expected number of new HIV infections according to actual conditions with the estimated numbers under counterfactual scenario of no funding for specific HIV programs. Local data were used to formulate evidence-based assumptions on the relationship between funding, HIV outcomes, and program coverage (Annex 1 section A1.6). Optima was used to project epidemic trajectories according to the counterfactual scenarios, and comparison of these trajectories with the calibrated epidemic trajectory according to actual conditions (Figure A1) resulted in an estimation of the impact of the HIV program.

Historical spending over the period 2007-2012, helped to reduce HIV incidence and therefore averted new HIV infections (Figure 21).

- Spending from 2007-2012 averted close to 3,900 infections just during that period
- The downstream effects of these prevented infections mean that by 2035, the spending from 2007-2012 will have averted a total of 12,600 infections, at a cost of Euro 3,500 (USD 4,700) per infection averted if only HIV program spending is considered (see Annex A1.3 for programs included), and Euro 4,600 (USD 6,200) if all HIV spending including management and coordination is included.
- These second-order, future benefits of the six years of historical spending are therefore much higher than the HIV infections averted while spending was happening from 2007 to 2012.

**Figure 26. Number of infections averted by historical HIV spending from 2007-2012, Niger (2007-2035)**

![Graph showing the number of infections averted by historical HIV spending from 2007-2012 to 2007-2035 in Niger.](image)


The HIV incidence decline occurred across sup-populations and was most dramatic in those with highest HIV incidence in the past (Figure 22).
The largest HIV risk reduction occurred in FSW, with an estimated 3.5% HIV incidence in 2000 which had dropped to approximately 1.1% in 2012.

Using the best available local and regional data on MSM, the estimated HIV incidence was at 0.9% in 2012 (reduced from 1.4% in 2000). This figure is uncertain given the scarcity of MSM data in Niger, however, the Optima-derived estimations point to this key population as a priority population to strengthen programming as well as strategic information.

The HIV incidence decline is expected to continue into the future as long as HIV program coverage remains at current levels.

**Figure 27. Estimated infections by population and time, Niger (2000-2035)**

Estimations for MSM are based on assumed HIV prevalence data using information from the sub-region and the resulting HIV incidence estimates for MSM are therefore uncertain.

![Graph showing estimated infections by population and time](image)

*Sources: Niger epidemic, demographic, behavioural and service data in the populated Optima model. The populations are described in Annex 1 section A1.2.*


**Best resource allocation in the current HIV strategic plan period**

One of the key interests of this analytical study was to use the Optima model to determine the allocation of HIV resources or spending required that best meet the objectives of HIV incidence or DALY reduction (see detailed objectives in Section 1). This optimization was done by combining the information on the relationship between costs and outcomes ([Annex 1, section A1.6](#)) with a simple optimization algorithm that found the best allocation of resources to meet the objective at hand; in this case, minimization of either HIV incidence or DALYs until 2025 in order to capture longer-term benefits of investments.
There are specific shifts in budget allocation required to optimize program impacts on HIV incidence and morbidity/mortality (DALYs) – Figure 23. Note that condoms are included in the intervention packages for the different populations; some community mobilisation activities are part of the PMTCT package; HCT is included in ART, SW and PMTCT service packages; and SW interventions include mobilisation activities.

- Compared to the 2012 spending pattern, spending to minimize either incidence or DALYs would prioritize ART, PMTCT and FSW spending, while reducing spending on the low-risk populations (primarily the general population)
- In Niger’s epidemic context, the optimal spending allocations look virtually the same for best reductions in HIV incidence or DALY, i.e.
  - Increased spending on ART from 31% currently to ca. 50%
  - Increased spending on PMTCT from 11% currently to ca. 19%
  - Increased spending on FSW from 1% currently to ca. 4%
- These shifts in spending reflect the better resource targeting to populations amongst whom the majority of new HIV infections occur (especially true for FSW and their sexual contacts); in addition, they emphasize the relatively high effectiveness of ARV treatment as prevention, since PLHIV on treatment have significantly reduced infectiousness. 40

**FIGURE 28. CURRENT VersUS OPTIMAL BUDGET ALLOCATIONS FOR MINIMIZING INCIDENCE (LEFT) AND DALYS (RIGHT) OVER THE PERIOD 2014-2025, NIGER**

Sources: Spending data from NASA; Niger epidemic, demographic, behavioural and service data in the populated Optima model. Note: “Current” = 2012 spending pattern. OVC, blood, PEP, waste, and management costs were kept fixed.

Condoms are part of the HIV intervention packages for the different populations. FSW = Female sex workers, MARPs = A combined group of prisoners, migrants, men having sex with men, uniformed security/defence personnel, mine workers and truckers, LRP= A combined group of general population females and males aged 15+ years.

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40 Optima and Spectrum used the factor 0.80 for reduction in HIV transmission when on ART (modified from the Spectrum default value of 0.92), based on programmatic effectiveness of ART on viral load reductions in several African ART interventions.
Optimization of the 2014-2017 budget (annual average of Euro 4.8 million or USD 6.5 million) for HIV incidence reduction averts an estimated 8,900 additional HIV infections from 2014-2025.

- Most of the benefit is obtained by increasing funding for FSW (7,000 extra infections averted, across all population groups, counting direct and indirect/secondary transmission events), and by increasing funding for PMTCT (which reduces MTCT by 50%, or 1,400 extra infections averted) and ART (3,400 extra infections averted).
- These increases require reducing funding for low-risk populations, leading to 3,000 additional infections, but the net benefit is still very positive (7000+1400+3500-3000=8900 infections averted).

If HIV funds are very limited or more abundant, allocations can be guided by an investment cascade which helps prioritize expenditures by HIV impact – Figure 24.

- Given limited funds (below of what has actually been acquired for the NSP period\(^{41}\)), PMTCT and ART should be given first priority, followed by FSW spending – this explicit rationing is not desirable since easily preventable HIV infections will occur in such a tight funding context.
- With larger budgets (notably, larger than the average budget over the period 2014-2017), programs for the low-risk population should be given significant funding with similar spending patterns to the 2012 distribution, except with a far greater proportion going towards PMTCT.

**Figure 29. HIV Investment Cascade, Niger (2014-2017)**

<table>
<thead>
<tr>
<th></th>
<th>20% budget</th>
<th>50% budget</th>
<th>100% budget</th>
<th>150% budget</th>
<th>200% budget</th>
<th>2012 expenditure</th>
<th>400% budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMTCT</td>
<td>629</td>
<td>1356</td>
<td>1265</td>
<td>2567</td>
<td>3716</td>
<td>1515</td>
<td>7045</td>
</tr>
<tr>
<td>ART</td>
<td>0</td>
<td>701</td>
<td>3193</td>
<td>4206</td>
<td>4462</td>
<td>3588</td>
<td>6509</td>
</tr>
<tr>
<td>LRP</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>871</td>
<td>4165</td>
<td>4560</td>
</tr>
<tr>
<td>MARPs</td>
<td>27</td>
<td>28</td>
<td>25</td>
<td>81</td>
<td>150</td>
<td>407</td>
<td>482</td>
</tr>
<tr>
<td>FSW</td>
<td>295</td>
<td>293</td>
<td>274</td>
<td>281</td>
<td>313</td>
<td>55</td>
<td>431</td>
</tr>
</tbody>
</table>

**Sources:** Spending data from NASA; Niger epidemic, demographic, behavioural and service data in the populated Optima model.

**Note:** 100% budget=Euro 4.8 m/USD 6.5 m per year, based on acquired funding by end 2013. FSW = Female sex workers, MARPs = A combined group of prisoners, migrants, men having sex with men, uniformed security/defence personnel, mine workers and truckers, LRP= A combined group of general population females and males aged 15+ years.

\(^{41}\) The yearly average of Euro 4.8 million (USD 6.5 million) is skewed to the earlier NSP years. Very low funding had been acquired for the years 2016-17 at the time of analysis, so the assumptions of 50% or 20% of the yearly average in the investment cascade are relevant. In turn, 2014 had a higher-than-average amount of acquired funding, and the investment cascade can provide guidance on prioritisation in years with strong availability of funding.
The reallocation of available funds results in a 12% additional reduction in new HIV infections over the period until 2025 compared to continuing the 2012 expenditure pattern, despite the fact that the funds available are only roughly half the 2012 budget - Figure 25.

**Figure 30. Cumulative Infections over 2013-2025 that Would Result from Different Spending Scenarios, Niger**

(no spending, a continuation of 2012 spending, and optimized spending at various budget levels relative to expected funds available 2014-2017)

Sources: Spending data from NASA; Niger epidemic, demographic, behavioural and service data in the populated Optima model. Note: 2012 budget = 2012 expenditure pattern. 100% budget = Euro 4.8 m/USD 6.5 m per year, based on acquired funding by end 2013. Drug costs are kept constant over time, other costs increase in line with GDP per capita.

Optima modelling also provided some broad estimates of additional costs caused from raising the ART eligibility threshold to CD4 500 and of saving gained with more modest management cost increases (Figure 25). Compared to the default expenditure of meeting NSP coverage targets, increasing the treatment CD4 threshold to 500 would increase ART coverage costs by an estimated 12% over the four NSP years. By 2017, ART coverage cost would be an extra Euro 2.7 million (USD 3.6 million) annually. Management costs are currently expected to grow far faster than inflation (4% population growth + 3% currency inflation). If these grew at the inflation rate instead, Euro 1.7 million (USD 2.3 million) could be saved over the four NSP years, as shown in Figure 26.
**Figure 31. Minimum budgets required to meet NSP 2013-2017 coverage targets, Niger**

Bar groups show different scenarios: Default (current conditions), CD4 threshold for treatment of 500 instead of 350, and lower management costs. Spending: in Euro, million.

![Spending chart](chart.png)

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default (€m)</td>
<td>10.5</td>
<td>13.1</td>
<td>16.6</td>
<td>20.2</td>
</tr>
<tr>
<td>Higher CD4 threshold</td>
<td>11.7</td>
<td>14.7</td>
<td>18.6</td>
<td>22.9</td>
</tr>
<tr>
<td>Lower management costs</td>
<td>10.5</td>
<td>13.0</td>
<td>16.0</td>
<td>19.2</td>
</tr>
</tbody>
</table>

Sources: National Strategic Plan 2013-2017, relationships between funding, HIV outcomes, and program coverage (Annex 1 section A1.6). Note that drug costs are kept constant over time, other costs increase in line with GDP per capita.
SECTION 6. Financing needs and fiscal space implications of HIV investments

NSP 2013-2017: Financing needs and gaps

The NSP 2013-2017 envisages a reduction in the number of new HIV infection by 50%, and a further expansion in access to ARV treatment to at least 80% of people who are eligible. Annual spending under the NSP is projected to increase steeply from Euro 8.8 million (USD 11.7 million) in 2013 to Euro 18.0 million (USD 23.9 million) in 2017. Table 6 presents acquired NSP funding, estimated needs and funding gaps.

- For the remaining four years of the NSP, only 35% of the total NSP projected spending of Euro 69.2 million/USD 93.1 million had been secured by December 2013 (leaving a funding gap of Euro 44.9 million/USD 60.4)
- While NSP-projected spending was fully acquired for 2014, only 31%, 6% and 1.5% had been acquired for the years 2015, 2016 and 2017.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquired resources (Euro mn)</td>
<td>(6.3)</td>
<td>11.0</td>
<td>4.0</td>
<td>2.8</td>
<td>0.3</td>
<td>24.4</td>
</tr>
<tr>
<td>Required (Euro mn)</td>
<td>(8.8)</td>
<td>10.5</td>
<td>13.1</td>
<td>16.6</td>
<td>20.2</td>
<td>69.2</td>
</tr>
<tr>
<td>Financing gap (Euro mn)</td>
<td>(2.5)</td>
<td>-0.5</td>
<td>9.1</td>
<td>13.8</td>
<td>19.9</td>
<td>44.9</td>
</tr>
</tbody>
</table>

Sources: Cartographie des fiancements, 2013; PSN 2013-2017

In terms of the longer-term financial consequences of the national response to HIV/AIDS, the cost projections under the NSP do not provide the long term picture.

- **On the expenditure side, the expansion in access to treatment has cost consequences which extend well beyond 2017.** Individuals newly accessing treatment in 2013-2017 will require treatment well into the future – the expansion in access to treatment therefore commits financial resources beyond the NSP period.
- **On the savings side, the increased investments in HIV prevention and treatment reduce future spending needs associated with future incidence.** A lower number of HIV infections reduces the demand for HIV/AIDS-related services and resulting costs over the coming years. To evaluate the consequences of the NSP in terms of absorbing fiscal space, these savings need to be taken into account.

The projected costs of the national response to HIV/AIDS, based on the costing of the NSP estimates provided by authorities through 2017, but extended through 2030, are summarized in Figures 27 and 28.

- Whereas the NSP costing assumes an annual inflation rate of 3%, the longer-term estimates have been specified in “real” terms, i.e., without inflation. This change facilitates comparisons over long periods.
- Cost assumptions for prevention spending are aligned with the assumptions of the NSP through 2017. Thereafter, prevention spending is assumed to increase in proportion to the
size of the relevant population (e.g., all adults, or – for PMTCT – HIV-positive women), keeping coverage rates of the relevant interventions constant.

- For treatment, unit costs were set at Euro 310 (USD 400) for first-line ART and Euro 1,110 (USD 1,430) for second-line ART, based on NASA expenditure data for the ART program and the number of patients treated in 2012. This is higher than the assumptions in the NSP / Resource Needs Model costing, which covered ARV drug costs only, in order to include additional costs of a comprehensive ART service such as laboratory monitoring costs, psychosocial counselling, nutritional support and clinical out-patient services.
- Social mitigation spending is taken from the NSP costing through 2017, and is assumed to grow in proportion to the relevant population (PLWH and AIDS orphans, respectively) thereafter.
- Overhead expenses are set at 13% of direct costs (or 12% of total costs), in line with the assumptions underlying the NSP.

**Figure 32. Financial Costs of HIV/AIDS, Niger (2010-2030, Euro MN 2013 Prices)**

[Graph showing financial costs over time]

Source: Fiscal framework model for Niger and authors’ estimates. The area between Mitigation and Overhead represents overhead costs.

**Figure 33. Financial Costs of HIV/AIDS, Niger (2010-2030, Percent of GDP)**

[Graph showing financial costs as % of GDP over time]

Source: Fiscal framework model for Niger and authors’ estimates. The area between Mitigation and Overhead represents overhead costs.

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The mark-up for overhead expenses assumed in the NSP costing is slightly higher (14% of direct costs), but has been adjusted to reflect that the present analysis captures the costs of care and treatment more fully.

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The projected costs of the national response to HIV/AIDS increase steeply during the NSP period and beyond.

- The largest driver of the costs is increasing HIV prevention spending. This reflects increasing coverage rates of HIV prevention interventions during the NSP, but also high population growth (according to the World Population Profile 2012, the adult 15+ population of Niger is projected to grow by 3.6% annually and 88% overall between 2013 and 2030).
- The costs of HIV/AIDS care and treatment increase steeply during the NSP, as treatment coverage is assumed to increase to 80% under the NSP. Thereafter, the number of people on treatment is projected to keep increasing – a consequence of people newly needing and accessing treatment coupled with low mortality rates on treatment (see in following section and footnote).
- While the costs of the national response to HIV/AIDS are projected to increase in absolute terms, the costs peak at 0.29% of GDP in 2017, and decline to 0.22% of GDP in 2030 (assuming that GDP growth rates above 5%, as projected in the IMF World Economic Outlook until 2018, can be maintained over this period).

Anticipated impacts of the investments under the NSP 2013-2017

The scaling-up of HIV prevention and treatment envisaged under the NSP results in a steep decline in HIV incidence and mortality (Figure 29). While the number of PLHIV declines overall, the number of people receiving ARV treatment increases (Figure 30).

**Figure 34. Modelled HIV incidence and AIDS deaths, Niger (2010-2030)**

Source: Fiscal framework model for Niger and authors’ estimates

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43 The emphasis of the analysis here is on the long-term financial consequences of the HIV/AIDS program and especially of new HIV infections. While access to second-line treatment plays a small role in Niger at present, the importance may increase over the next year, and (because of higher unit costs) contribute significantly to the long-term cost. The current projections therefore make a small allowance for transition to second-line treatment (1% of people on first-line treatment annually).
Longer-term costs of responding to HIV and future savings

Until 2030, the costs of the national response of HIV/AIDS are dominated by prevention spending and the demand from people already living with HIV as of 2013 (Figure 31), for three reasons:

- Low mortality on HIV treatment means that people already receiving treatment in 2013 tend to remain on treatment over a long period.
- HIV infections translate into demand for HIV/AIDS-related services and spending slowly.
- Because the NSP is preceded by a period in which HIV incidence was already in decline, the number of new HIV infections – relative to the number of people already HIV positive in 2013 – is low at the outset of the NSP.

*Figure 36. Projected HIV costs cause by past and new HIV infections, Niger (2013-2030, percent of GDP)*

Source: Fiscal framework model for Niger and authors’ estimates

Note: Population-based spending denotes spending that cannot be attributed to PLWH (i.e., most prevention spending), and a proportional share of the overhead expenses.
Nevertheless, new HIV infections result in substantial costs, which extend over a long period (Figure 32). Note that this projection covers a long time horizon and projections become much less precise as they extend further into the future. The projection does however illustrate the long-term costs and “treatment liability” caused by new infections.

One new HIV infection in 2013 results in a cost of about Euro 2,500 (USD 3,300) for both men and women, applying a discount rate of 5%.

- The estimates are sensitive to the assumptions regarding mortality on treatment. The Spectrum files for Niger assume very low AIDS-related mortality rates for people receiving ARV treatment, and the estimates may overstate the long-term costs.\(^4\)
- Even if mortality rates on ART were higher than those assumed in Spectrum, the long-term costs resulting from one additional HIV infection would be substantial. An additional 1% annually in AIDS-related mortality reduces the estimated cost resulting from each new HIV infection by about 15%.
- The projected costs of one new infection differ between sexes, principally due to PMTCT (leading to higher projected cost for females in the short-term), transition to treatment rates (for technical reasons regarding assumptions on treatment coverage, the path of HIV incidence, and certain features of Spectrum, fewer women transition to treatment, so the female curve is lower in the mid-term), and survival (it is assumed that survival for female PLHIV is higher, so the cost curve declines more slowly in the long-term for females).

\textbf{Figure 37. Cost of one new infection occurring in 2013, Niger}

\begin{center}
\includegraphics[width=\textwidth]{figure37.png}
\end{center}

Source: Fiscal framework model for Niger and authors’ estimates

The decline in HIV incidence achieved during the course of the NSP (and over the longer period until 2030) makes a substantial contribution to containing the long-term costs of the HIV program.

- The decline in HIV incidence between 2013 and 2017 results in a saving in terms of reduced long-term spending commitments equivalent to Euro 6.3 million (USD 8.4 million).
- The increase in HIV/AIDS-related spending over the same period adds up to Euro 16.5 million (USD 22.0 million).
- Assuming that the number of new HIV infections would have remained constant without this scaling-up of prevention spending, these estimates imply that – in addition to the obvious health gains – the financial savings achieved by the increases vestments in HIV prevention offset about one-third of the additional costs of the scaling-up of prevention and treatment efforts.

\(^4\) E.g., for individuals initiating treatment at a CD4 count of 100-199, the Spectrum default parameters for West Africa assume an annual HIV-related mortality of 0.1-1.1% for women, and 0.6-1.6% for men.
ANNEX 1. Optima modelling: Analytical Framework and Methods

A1.1. Optimizing budget allocations for impact
The analysis consisted of estimating costs based on cost-coverage curves, and optimizing budget allocations to meet a given objective. Both minimizing new HIV infections and minimizing DALYs were included (see main report for research questions).

In the optimisation function, only intervention program costs were reallocated (“optimized”), while other costs like management/coordination expenditures were fixed and not included in the optimisation of allocations. Drug costs are kept constant over time, other costs increase in line with GDP per capita.

A1.2. Population groups and transmission pathways
The following populations were defined for the Optima analysis (maximum of 14 possible):

1. Children aged 0-14 years (CHLD)
2. Females aged 15-24 years (FYTH)
3. Males aged 15-24 years (MYTH)
4. Females aged 25-49 years (FAD)
5. Males aged 25-49 years (MAD)
6. Females aged 50+ years (FOLD)
7. Males aged 50+ years (MOLD)
8. Female sex workers (FSW)
9. Prisoners (PRI)
10. Migrants and mobile populations (MIG)
11. Men who have sex with men (MSM)
12. Uniformed security (UNI)
13. Mine workers (MIN)
14. Truckers (TRU)

We assume HIV transmission between these populations only occurs through sexual partnerships. All male populations were assumed to partner with all female populations, except that males did not pair with females older than themselves, and males paired with females at most one age stratification younger than themselves (e.g. males 50+ did not form partnerships with females <24). MSM partnered only with each other.

A1.3. HIV programs included in the analysis
Eight basic HIV prevention and treatment programs were distinguished:

1. Targeted FSW intervention package
2. Prevention services targeted at MARPs like prisoners, military, truckers, migrants, MSM (IEC, BCC, condom promotion, HIV counselling & testing)
3. Prevention services for non-MARP
4. Public sector condom distribution
A1.4. Overview of the Optima methodology

The Optimization and Prioritization Tool Optima (formerly Prevtol) is an extremely flexible population-based HIV model. Optima can assess HIV epidemic trends, resource needs, the cost-effectiveness of past programs, and the impact of potential future programs using a detailed mathematical model of HIV transmission and disease progression. Optima can perform detailed country-specific HIV program evaluations. It can build on the results from other models (like Goals) to assess allocative efficiency and the resources required to achieve complex objectives over varying periods.

Up to 14 arbitrarily defined population groups are available within Optima to describe the specific characteristics of an HIV epidemic. Optima incorporates a model of HIV transmission and progression using a coupled system of ordinary differential equations to track the movement of people between health states and population groups. Individuals are assigned to a given population based on their dominant risk. The model incorporates the effects of different sexual partnership types, condom use, infection stage, CD4 count categories, homosexual and heterosexual partnerships, the extent of male circumcision, diagnosis, first and second line anti-retroviral treatment, and treatment failure on the transmission of HIV and infection progression.

Optima requires detailed demographic, epidemiological, behavioral, clinical, and health economic data which is entered using an Excel spreadsheet. Data entry is flexible, allowing everything from a separate data point for every population for each year, or a single data point for all populations over the entire simulation period. (Optima assumes parameters with no data are zero.) Using available data, we calibrated Optima to accurately represent past and current trends in Niger’s HIV epidemic. The model uses healthcare costs and disability-weights specified by CD4 count to perform cost-effectiveness and return-on-investment calculations.

Given available coverage, spending and outcome data for implemented HIV prevention and treatment programs, Optima can determine the optimal allocation of resources or the amount of spending required to meet specified objectives (e.g. minimizing infections, minimizing AIDS deaths) or a combination of objectives. The model also enables additional programmatic scenarios representing the potential introduction of new programs or changes to current program implementation as required.

A1.5. Optima calibration to the HIV epidemic in Niger

We used all available demographic, epidemiological, behavioral, and clinical data to calibrate the Optima model to the HIV epidemic in Niger (shown in Figure 38 and Figure 39).

In general, prevalence in Niger is declining rapidly in most population groups, due to both reductions in incidence and deaths of people currently living with HIV. Exceptions include MSM, migrants, and prisoners, for whom there are not sufficient data to confidently determine epidemic trends; however, current indications are that prevalence is relatively stable among these groups.
Figure 38: Calibration of model to the HIV epidemic in Niger.

Black discs represent available data for HIV prevalence. Lines attached to these discs represent uncertainty bounds, where available. The solid curve is the best fitting simulation and the light band represents the 95% confidence interval for the model outputs. MSM prevalence was assumed based on data in the West Africa region, in the absence of local data.
**Figure 39: Calibration of Model to the HIV Epidemic in Niger.**

Black discs represent available data for the number of people on first and second line anti-retroviral treatment. Lines attached to these discs represent uncertainty bounds, where available. The solid curve is the best fitting simulation and the light band represents the 95% confidence interval for the model outputs.

**A1.6. Comparison between Optima and Spectrum estimates**

Part of the calibration process involved aligning the future epidemic trends projected by Optima with estimates from the Spectrum software package. Figure 40 shows how the projections from Optima compare to Spectrum estimates for overall prevalence, overall incidence, mother-to-child transmission and AIDS deaths (revised Niger Spectrum version of 2013).
Figure 40: Comparison of annual new HIV infections, annual mother-to-child transmissions, and annual AIDS deaths estimated by Optima and Spectrum over 2000-2020.

Prevalence from Optima is the prevalence in the overall population while the HIV prevalence from Spectrum is for population aged over 15.

Optima captures the same epidemiological trends as the obtained from the Spectrum software package (revised Niger Spectrum version 2013). There are differences, however, in the projections from each model, particularly for overall HIV prevalence and annual HIV incidence. The reason for these differences between the models — despite using the same demographic, epidemiological, behavioral and clinical data inputs — is due to differing model structures and modeling assumptions.

Both Spectrum and Optima are deterministic population-based models using similar modeling methods to describe HIV epidemics and assess the effectiveness of HIV prevention programs. Each model describes the transmission of HIV and the resulting change in CD4 count within those infected. Spectrum uses a greater number of CD4 count categories but Optima includes diagnoses and the impact of testing, first and second line ART and treatment failure, and the impact of treatment on CD4 count. Mortality of HIV-positive people is dependent on CD4 count in both models with Spectrum using lower death rates than Optima.

The major difference between Spectrum and Optima is the underlying structure of the models. Spectrum uses a generic population structure dividing the overall population into low, medium, and high-risk groups and separate most-at-risk populations with associated partnerships. In this analysis Optima is setup to directly match the characteristics of the Nigerian HIV epidemic and include all populations driving the HIV epidemic (many of which cannot be included in Spectrum) — with transmission able to match the partnership mixing in Niger, rather than using pre-specified partnerships.
A1.7. Relationships between program costs and effects on behaviour and program coverage

A central component of our analyses is the relationships between the cost of HIV prevention programs and the resulting population coverage and behavioral outcomes. Such relationships are required to understand how incremental changes in spending ultimately affect HIV epidemics and determine the optimal funding allocation. For each population, we derived a set of relationships directly linking estimated funding to coverage and associated behavioral data. To produce these relationships we used an ecological “top-down” approach to relate program cost and outcomes. Indirect costs have no direct impact on HIV transmission parameters; but changes to HIV programs may affect these costs, for example in the supply of additional condoms. The proportion of funding allocated to indirect costs is assumed to remain the same as the overall HIV program budget changes. A limitation of our approach is the assumption that all changes in behavior are assumed to be due to changes in program funding.

A1.8. NASA expenditure data used in Optima

All NASA data and worksheets came from the national assessments covering the years 2007 to 2012, provided to the authors by the CISLS.

ANNEX 2. Optima modelling: Additional results on incidence estimations up to 2035

<p>| Table A7: Estimated new HIV infections by population for the best-fitting simulation (2012-2035) |</p>
<table>
<thead>
<tr>
<th>Population Group</th>
<th>2012</th>
<th>2015</th>
<th>2017</th>
<th>2025</th>
<th>2035</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children 0-14 years</td>
<td>806</td>
<td>714</td>
<td>659</td>
<td>480</td>
<td>338</td>
</tr>
<tr>
<td>Females 15-24 years</td>
<td>184</td>
<td>137</td>
<td>117</td>
<td>75</td>
<td>54</td>
</tr>
<tr>
<td>Males 15-24 years</td>
<td>17</td>
<td>13</td>
<td>11</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Females 25-49 years</td>
<td>499</td>
<td>379</td>
<td>327</td>
<td>220</td>
<td>161</td>
</tr>
<tr>
<td>Males 25-49 years</td>
<td>543</td>
<td>425</td>
<td>376</td>
<td>269</td>
<td>202</td>
</tr>
<tr>
<td>Females 50+ years</td>
<td>56</td>
<td>43</td>
<td>38</td>
<td>27</td>
<td>20</td>
</tr>
<tr>
<td>Males 50+ years</td>
<td>237</td>
<td>184</td>
<td>164</td>
<td>118</td>
<td>89</td>
</tr>
<tr>
<td>Female sex workers</td>
<td>350</td>
<td>273</td>
<td>241</td>
<td>173</td>
<td>132</td>
</tr>
<tr>
<td>Prisoners</td>
<td>17</td>
<td>14</td>
<td>12</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Migrants/mobile populations</td>
<td>464</td>
<td>365</td>
<td>324</td>
<td>233</td>
<td>176</td>
</tr>
<tr>
<td>Men having sex with men</td>
<td>96</td>
<td>84</td>
<td>80</td>
<td>74</td>
<td>75</td>
</tr>
<tr>
<td>Uniformed security</td>
<td>26</td>
<td>21</td>
<td>18</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Mine workers</td>
<td>30</td>
<td>24</td>
<td>21</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>Truckers</td>
<td>27</td>
<td>21</td>
<td>19</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Total estimated HIV incidence</td>
<td>3,352</td>
<td>2,697</td>
<td>2,407</td>
<td>1,727</td>
<td>1,291</td>
</tr>
</tbody>
</table>