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The impact of HIV on care work and the care workforce

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Preface

There are more than 37 million people living with HIV globally, the number having increased by 14 per cent between 2012 and 2018. More than 20 million live in East and Southern Africa and 5 million in West and Central Africa. The majority of those living with or affected by HIV are of working age. Paid and unpaid care workers often provide support to them, but too often women are disproportionately taking on unpaid care work, exacerbating gender inequalities in labour markets, education and social activities.

Focusing on care needs and the role played by paid and unpaid care work, *The impact of HIV on care work and the care workforce* provides an overview of the gaps and challenges in sub-Saharan Africa, specifically in six countries: Liberia, Namibia, South Africa, Uganda, the United Republic of Tanzania and Zambia. By providing a picture of front-line prevention and treatment policies, this working paper assesses the socio-economic consequences of low antiretroviral therapy (ART) coverage as well as the key role of the health workforce in international testing and treatment targets (90-90-90). The impact of HIV on caregivers' working status and their employment opportunities is also reviewed through an empirical analysis.

This paper shows that additional action is required to increase the number of people who know their HIV status and to guarantee better access to ART. In particular, there is a need for accelerated action in promoting a wider access to HIV services, from testing and counselling facilities to self-testing programmes. Further, this paper highlights the persistent shortage of doctors, nurses and midwives, and provides insight on the essential role played by community health workers in filling the gaps in care jobs.

Caregivers with a family member living with HIV have less opportunity to do paid work in the labour market due to increased unpaid care work in the household. The negative impact is prominent, especially for women caregivers, since they perform a disproportionate share of unpaid care work. This gendered care burden further deepens the inequality between women and men in labour force participation, education opportunities and other social activities through their life course. This paper calls for investment in specific programmes that address gaps in care jobs and inequalities in the distribution of unpaid care work. Both strategies are necessary to create favourable conditions for achieving the 90-90-90 goals and also to mitigate the negative impacts of unpaid care work on gender equality at work.

The impact of HIV on care work and the care workforce is part of a working paper series commissioned as background research for the 2018 ILO report, *Care work and*

care jobs for the future of decent work. This major report and the related research build a compelling, evidence-based case for making good-quality care jobs a priority in macroeconomic, social protection, labour and migration policy agendas. These publications represent an important contribution to the ILO's Women at Work Centenary initiative, which examines why progress in closing the gender gaps in the world of work has been so slow and what needs to be done for real transformation. As the ILO enters its second century, the initiative has identified innovative action to guide work on gender equality and non-discrimination.

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Abbreviations

AIDS	acquired immunodeficiency syndrome
ART	antiretroviral therapy
CHW	community health worker
DHS	Demographic and Health Surveys
HCT	HIV counselling and testing
HIV	human immunodeficiency virus
ILO	International Labour Organization
UNAIDS	Joint United Nations Programme on HIV/AIDS
PLHIV	people living with HIV
PrEP	pre-exposure prophylaxis
PMTCT	prevention of mother-to-child transmission
SDG	Sustainable Development Goal
VMMC	voluntary medical male circumcision
WHO	World Health Organization

Executive summary

Introduction

In 2018, there were approximately 37.9 million people living with HIV worldwide, 20.6 million (about 55 per cent) of whom live in East and southern Africa and 5 million in West and Central Africa. Despite extensive efforts to end the AIDS epidemic by 2030, globally the number of people living with HIV (PLHIV) increased by 14 per cent from 2012 to 2018. East and southern Africa shows the highest absolute HIV prevalence value, 7 per cent compared with the global average of 0.8 per cent, with a prevalence of 2 per cent in West and Central Africa (UNAIDS, 2019).

UNAIDS' *90-90-90: An ambitious target to help end the AIDS epidemic*, launched at the 20th International AIDS Conference in 2014, has become the global reference point for achieving an end to the AIDS epidemic by 2030 (UNAIDS, 2014a). The three-part target is as follows:

1. By 2020, 90 per cent of all people living with HIV know their HIV status.
2. By 2020, 90 per cent of all people diagnosed with HIV infection receive ART.
3. By 2020, 90 per cent of all people receiving ART have viral suppression.

This working paper provides a comprehensive picture of the gaps and challenges in paid and unpaid health-care work in sub-Saharan Africa (SSA), drawn from several data sources and following different methodological approaches. It is part of the research undertaken for the ILO global report, *Care work and care jobs for the future of decent work* (ILO, 2018a), which analyses the extent of unpaid care and household work and its impact on gender inequalities at work. This paper focuses on six sub-Saharan African countries, namely Liberia, Namibia, South Africa, Uganda, the United Republic of Tanzania and Zambia, for which the ILO has existing data on care work. After providing a preliminary description of prevention and treatment policies, empirical analysis is used to evaluate the socio-economic consequences of low ART coverage, current health-care workforce needs, and the importance of increasing the health-care workforce and number of facilities to reach the 90-90-90 treatment goals. Section 2 examines the role of unpaid work in ending the AIDS epidemic. A literature review and an empirical analysis were used to assess the impact of HIV on caregivers' working status and opportunities.

Data and methods

Epidemiological and care data are used on HIV prevalence, new infection rates, treatment coverage, the number of people living with HIV, and the number of those who know their HIV status. Context data includes the paid and unpaid health-care workforce, community health workers, active health service plans, prevention and

counselling services, and diagnostic and treatment services. These data were collected and matched to provide evidence of care needs and of the role played by paid and unpaid health-care workers in ending the AIDS epidemic.

Descriptive statistics and econometric models have been used, along with a deep review of existing literature. The aim is to examine the impact of HIV (and of having family members living with HIV within the household) on employment status, gender inequality, current and future care needs, and paid and unpaid health-care worker shortages.

Main results

Findings show that substantial effort is required to increase the number of people living with HIV who know their status and to guarantee wider access to ART. For example, in Liberia, only 68 per cent of people living with HIV are aware of their status, while the first 90 is achieved in South Africa and Namibia. The second 90 is achieved in United Republic of Tanzania and Namibia, and almost achieved in Zambia and Uganda.

The impact of HIV on labour market participation is assessed by looking at CD4 count.[1] Providing ART for people living with HIV is essential to increase their CD4 count and is associated with improved household economic conditions. Indeed, economic outcomes can be correlated with CD4 count. It is estimated that that those with a CD4>350 are expected to work for pay or profit 5.97 days more a month than those with a CD4<350.[2] Poor ART coverage also affects the work opportunities of caregivers.

Analysis of the health-care workforce highlights a clear shortage of doctors, nurses and midwives when compared with the Sustainable Development Goals (SDGs) index, which is set at 4.45 per 1,000 population for doctors, nurses and midwives.[3] Zambia, Liberia and the United Republic of Tanzania record a particularly low density of less than one. Of the six countries studied, South Africa is the only country that meets and exceeds the SDG threshold. There is a shortage of 86,000 doctors, nurses and midwives in Uganda, and 196,000 in the United Republic of Tanzania. Zambia would need more than 62,000 additional doctors, nurses and midwives to meet the threshold, and Liberia more than 15,000.

Additionally, community health workers (CHWs) have an important role in addressing the health-care worker shortage. The density of CHWs per 1,000 population shows high variability in coverage among the six countries, with the highest density in Zambia

[1] Protective CD4 cells are part of the human immune system, CD4 lower counts signify greater progression of the infection (ILO, 2018b).

[2] Ibid.

[3] For more information on the details of SDG 3: Ensure healthy lives and promote well-being for all at all ages, see https://sustainabledevelopment.un.org/sdg3.

(3.13 CHWs per 1,000 population) and the lowest in the United Republic of Tanzania (0.47 per 1,000 population).

Through econometric analysis, it has been possible to examine the role played by workforce density (doctors, nurses and midwives) and HIV counselling and testing (HCT) on the first 90 target (90 per cent of all people living with HIV know their HIV status). The model shows the positive and statistically significant impact of the two factors on the percentage of people living with HIV who know their status. The coefficient related to the workforce was equal to 4.6 (p-value <0.05), indicating strong correlation between the paid workforce and increasing knowledge about HIV status. The impact of increasing facilities is also positive, with a coefficient equal to 0.61; slightly significant (p-value <0.10) but lower than the one recorded for the workforce.

Finally, estimates obtained using Demographic and Health Surveys (DHS) microdata show that the presence of people living with HIV in a household imposes a burden on caregivers, resulting in a significant amount of weekly care work, which further reduces their probability of being employed. In all the countries analysed, the percentage of women working was negatively influenced by the HIV status of a family member. A multivariate logit model on the probability of being employed shows that the odds of being employed are far better for women with no people living with HIV in the household.

Conclusion

A heavy burden is borne by people living with HIV and caregiving family members that further affects different aspects of their lives, such as labour participation, education opportunities, physical health, and psychological and social distress. This care burden mainly restricts women, exacerbating gender inequalities in employment, education and other social/community activities.

Specific programmes are needed to address such care gaps and inequalities, and to create favourable conditions for achieving the 90-90-90 goals, with the overall aim of ending the AIDS epidemic by 2030. This working paper finds that two components are imperative: 1) investing in and strengthening the health-care workforce; 2) achieving broader ART coverage.

INTRODUCTION

THERE ARE 37.9 MILLION PEOPLE LIVING WITH HIV IN THE WORLD

The HIV epidemic represents more than 30 years of devastation, challenge and loss (UNAIDS, 2016a). In 2018, there were an estimated 37.9 million people of all ages living with HIV, 20.6 million (approximately 55 per cent) of whom live in East and southern Africa and 5 million in West and Central Africa. UNAIDS (2019) data show that, from 2012 to 2018, the number of people living with HIV globally registered a 14 per cent increase as a result of growing HIV testing availability. A similar percentage increase was registered in East and southern Africa. Data, however, suggest a positive trend in terms of new HIV infections, with a 15 per cent decrease worldwide over the same six-year period and, particularly encouraging, a 20 per cent decrease in East and southern Africa. Data for West and Central Africa are also positive, showing a decrease of 9.6 per cent. Data on HIV prevalence for population aged 15–49 also shows an encouraging trend for East and southern Africa, where a 6.7 per cent reduction was detected from 2012 (7.5 per cent), to 2018 (7.0 per cent) and also for West and Central Africa (1.7 per cent to 1.5 per cent). On the other hand, East and southern Africa still show the highest absolute HIV prevalence, a value of 7 per cent compared with the global average of 0.8, and a prevalence of 1.5 per cent in West and Central Africa (UNAIDS, 2019).

THERE HAS BEEN A 20 PER CENT DECREASE IN NEW INFECTIONS OVER THE LAST SIX YEARS IN EAST AND SOUTHERN AFRICA

EAST AND SOUTHERN AFRICA IS THE REGION WITH THE HIGHEST PREVALENCE RATES

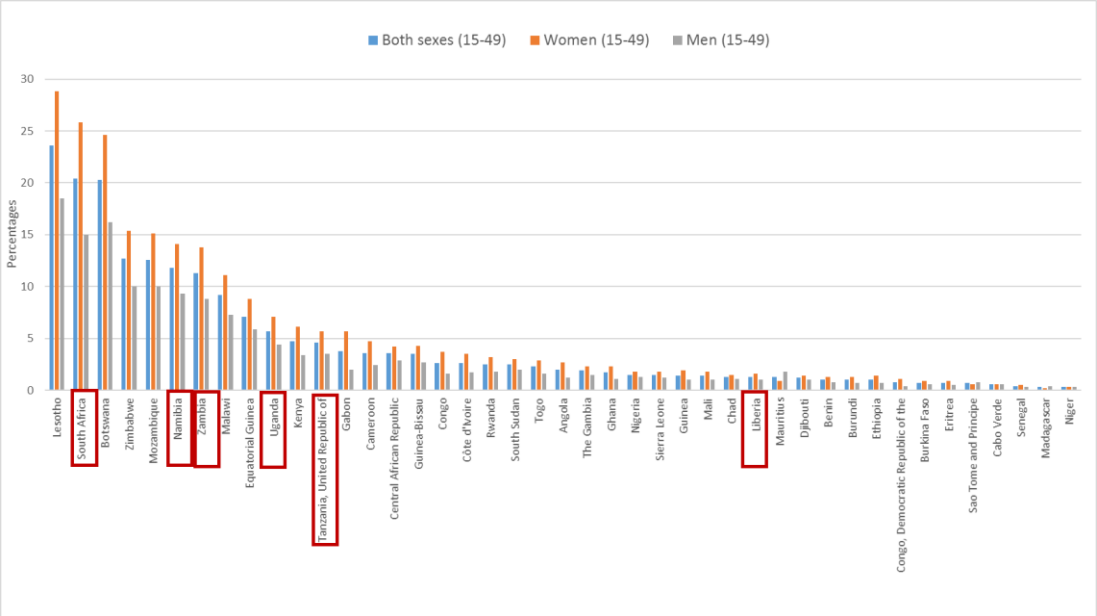
This paper is part of a wider ILO research effort undertaken for the global report, *Care work and care jobs for the future of decent work* (ILO, 2018a), which analyses the extent of unpaid care and household work and its impacts on gender inequalities. This paper focuses on a selection of six sub-Saharan Africa countries: Liberia, Namibia, South Africa, Uganda, United Republic of Tanzania, and Zambia.

Since the HIV epidemic varies considerably within and between countries and regions, this paper will first provide an overview of HIV trends (prevalence and new infections), highlighting groups of populations at high risk. This sets the basis for discussion on health-care needs. Examining the HIV prevalence data (figure 1, table 1), it is clear that in sub-

KEY POPULATIONS

Saharan Africa overall, women experience a greater risk of living with HIV compared with the rest of the population. HIV prevalence is generally lower among adolescents (aged 15–19 years) than among adults (15-49). Even if prevalence data on other key populations (for example, sex workers, and men who have sex with men) are available for only a minority of countries, table 2 shows that sex workers and men who have sex with men display the highest HIV prevalence rates, higher than the average in all countries for which data are available.

Figure 1. Prevalence of HIV among adults aged 15–49 in sub-Saharan Africa, 2018 (percentage)



Source: UNAIDS, 2019.

Table 1. HIV prevalence by gender and age, 2018 (percentage)

Country	Total	Women		Men	
	15–49	15–24	15–49	15–24	15–49
Liberia	1.3	0.8	1.6	0.4	1.0
Namibia	11.8	4.5	14.1	2.6	9.3
South Africa	20.4	11.3	25.8	3.7	15.0
Uganda	5.7	2.8	7.1	1.1	4.4
Tanzania, United Rep. of	4.6	2.2	5.7	1.2	3.5
Zambia	11.3	5.0	13.8	2.4	8.8

Source: UNAIDS, 2019.

Table 2. HIV prevalence for key populations, latest year (percentage)

Country	Sex workers	Men who have sex with men
Liberia	9.8	19.8
Namibia	40.7	n.a.
South Africa	57.7	18.1
Uganda	85.0	13.2
Tanzania, United Rep. of	15.4	8.4
Zambia	48.8	n.a.

Note: n.a. = data not available.
Source: UNAIDS, 2019.

DURING THE TWO-YEAR PERIOD 2016–18 THE NUMBER OF NEW INFECTIONS WENT DOWN IN ALL COUNTRIES ANALYSED BUT YOUNG WOMEN STILL REPRESENT A LARGE SHARE OF NEW INFECTIONS

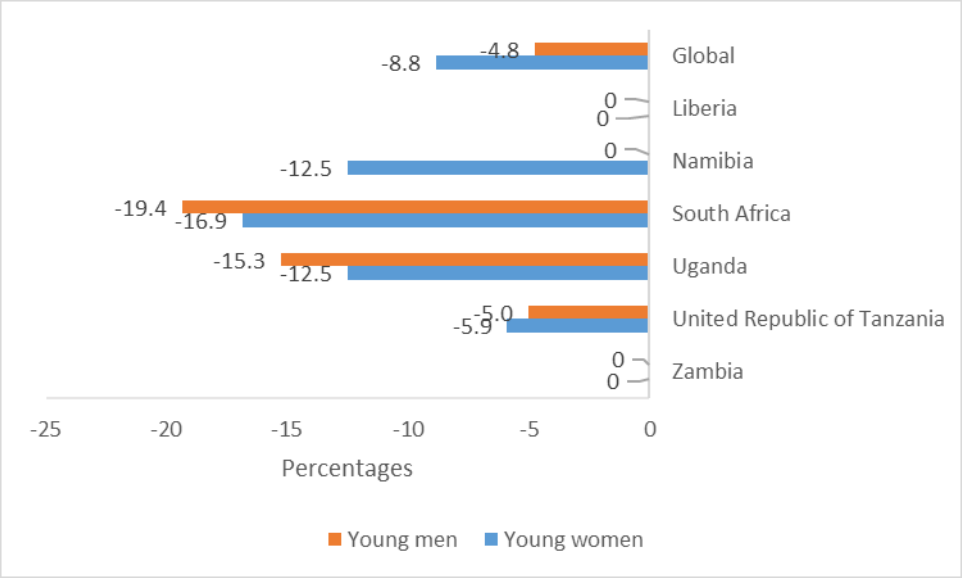
Table 3 shows a decrease in the number of new infections over the two-year period 2016–18 in all countries studied, from –16 per cent (Uganda) to –2 per cent (Namibia). While young people, especially women, still represent a large share of new infections, figure 2 shows a reduction in the number of new infections among young women in the same period in all selected countries, excluding Liberia and Zambia, where the number of new infections remains constant for both young men and women.

Table 3. New HIV infections by gender and age, 2016–18

Country	Number of new infections 2018	% of variation 2016–18	% of new infections on the total 2018				
			Children (0–14)	Adolescents (10–19)		Young people (15–24)	
				Women	Men	Women	Men
Liberia	1 900	–14	< 26	< 26	< 5	< 26	< 26
Namibia	6 100	–10	< 8	< 16	< 7	23	< 16
South Africa	240 000	–14	6	14	2	29	10
Uganda	53 000	–16	14	13	< 2	26	9
Tanzania, United Rep. of	72 000	–10	12	11	4	22	11
Zambia	48 000	–2	11	13	3	27	12
World	1 700 000	–6	9	8	3	18	12

Source: UNAIDS, 2019.

Figure 2. New infections among young men and women aged 15–24, percentage variation, 2016–18



Source: UNAIDS, 2019.

1. ENDING THE AIDS EPIDEMIC BY 2030: CARE NEEDS AND GAPS

1.1 Introduction

GETTING CLOSER TO UNAIDS' 90-90-90 TARGET

In 2014, UNAIDS' *90-90-90: An ambitious treatment target to help end the AIDS epidemic* was launched at the 20th International AIDS Conference (UNAIDS, 2014a). This has become the global point of reference for the overarching goal of ending the epidemic by 2030 (UNAIDS, 2016a).[4] In 2016, the United Nations General Assembly (2016) issued a political declaration calling for global commitment to reaching the 90-90-90 targets by 2020 and to fast-tracking the response, including:

1. Reducing the number of new HIV infections to fewer than 500,000 globally.
2. Reducing AIDS-related deaths to fewer than 500,000 globally.
3. Eliminating stigma and discrimination.

PREVENTION POLICIES SHOULD FOCUS ON KEY POPULATIONS AS A WAY TO REDUCE NEW INFECTIONS

This should be sought through powerful policy action, with a focus on particularly vulnerable groups (UNAIDS, 2014a), to keep the 90-90-90 achievements on track. To reduce the number of new HIV infections to fewer than 500,000 globally, suitable prevention policies and programmes need to be adopted; for example, condom programmes, voluntary medical male circumcision (VMMC), pre-exposure prophylaxis (PrEP) and availability of sterile injecting equipment. These should be directed at specific groups, including pregnant women and their male partners, as well as sex workers, people who inject drugs, transgender persons, prisoners and men who have sex with men (UNAIDS, 2014a). Further, increasing knowledge of HIV status, and improving access to ART, will play key roles in reducing AIDS-related deaths.

[4] For more details on 90-90-90, see UNAIDS 2014a and 2014b. The website is available at: http://www.unaids.org/en/resources/documents/2017/90-90-90/.

THE IMPORTANCE OF THE 90-90-90 TREATMENT FOR ALL TARGET IN ENDING THE AIDS EPIDEMIC BY 2030

The three-phase 90-90-90 target (UNAIDS, 2014a) that needs to be achieved by 2020 is:

1. 90 per cent of all people living with HIV know their HIV status.
2. 90 per cent of all people diagnosed with HIV infection receive ART.
3. 90 per cent of all people receiving ART have viral suppression.

Although challenging, there is broad confidence the 90-90-90 target can be achieved, and the AIDS epidemic ended by 2030, if appropriate measures are adopted and processes fast-tracked.

NATIONAL STRATEGIC PLANS AND RESPONSE PROGRESS REPORTS

National strategic plans (period 2011–22) and response progress reports[5] represent two helpful instruments that identify the policies adopted and to be adopted (i.e. future objectives) to reach the "zero new infections, zero related deaths and zero discrimination" commitment (Sherwood et al., 2017).

A review of the national strategic plans from the countries analysed in this paper suggests that all six should focus their policies on two main goals:

1. accelerating prevention to reduce new infections; and
2. providing treatment, care and adherence support for people living with HIV.

Within these goals, there are a number of programmes linked to the availability of a quality health-care workforce and effective health facilities. These would certainly include:

- providing HIV counselling and testing services (HCT)
- providing biomedical prevention services, encompassing VMMC, PrEP, elimination and prevention of mother-to-child transmission (eMTCT and PMTCT)
- providing ART.

[5] National reports consulted for the countries studied in this paper are listed at the end of the References.

This paper, therefore, is focused on those areas of intervention that depend on a strong health-care workforce that could then be considered sufficiently adequate to reach 90-90-90 by 2020.

1.2 Reducing new infections

HIV COUNSELLING AND TESTING (HCT) SERVICES

The United Nations General Assembly (2016) identifies five prevention pillars that should be attained to reduce the number of new HIV infections to fewer than 500,000 by 2020. In the context of prevention, HCT services are essential instruments to improve knowledge of HIV status and to reduce new infections. According to WHO (2016b):

> HIV testing services include the full range of services that should be provided together with HIV testing: counselling (pre-test information and post-test counselling); linkage to appropriate HIV prevention, treatment and care services, and other clinical and support services; and coordination with laboratory services to support quality assurance and the delivery of correct results.[6]

A review of the six national strategic plans provided data on the adequacy of existing programmes to guarantee access to testing, and served as a basis to evaluate future workforce needs.

BETTER ACCESS TO HCT SERVICES IS ESSENTIAL TO IMPROVE KNOWLEDGE OF HIV STATUS AND EXPAND ACCESS TO TREATMENT, SUPPORT AND PREVENTION

Liberia and Namibia have promoted many strategies, including building new sites for HIV and AIDS support services, improved quality of testing, increased human resources (Namibia), and expanded community participation in providing HCT services as volunteers (Liberia). Namibia also promoted mobile and door-to-door HCT. In December 2013, South Africa launched a revitalization strategy that ensures linkage to care though providing behavioural and post-counselling services. Namibia, South Africa and Zambia also promoted self-testing. Liberia has proposed HIV rapid test kits that enable clients to receive same-day test results. The United Republic of Tanzania prioritized increased financial resources devoted to HCT, linkage to

[6] See also the WHO website on HCT, available at: https://www.who.int/hiv/topics/vct/about/en/.

care for HIV-positive people, encouragement for repeat HIV testing, and promoted couples' HCT (Liberia, 2016; Namibia, 2015; SANAC, 2017; UNAIDS, 2016a; WHO, 2016b; Zambia 2015a).

However, a study by Staveteig et al. (2017) in 16 countries in sub-Saharan Africa (including Namibia, the United Republic of Tanzania, Uganda and Zambia) suggests that gaps persist in HIV testing among adolescents, the least educated and men. This will require targeted efforts to strengthen health infrastructure and increased levels of funding for HIV programmes.

VOLUNTARY MEDICAL MALE CIRCUMCISION

VMMC is a biomedical prevention procedure that contributes to lower probability of HIV and transmission of sexually transmitted infections (STIs). In Liberia, male circumcision is linked to the rite of passage to adulthood and is widespread (Liberia, 2016). Uganda and Zambia promoted national guidelines on VMMC (Uganda, 2015; Zambia, 2015b). In 2010, South Africa promoted the National Medical Male Circumcision Programme to reach 80 per cent of HIV-negative adult men, especially those living in rural areas (SANAC, 2017).

Liberia and the United Republic of Tanzania (table 4) are the countries where VMMC prevalence is highest. Between 2015 and 2016 the number of male circumcisions carried out increased by 26 per cent in the United Republic of Tanzania (from 435,302 to 548,390). In Namibia, where the prevalence is lower, VCCM increased by 47 per cent over the same two years, with a similar trend in Zambia (40 per cent). Uganda is an exception, with the number of VMMCs decreasing by 26 per cent.

PRE-EXPOSURE PROPHYLAXIS

PrEP is another prevention programme that should be adopted for populations at high risk. The national strategic plans of the six countries studied show limited efforts to establish PrEP, with only Liberia and Zambia adopting programmes. Liberia's strategies included increased financial resources for PrEP and its integration into other

care services, including more funding for PMTCT and ART (Liberia, 2014; Zambia, 2015b).

Sex workers and men who have sex with men must have access to PrEP. Table 5 shows that within the six countries, PrEP is available to them in Namibia, South Africa, Uganda and Zambia, but not in Liberia and the United Republic of Tanzania.

Based on the above, it appears that investing in the health-care workforce is essential to extend the availability of VMMC and PrEP.

Table 4. Prevalence of male circumcision, latest year (percentage)

Country	Prevalence of male circumcision (15–49 years)
Liberia	99.2
Namibia	25.5
South Africa	44.7*
Uganda	26.8
Tanzania, United Rep. of	80.3
Zambia	21.9

Source: UNAIDS, 2019; * Morris et al., 2016.

Table 5. Availability of PrEP, 2017

Country	Liberia	Namibia	South Africa	Uganda	United Republic of Tanzania	Zambia
PrEP availability	✘	✓	✓	✓	✘	✓

Note: In Uganda, there is no regulatory approval for scaling up PreP. In Tanzania, there is a regulatory approval for PrEP, but any PrEP use is private.
Source: UNAIDS, 2017b.

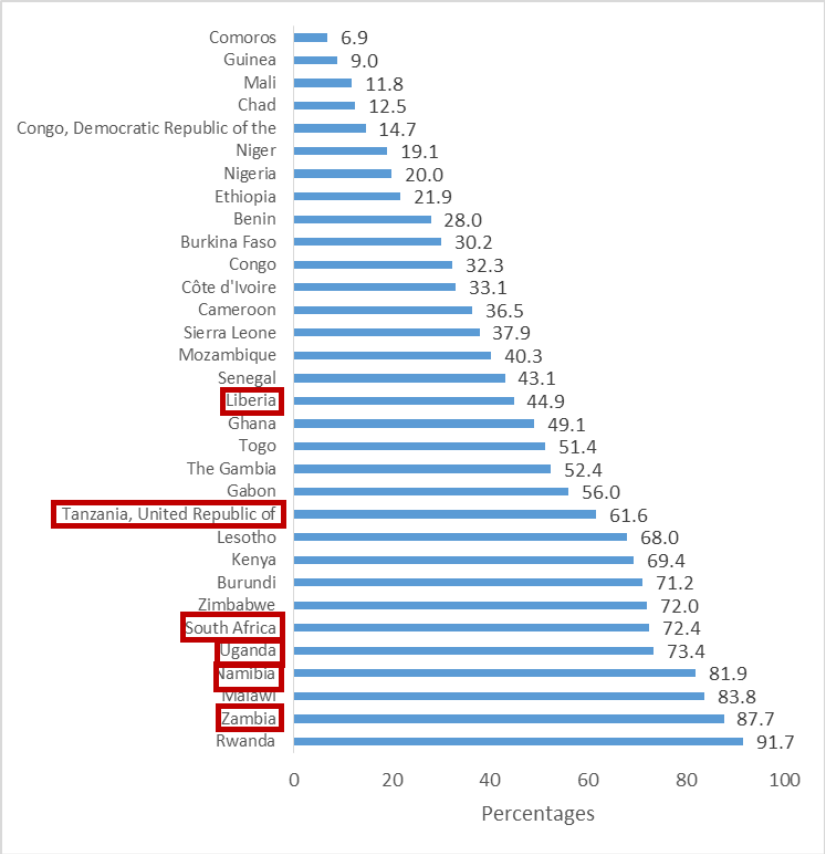
GAPS IN PREVENTION OF MOTHER-TO-CHILD TRANSMISSION

Another effective measure to reduce the number of new HIV infections is preventing mother-to-child transmission. Despite a global decrease (down 10 per cent from 2014 to 2017) in the prevalence of mother-to-child transmission during pregnancy, labour, delivery or breastfeeding, child infections still represented 9 per cent of total new infections in 2017 (UNAIDS, 2019). The importance of PMTCT is widely recognized in the national strategic plans of all six countries. Liberia has developed national programmes led by the Ministry of Health that focus on access to ART, counselling and support, safe obstetric services and family planning services (The Republic of Liberia, 2016).

MORE THAN 95,000 NEW INFECTIONS WERE AVERTED DUE TO PMTCT PROGRAMMES IN THE SIX COUNTRIES

In 2018, globally, 200,000 new infections were averted due to PMTCT programmes. More than 95,000 of these were attributed to the six countries studied, with an estimated 53,000 in South Africa (UNAIDS, 2019). In sub-Saharan African countries, there is a large variability in the percentage of pregnant women tested for HIV during antenatal visits for their most recent birth, receiving results and post-test counselling (figure 3). An overview of ART coverage for PMTCT in 2018, provided in table 6, indicates that two of the six countries investigated reported coverage higher than 95 per cent.

Figure 3. Pregnant women tested for HIV during antenatal visit for most recent birth, receiving results and post-test counselling, latest year



Source: DHS, 2019.

Table 6. ART coverage for PMTCT and new HIV infections averted, 2016–2018

Country	Coverage of pregnant women who receive ART for PMTCT (%)		Infections averted due to PMTCT	
	2016	2018	2016	2018
Liberia	68	93	<500	<500
Namibia	>95	>95	2 000	1 800
South Africa	85	87	56 000	53 000
Uganda	>95	93	18 000	17 000
Tanzania, United Rep. of	81	93	11 000	14 000
Zambia	>95	>95	8 900	8 800

Source: UNAIDS, 2019.

1.3 90-90-90 targets and access to ART

The UNAIDS' 90-90-90 treatment target was launched at the 20th International AIDS Conference in Melbourne in 2014. This three-part target has become a central pillar of the global push to end the AIDS epidemic. It reflects a fundamental shift in the approach to HIV treatment, moving away from a focus on the number of people accessing ART and towards emphasizing viral suppression among people living with HIV. The first '90' target aims, by December 2020, to diagnose 90 per cent of people living with HIV, the second to provide 90 per cent of them with ART, and the third to suppress the virus in 90 per cent of those receiving care. It is important to point out that reaching the first 90 is a pre-requisite for also reaching the second and third. Progress may be undermined if the first 90 target is not met (UNAIDS, 2017b).

PROGRESS ON THE 90-90-90 TARGETS

Table 7 provides an overview of the situation in the selected countries in 2018 (UNAIDS, 2019). In Liberia, only 68 per cent of people living with HIV knew their status (first 90 target), followed by the United Republic of Tanzania (78 per cent), Uganda (84 per cent) and Zambia (87 per cent). While the first 90 is achieved in South Africa and Namibia. The second 90 is achieved in United Republic of Tanzania and Namibia, and almost achieved in Zambia and Uganda. The third 90 target is achieved in Namibia and has values above 80 per cent in South Africa, Uganda and the United Republic of Tanzania, while in Zambia, 75 per cent of people on treatment are virally supressed. Liberia is by far the country with the greatest gaps in terms of the first and second 90 targets (Table 7). Identifying, reaching and testing specific groups are the first steps towards establishing adequate response programmes, which have implications for health-care workforce coverage and health service provision.

Table 7. 90-90-90 progress, 2018 (percentage)

Country	1st target 90% of people living with HIV know their status	2nd target 90% of people diagnosed with HIV are on treatment	3rd target 90% of people on treatment will have viral suppression
Liberia	68	52	n.a.
Namibia	91	>95	95
South Africa	90	68	87
Uganda	84	87	88
United Republic of Tanzania	78	92	87
Zambia	87	89	75
Global	79	78	86

n.a. = data not available.
Source: UNAIDS, 2019.

HIV COUNSELLING AND TESTING FACILITIES

Table 8 reports on the number of facilities where HCT are available, including health and non-health facilities. In absolute terms (total number), of the six countries, South Africa and the United Republic of Tanzania record the highest number of sites. In relative terms (per 100,000 adult population), Namibia and Zambia report the highest values (22 per 100,000 adult population), while South Africa shows data that is particularly concerning.

Table 8. HIV counselling and testing (HCT) facilities, 2014

Country	HCT facilities, reported number	HCT facilities, estimated number per 100 000 adult population
Liberia	368	15
Namibia	338	22
South Africa	4 096	11
Uganda*	3 365	17
United Republic of Tanzania	4 391	16
Zambia	1 765	22
Average for African countries		13.5

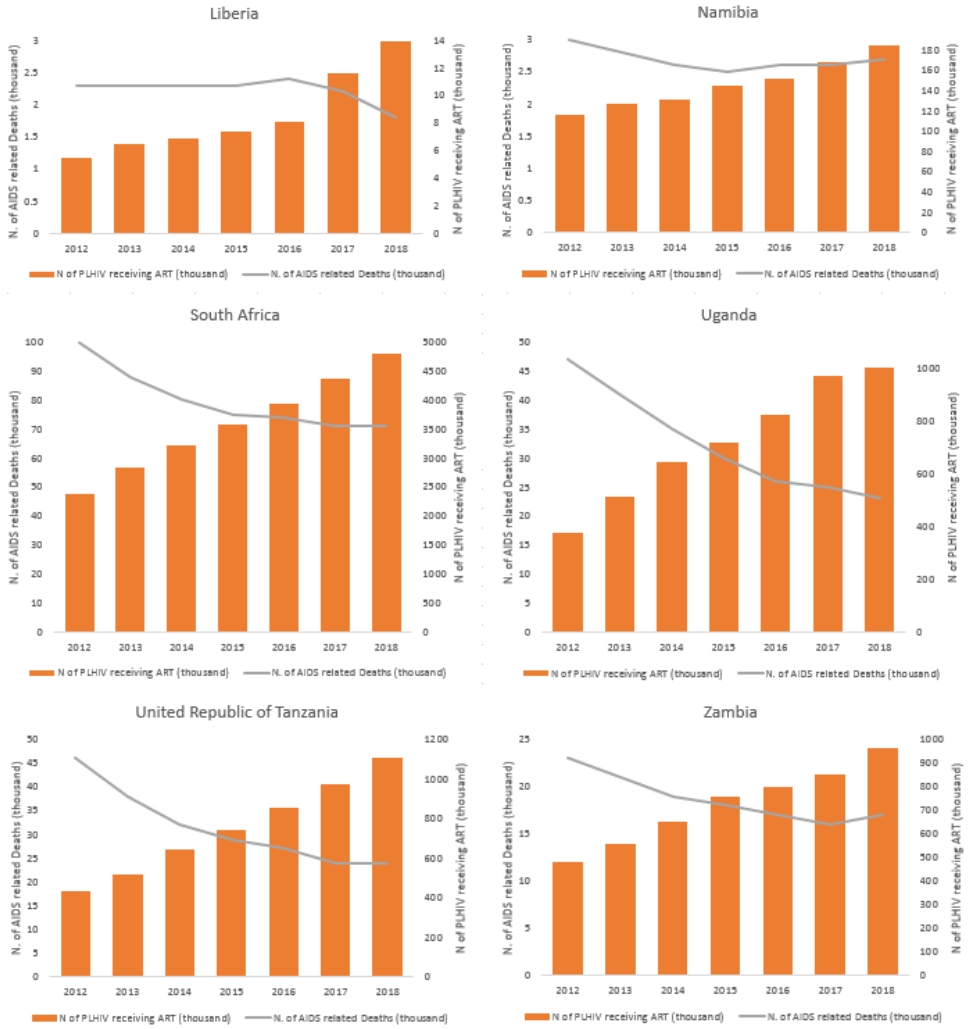
* = No inventory for HCT sites.
Note: The average for African countries was computed on 45 countries with available data.
Source: WHO, 2018.

According to WHO guidelines (2017), treatment for those living with HIV should provide them with a complete package of services (screening and diagnosis, treatment, prophylaxis and preventive treatment for specific pathologies, such as tuberculosis, rapid initiation of ART, and adherence support) to minimize morbidity and mortality.

THERE IS A NEGATIVE RELATIONSHIP BETWEEN ART COVERAGE AND AIDS-RELATED DEATHS

Guaranteeing wider availability of ART should become an absolute priority for policymakers. Coverage has an impact on the number of AIDS-related deaths, and figure 4 shows the relationship between AIDS-related deaths and ART coverage for the countries studied. To achieve wider ART availability, facilities such as hospitals and decentralized primary care clinics must be expanded, and the health-care workforce increased (WHO, 2017). Community mobilization can represent an effective tool to improve access to HIV testing, prevention, care and adherence to treatment. Better community service delivery may be a suitable instrument to reduce costs and, in the meantime, bring services closer to individuals in need, especially for those living in rural areas. A specific discussion on this is provided in section 1.6.

Figure 4. AIDS-related deaths and ART coverage, 2012–18



Source: Authors' calculations based on UNAIDS, 2019.

1.4 Socio-economic consequences of low ART coverage

DEBILITATION AND OPPORTUNISTIC INFECTIONS

Low ART coverage has negative socio-economic consequences for people living with HIV and their families. If left untreated, HIV causes progressive debilitation that, in turn, is associated with the onset of opportunistic infections, reduced productivity and ability to work, and a higher burden for household caregivers.

The literature provides evidence that ART is able to invert this trend, giving people living with HIV the opportunity to recover their capacity to work (Tirivayi and Koethe, 2016;

Thirumurthy, Zivin and Goldstein, 2008; Wagner et al., 2009).

The impact of HIV on labour participation by looking at CD4 count

This section investigates the impact of HIV on employment participation by looking at CD4 count,[7] which is often used as a proxy for quality of life and ability to work for people living with HIV.[8] The proposed simulation is based on the results obtained by Tirivayi and Koethe (2016), which found that those with a CD4>350 are expected to work for pay or profit 5.97 days more a month than those with a CD4<350. Further, it was found that people living with HIV with CD4>350 are 22 per cent more likely to be in employment than those with CD4<350, and are also working an extra 9.06 hours per week.

Estimating the number of people living with HIV according to their CD4 value

Using the findings of Tirivayi and Koethe (2016), it is possible to estimate the effects of HIV on productivity and labour in the six countries studied, and the consequences of the gaps in ART coverage. To do so, UNAIDS (2017a; 2017b) data on the number of people aged 15+ living with HIV was used, combined with the number on ART, to get an estimation of the number not on ART. Finally, the CD4 count was used to estimate the number of people living with HIV according to their CD4 value. The estimates are provided in table 9, and show a decreasing trend in the number not on ART from 2010 to 2015. This information was then combined with results from Tirivayi and Koethe to obtain the days of work lost due to a CD4 less than 350.

Yearly lost number of work days due to CD4 counts less than 350

Estimations are reported in table 10 and, encouragingly, show a decreasing trend in the socio-economic impact of HIV during the period 2010–15. A concern is registered in Namibia, where people living with HIV, not on ART, and having less than CD4<200, increased over the period. In general, these data are alarming, highlighting the economic

[7] For global estimates regarding lost earnings due to diminished productivity attributable to AIDS see ILO, 2018b.

[8] The definition of CD4 count, as provided by the US National Institutes of Health, is: "A laboratory test that measures the number of CD4 T lymphocytes (CD4 cells) in a sample of blood. In people with HIV, the CD4 count is the most important laboratory indicator of immune function and the strongest predictor of HIV progression. The CD4 count is also used to monitor a person's response to antiretroviral therapy (ART)." See https://aidsinfo.nih.gov/understanding-hiv-aids/glossary/822/cd4-count.

consequences of HIV: the total yearly number of days of work lost because of a CD4<350 ranges from 901,330 in Liberia to 56,223,131 in South Africa.

According to Tirivayi and Koethe (2016), an estimated 71.64 days of work are lost per year because of HIV for each person living with HIV with CD4<350. This data does not take account of the effect of HIV on household members with regards to labour and productivity. In their study, it was noted that HIV-negative adult family members have a lower likelihood of labour-force participation if the person living with HIV presents a CD4<350. Because the effect is not statistically significant in Tirivayi and Koethe's analysis, it was not used in this working paper's simulation.

THE INITIATION TO ART FOR PEOPLE LIVING WITH HIV IS ESSENTIAL TO INCREASE CD4 COUNT AND THEREBY IMPROVE PATIENT HEALTH AND HOUSEHOLD ECONOMIC CONDITIONS

The strong correlation between CD4 count and opportunistic infections has an important effect on the care needs of people living with HIV. The National Institutes of Health (NIH) has produced guidelines for the global community, highlighting how opportunistic infections are linked to CD4 values (2018). ART initiation for people living with HIV is essential to increase their CD4 count and improve household economic conditions. Thirumurthy et al. (2013) reviewed a community health campaign in Uganda and found that people living with HIV with CD4<200 work on average 4.8 fewer days per month and 1.7 fewer hours per day than those with CD4>500 (NIH, 2018).

Table 9. Estimated number of people aged 15 years and above living with HIV not on ART, by CD4 count

	Liberia		Namibia		South Africa		United Republic of Tanzania		Uganda		Zambia	
CD4	**2015**	**Var % 2010–15**	**2015**	**Var % 2010–15**	**2015**	**Var % 2010–15**	**2015**	**Var % 2010–15**	**2015**	**Var % 2010–15**	**2015**	**Var % 2010–15**
CD4≥500	10 426	–4	35 143	–6	1 439 127	–8	219 951	–35	212 609	–38	186 595	–18
CD4 350–500	8 972	–12	27 098	–20	1 142 072	–19	195 043	–35	150 067	–47	131 344	–34
CD4 250–349	5 360	–17	10 366	–50	478 379	–37	68 619	–61	59 480	–57	46 923	–46
CD4 200–249	2 961	–19	3 490	–70	186 940	–54	25 445	–74	21 658	–61	14 541	–64
CD4 100–199	2 788	–16	1 381	86	97 408	–68	14 774	–66	10 149	–67	4 941	–73
CD4 50–99	993	–8	197	354	18 689	–77	3 419	–71	1 751	–79	590	–79
CD4<50	479	13	26	925	3 385	–86	750	–85	286	–92	67	–82

Source: Authors' elaboration on data from Tirivayi and Koethe, 2016, UNAIDS (2017a; 2017b).

Table 10. Estimated working days per year lost because of CD4<350, 2010–15

Year	Liberia	Namibia	South Africa	United Republic of Tanzania	Uganda	Zambia
2010	1 067 000	2 370 282	113 375 458	23 782 417	16 970 270	10 705 084
2015	901 330	1 107 491	56 223 131	8 095 753	6 685 733	4 804 269

Source: Authors' elaboration on data from Tirivayi and Koethe, 2016.

1.5 Health workforce needs

THE SDG INDEX THRESHOLD IS SET AT 4.45 DOCTORS, NURSES AND MIDWIVES PER 1,000 POPULATION

Expanding access to ART requires the evaluation of health-care workforce needs. Sustainable Development Goal 3, to ensure healthy lives and promote well-being for all, at all ages,[9] sets an index threshold to indicate the minimum density of an adequate health-care workforce. The index is 4.45 doctors, nurses and midwives per 1,000 population. Other estimates, obtained with different approaches and methodologies, are also available. For instance, WHO (2016a) provides estimates based on simultaneous equation methods, and data enveloped analysis. WHO's estimate is currently 4.1. The information provided in tables 11 and 12 indicates that the health-care workforces in the six countries studied are inadequate to ensure effective health care.

THERE IS A SEVERE SHORTAGE OF DOCTORS, NURSES AND MIDWIVES: 86,000 IN UGANDA, 196,000 IN THE UNITED REPUBLIC OF TANZANIA, 62,000 IN ZAMBIA, AND IN LIBERIA 15,000

The shortage of doctors, nurses and midwives is evident in data presented in table 13 and figure 5; the SDG index is not being met in five of the six countries. Liberia, the United Republic of Tanzania and Zambia record a particularly poor density, at lower than one. South Africa is the only country that meets and exceeds the SDG threshold. In absolute terms, this means a shortage of 86,000 doctors, nurses and midwives in Uganda, and 196,000 in the United Republic of Tanzania. Zambia would need more than 62,000 additional doctors, nurses and midwives, and Liberia more than 15,000, to meet the requirements.

[9] For more on SDG 3, see https://sustainabledevelopment.un.org/sdg3.

Table 11. Health-care workforce, absolute number, latest year

Country	Liberia	Namibia	South Africa	Uganda	United Republic of Tanzania	Zambia
Physicians	51	774	41 775	3 361	1 481	2 399
Environmental and public health workers	40	198	3 518	n.a.	2 047	566
Pharmaceutical personnel	269	376	34 261	762	656	1 223
Laboratory health workers	115	171	9 777		2 309	682
Dentistry personnel	4	90	10 770	440	509	401
Other health workers	195	338	118 315	15 400	33 357	4 916
Community and traditional health workers	n.a	n.a.	n.a.	5 430	n.a.	n.a.
Nursing and midwife personnel	978	5 750	278 617	37 625	20 800	978
Year	**2008**	**2007**	**2015**	**2005**	**2012**	**2012**

n.a. = data not available.
Source: WHO, 2018.

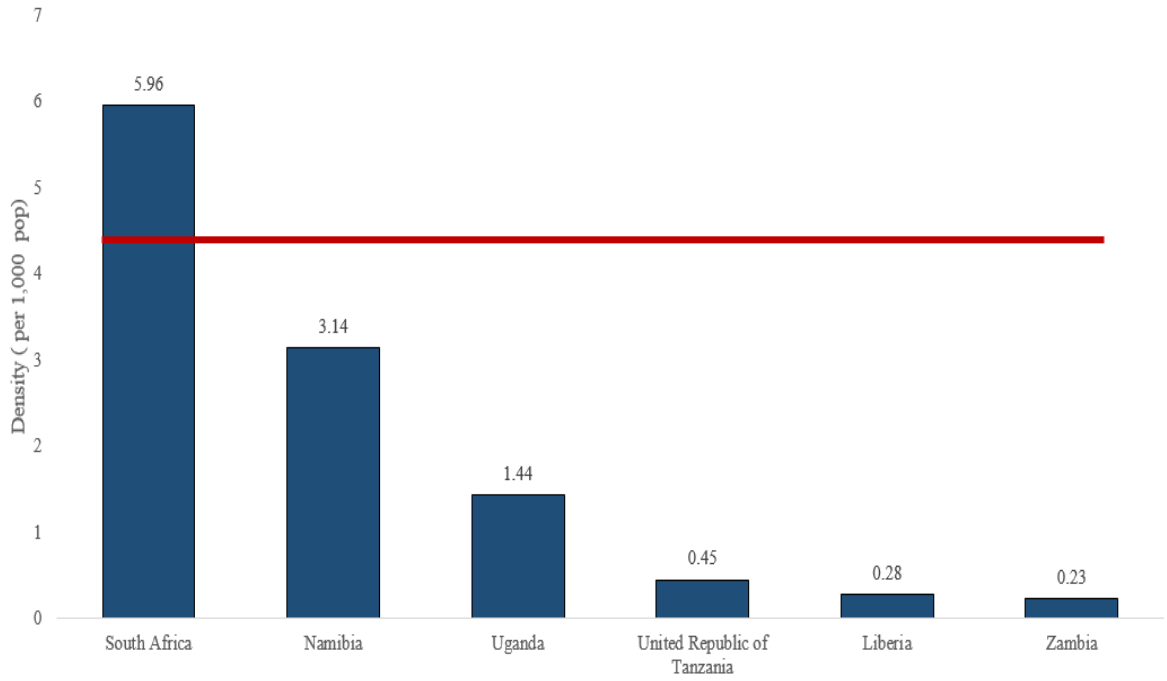
Table 12. Health-care *w*orkforce density, per 1,000 population, latest year

Country	Liberia	Namibia	South Africa	Uganda	United Republic of Tanzania	Zambia
Pharmaceutical personnel	0.073	0.180	0.629	0.034	0.013	0.083
Physicians	0.014	0.372	0.767	0.170	0.030	0.162
Laboratory health workers	0.031	0.082	0.179	n.a.	0.047	0.046
Dentistry personnel	0.001	0.043	0.198	n.a.	0.010	0.027
Other health workers	0.053	0.162	2.171	n.a.	0.686	0.332
Environmental and public health workers	0.011	0.095	0.065	n.a.	0.042	0.038
Health management and support workers	0.014	n.a.	n.a.	n.a.	0.007	n.a.
Nursing and midwife personnel	0.266	2.760	5.113	1.318	0.428	n.a.
Year	**2008**	**2007**	**2015**	**2005**	**2012**	**2012**

n.a. = data not available.

Source: WHO, 2018.

Figure 5. Health-care workforce density, 2017



Note: Density of doctors, nurses and midwives is presented as a distance from the 4.45 SDG index threshold.
Source: WHO, 2018; UN DESA, 2017.

THE SHORTAGE OF QUALIFIED HEALTH-CARE WORKERS AND HEALTH-CARE FACILITIES INCREASES THE NEED FOR HOME CARE

Against WHO's benchmark of 20 physicians per 100,000 population, Liberia and the United Republic of Tanzania fall well short, as table 12 shows. Zambia is just below (with a value of 16.2 per 100,000 population), while Namibia and South Africa exceed the threshold, with values of 37.2 and 76.7. Table 13 provides evidence of the SDG-based threshold workforce shortage measured in absolute terms, and identifies the number of physicians and other categories needed. More than 190,000 workforce units are required in the United Republic of Tanzania to reach the suggested SDG threshold. In Uganda and Zambia, the number of doctors and nurses necessary to meet the SDG index is far from being achieved. Meena (2010) ascribes part of the paid workers' shortage in the United Republic of Tanzania to low wages and bad working conditions among nurses and doctors, suggesting this is also perhaps responsible for the high number of advanced infections in people living with HIV not receiving ART.[10] Consequently, the shortage of qualified

[10] Other factors can be responsible for the shortage of health-care workers, including brain drain and inadequate numbers being trained.

health-care workers and facilities increases the need for unpaid care work.

The inability of paid workers to provide a sufficient level of care to people in need is responsible for a larger burden having to be taken up by unpaid care workers. They are forced to take the place of health-care workers or public hospitals when the latter are unable to fulfil the demand.

Table 13. Shortage of doctors, nurses and midwives, SDG threshold, latest year

Country	**Liberia**	**Namibia**	**South Africa**	**Uganda**	**United Republic of Tanzania**	**Zambia**
Doctors, nurses and midwives	1 029	6 524	320 392	40 986	22 281	3 377
Population (thousands)	3 663	2 080	53 767	28 544	49 083	14 700
Density (per 1000 pop.)	0.28	3.14	5.96	1.44	0.45	0.23
Doctors, nurses and midwives (SDG threshold)	16 300	9 256	239 265	127 021	218 419	65 415
Doctors, nurses and midwives "shortage" (SDG threshold)	–15 271	–2 732	81 127	–86 035	–196 138	–62 038
Year	**2008**	**2007**	**2015**	**2005**	**2012**	**2012**

Source: WHO, 2018; UNAIDS, 2017a.

1.6 Community health workers

The standard definition of a community health worker (CHW) was provided by the International Labour Organization (2008):

COMMUNITY HEALTH WORKERS HAVE AN IMPORTANT ROLE, PARTIALLY FILLING THE HEALTH-CARE WORKER SHORTAGE

> Community health workers provide health education and referrals for a wide range of services, and provide support and assistance to communities, families and individuals with preventive health measures and gaining access to appropriate curative health and social services. They create a bridge between providers of health, social and community services and communities that may have difficulty in accessing these services.

THE LOWEST CHW DENSITY IS IN THE UNITED REPUBLIC OF TANZANIA

In moving towards universal health coverage, CHWs have an important role in helping to fill the severe shortages in the health-care workforce. As shown in table 14, the density of CHWs per 1,000 population indicates a high variability in coverage among the five countries.[11] The highest density is detectable in Zambia, with 3.13 CHWs per 1,000 population; the lowest in the United Republic of Tanzania, with a 0.47 density. However, it should be noted that all countries for which data are available present a higher CHW density than the average for the sub-Saharan Africa region (0.34 per 1,000 population).

Table 14. Community health workers (CHWs), number and density, latest year

Country/region	CHWs number	CHWs density per 1 000	CHWs average age	CHWs % of women
Sub-Saharan Africa	322 199	0.34	32	68
Uganda	29 825	0.74	30	70
United Republic of Tanzania	25 222	0.47	29	51
Zambia	50 460	3.13	32	57
Liberia	9 672	2.15	25	38

Note: For Liberia, Uganda, the United Republic of Tanzania and Zambia density was computed using data from the UNDESA 2017.
Source: One Million Community Health Workers Campaign, available at: http://1millionhealthworkers.org/operations-room/.

[11] Data for South Africa on CHWs are not available.

Table 15. Community health workers (CHWs), remuneration, latest year

Countries	Unpaid–not salaried %	Paid–salaried %	Other %
Sub-Saharan Africa	68.7	13.3	17.9
Uganda	n.a.	1.3	98.7
United Republic of Tanzania	81.6	1.0	17.4
Zambia	n.a.	100	n.a.
Liberia	100	n.a.	n.a.

n.a. = data not available.

Note: Unpaid – not salaried includes CHWs employed on a voluntary basis and those who are not salaried but might periodically receive non-monetary incentives.

Source: One Million Community Health Workers Campaign, available at: http://1millionhealthworkers.org/operations-room/.

CHWs are generally young women, with an average age always below 32 years. Liberia records the youngest, workers, having an average age of 25. It is also the only country where men have a presence, with women comprising only 38 per cent of CHWs. CHWs perform their activity without remuneration, as shown in table 15. The unpaid–not salaried category includes unpaid CHWs (completely voluntary), unpaid CHWs (but periodically receiving non-monetary incentives) and not salaried CHWs (but periodically getting monetary incentives). With the exception of Zambia, the percentage of paid–salaried CHWs is generally low (1 per cent in the United Republic of Tanzania, 1.3 per cent in Uganda). Table 16 highlights the low education level of CHWs. The top, secondary school level is highest in Uganda (90.6 per cent), and lowest in Liberia (2.3 per cent).

Table 16. Community health workers (CHWs), level of education, latest year

Countries	Literacy and basic arithmetic %	Primary school level education %	Secondary school level education %	Other %
Sub-Saharan Africa	3.9	55.4	17.8	22.9
Uganda	9.4	n.a.	90.6	n.a.
United Republic of Tanzania	1.3	47.5	33.4	17.8
Zambia	n.a.	n.a	n.a.	n.a
Liberia	n.a.	97.7	2.3	n.a.

n.a. = data not available

Source: One Million Community Health Workers Campaign, available at: http://1millionhealthworkers.org/operations-room/.

1.7 Benefits of strengthening the health-care workforce

STRENGTHENING THE HEALTH-CARE WORKFORCE AND FACILITIES IS A PRIORITY TO REACH THE FIRST 90 TARGET

The proposed analysis suggests workforce and facility gaps that need to be filled to reach the three-part 90-90-90 treatment target. Given the cascading nature of the target, adopting specific workforce policies is particularly essential to reach the first 90: by 2020, 90 per cent of people living with HIV know their status. This section assesses the impact of the health-care workforce and testing facilities on the percentage of people living with HIV who know their status (UNAIDS, 2017b).

The following data have been taken into account (WHO, 2018):

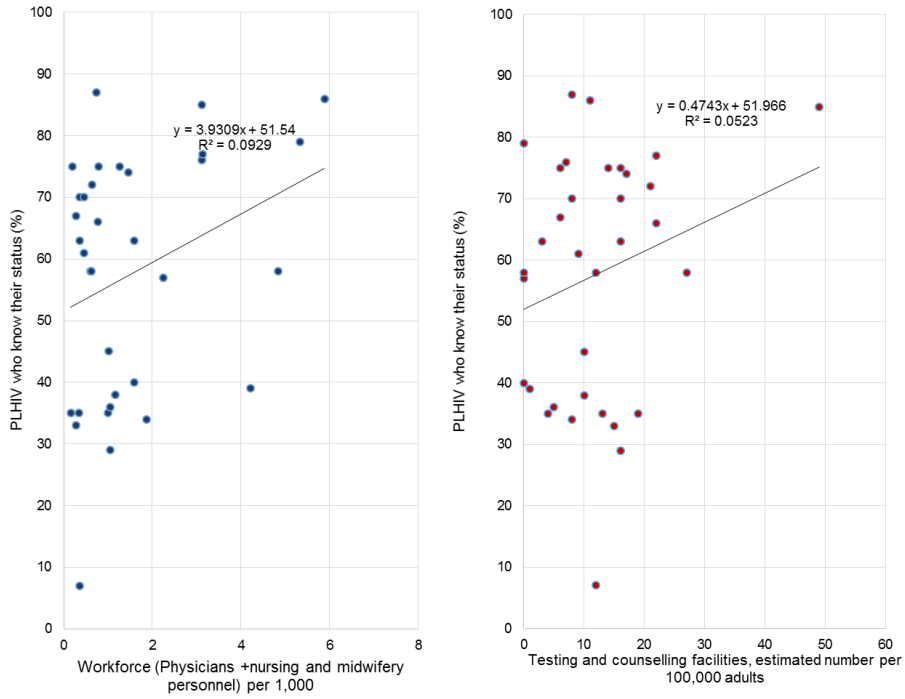
- the density of workforce (physicians, nursing and midwife personnel per 1,000 population); and
- the density of HIV counselling and testing, or HCT, facilities (per 100,000 adults).

These two variables were combined with the percentage of people living with HIV who know their status, using the following linear regression:

$$People\ living\ with\ HIV\ who\ know\ their\ status = f(WORKFORCE, FACILITIES)$$

The bivariate scatter plots reported in figure 6 show the correlation between the two regressors and the first 90 target. The coefficient for workforce is positive, meaning that an increase in workforce leads to an increase in the percentage of people living with HIV who know their status. The same is true for the density of HCT facilities.

Figure 6. People living with HIV who know their status, and workforce and HCT facilities, latest year



Source: Authors' calculations based on data from UNAIDS, 2017b, and WHO, 2018.

RESULTS OF THE REGRESSION MODEL

The complete regression, run using the above-mentioned covariates (density of workforce, density of HCT facilities), shows the positive and statistically significant impact of the two variables on the percentage of people living with HIV who know their status (table 17). The coefficient for workforce is equal to 4.6, which means that an increase of one health worker per 1,000 people would lead to a 4.6 percentage point increase in people living with HIV who know their status. This result shows the positive role of a paid workforce (measured in physicians and nurses) on increasing knowledge of HIV status, as shown in table 17.

Table 17. Regression model results, percentage of people living with HIV knowing their status

	Sign of impact	Size of the impact	Significance of the impact
Workforce	+	4.60	**
Facilities	+	0.61	*

+ = positive impact; ** = p-value <0.05; * = p-value <0.10.
Source: Authors' calculations based on data from UNAIDS, 2017b, and WHO, 2018.

Additionally, the impact of increasing facilities is also positive (0.61) and significant (p-value <0.10), but lower than that recorded for workforce. However, the goodness of fit of the model, measured though R^2 turns out to be low (17 per cent).[12] In other words, the model is able to explain only 17 per cent of the variability of the percentage of people living with HIV who know their status. The remaining variability is attributable to other factors not included in the model.

The results should be read with caution as the number of observations was limited due to data availability. In addition, data do not refer to the same time period. Workforce data refer to the last available data for each country, and facilities data to year 2014 and data on people living with HIV who know their status from 2015 or 2016. Even with these limitations, the regression can still be used to provide an idea of the relationship between the first target and health-care workforce and facilities.

2. THE ROLE OF UNPAID WORK IN ENDING THE AIDS EPIDEMIC

PEOPLE WHO HAVE BEEN MADE VULNERABLE MAINLY RELY ON FAMILY MEMBERS AND VOLUNTEERS FOR THEIR CARE

In sub-Saharan Africa, the large coverage gaps in the health workforce and facilities have resulted in people living with HIV who do not have access to ART relying mainly on family members and volunteers for their care. However, it is important to acknowledge that this kind of care is unpaid, and is neither trained nor supported. According to Antonopoulos and Toay (2009), “for PLHIV in poor households, family members and community volunteers have become the primary source of day-to-day care”.

In households with people living with HIV, the role played by family members is important, as they usually have to fill the gaps left by unmet health-care needs. Hence, unpaid workers represent an important category of care workers. As

[12] The complete results of the regression are available in Appendix 1, table A.1.1.

numerous studies have emphasized, these family members not only provide primary health care but also emotional support (Razavi and Staab, 2010; Meena, 2010; Bachmann and Booysen, 2006; Global Coalition on Women and AIDS, 2004; Grunfeld et al., 2004; Kipp, et al., 2007; VSO, 2006; van Empelen, 2005; Ogden, Esim and Grown, 2006).

ROUGHLY 70–90 PER CENT OF CARE SUPPORT IS PROVIDED BY FAMILIES

International organizations, including WHO, support the idea that HIV not only takes a toll on people living with HIV, but also places a heavy burden on families and informal caregivers, especially in sub-Saharan African countries. Asuquo, Etowa and Akpan (2017) found that an estimated 70 to 90 per cent of care support is provided by family members. New drugs and treatments, such as ART, have increased the number of people living with HIV and, consequently, the need for more caregivers (Singh et al., 2011).

The vital role of caregivers generally goes unrecognized by governments, which have promoted only a limited number of programmes and policies directed at unpaid caregivers. In addition, worldwide, this type of work is not remunerated and not counted in the gross domestic product, even if it creates substantial invisible value and should be sustained by health-care policymakers (Meena, 2010; Razavi and Staab, 2010; Folbre, 2001; Kohli et al., 2012).

THE INABILITY OF GOVERNMENTS TO GUARANTEE CARE FOR THESE PATIENTS SHIFTS A PUBLIC COST ON TO THE SHOULDERS OF PRIVATE CITIZENS

Many economists claim that unpaid care work generates a benefit to the national economy because of the savings created for health-care authorities. However, the inability of governments to guarantee care for the people living with HIV who need it shifts the public cost on to private citizens; it becomes a private matter. In this way, the public authorities only transfer the problem, not solve it (Tshililo and Davhana-Maselesele, 2009; Antonopoulos and Toay, 2009).

This burden of unpaid work also generates substantial hidden costs for caregivers, who do not receive adequate recognition from policymakers. Antonopoulos and Toay (2009) suggest that the time unpaid caregivers dedicate to providing care for people living with HIV should be considered a tax, since they inevitably have to give up other

CAREGIVERS OFTEN HAVE TO GIVE UP ON THEIR OWN EDUCATION, POLITICAL PARTICIPATION AND OPPORTUNITIES TO FIND DECENT WORK

types of activities, such as labour-force participation, education and their own personal care. They say economists have attempted to estimate the indirect and direct costs for these types of non-remunerated activities, though they are far from calculating the opportunity cost for caregivers.

A number of studies have emphasized that providing better data and information to governments will result in better policies and assistance plans for people living with HIV and their families, which could then significantly alleviate the heavy burden placed on caregivers (HelpAge International, 2006).

2.1 Methodology

DATA SETS

This section identifies the impact of people living with HIV on caregivers' employment status. To run such an analysis, it is necessary to use the following DHS microdata:

- Liberia, DHS year 2013, number of observations 8,432 (3,950 men, 4,482 women).
- Namibia, DHS year 2013, number of observations 9,309 (4,101 men, 5,208 women).
- Zambia, DHS year 2013–14, number of observations 29,685 (13,997 men, 15,661 women).

The aim of this section was to test the relationship between HIV and having at least one family member living with HIV on various aspects of life, namely educational level and employment status. The analysis should also indicate whether this impact is equal (or not) for men and women caregivers.

DESCRIPTIVE ANALYSIS

The first step in the analysis utilizes a descriptive comparison of the percentage of men and women working, depending on their HIV status and on the HIV status of their family members. To test if differences in proportions between groups can be considered statistically significant, a hypothesis test on proportions was used. Statistically significant tests are marked using stars (*).

MULTIVARIATE ANALYSIS

The second step proposes a multivariate analysis to examine the relationship between the probability of working and a set of demographic and contextual variables, including the presence of a family member living with HIV. Other factors (for example, educational level, or living in rural areas) may also have an impact on the decision on whether or not to work.

To run the regression, the three DHS data sets for Liberia, Namibia and Zambia were pooled to obtain a composite and unique data set. The analysis was restricted to household members who are HIV-negative. As a result, the final data set includes 40,653 observations containing information on people aged 15–64 who are HIV-negative.

A logit model was used to estimate maximum likelihood. The binary response variable is represented by a dummy variable assuming value one if the respondent is currently working, and zero if the respondent is not working. The logit regression provides a model of the probability of working given a set of regressors, belonging to different domains connected to socio-demographic factors and the presence of people living with HIV in the household. Due to the pooled nature of the data set, country dummies were included.

2.2 HIV status, unpaid care workers and gender inequality

Traditional divisions of work shift the role of unpaid caregivers to women and girls, who are most often responsible for cleaning, cooking and washing in the household. The specific activity of fetching water could be used as a proxy to assess gender roles in an HIV-affected household. The time spent on this time-consuming task, which is often undertaken by women and girls, deserves particular attention as it corresponds to several months of full-time unpaid work per year. It is evident these activities increase if a person living with HIV in the household requires special care, due to more frequent bathing and cleaning (Antonopoulos and Toay, 2009, ILO, 2018b).

Overall, the percentage of households with water available less than 30 minutes away (round trip) significantly varies within countries, accounting for less than 31 per cent in Namibia, to almost 41 per cent in Zambia and 71 per cent in Liberia.[13] In addition, differences persist between urban and rural areas. The time required to fetch water tends to be lower for those living in urban areas in Namibia and Zambia,

[13] The analysis proposed is constrained on DHS data set availability.

while the opposite is true in Liberia (table 18). These results suggest there is no clear pattern in water accessibility between urban and rural areas.

The time-tax burden of unpaid work affects women's access to paid work, receiving education, participating in community events, and last but not least, caring for themselves. The care burden that encumbers women is, therefore, responsible for gender inequalities in employment participation, learning and other social/community activities.

While there is no comprehensive data set providing information on how time is allocated within households with people living with HIV, DHS data for a selection of countries can be useful in understanding the burden of unpaid care work in HIV-affected households and its impact on accessing paid work and higher educational levels (ILO, 2018b).

Table 18. Average time to fetch water in selected countries, in minutes, latest year

Average Time to get to water source (in minutes)	Liberia	Namibia	Zambia
Total	17.70	25.51	22.68
Urban	19.98	16.66	21.25
Rural	16.35	29.44	23.48

Source: Authors' calculations based on DHS microdata.

IMPACT OF PEOPLE LIVING WITH HIV ON WORKING STATUS AND EDUCATIONAL LEVEL

Table 19 indicates that the percentage of women in paid work is significantly lower than for men. In Zambia, 49 per cent of women are employed, compared with 74 per cent of men. The country recording the lowest percentage of employed women is Namibia, where only 41 per cent of women work for pay or profit. Two different patterns emerge when reviewing employment status disaggregated by HIV status. In Namibia and Zambia, the percentage of women and men in employment is higher among those who are HIV-positive. Conversely, in Liberia only 39 per cent of HIV-positive women are employed, compared with 55 per cent who are HIV-negative. Analysis of educational levels (tables 20 and 21) suggests that in Liberia and Zambia women have a lower education level than men. In Liberia, for example, women receive on average 4.35 years of education, while men get 6.9 years.

Disaggregating the analysis by HIV status, Namibian women living with HIV record significantly lower levels of education, and the literacy level is also lower for those who are HIV-negative. In Liberia, differences in the education level, and in the percentage of literate people, between those living with HIV and those who are not living with HIV (women and men) are not statistically significant.

Table 19. Respondents in employment,[14] by HIV status and gender (percentages)

		Liberia	Namibia	Zambia
Women	HIV-positive	39	51	56
	HIV-negative	55	39	47
	Signif.	*	***	***
	Total	**55**	**41**	**49**
Men	HIV-positive	73	70	84
	HIV-negative	72	55	72
	Signif.	–	***	***
	Total	**72**	**56**	**74**
Total	HIV-positive	53	58	68
	HIV-negative	63	47	60
	Signif.	–	***	***
	Total	**63**	**48**	**61**

Note: p-value <0.1 *; p-value <0.05 **; p-value <0.01 ***.
Source: Authors' elaboration on DHS microdata.

[14] Employment includes formal and informal employment.

Table 20. Average number of years of education, by HIV status and gender

		Liberia	Namibia	Zambia
Women	HIV-positive	4.01	7.55	7.32
	HIV-negative	4.41	8.69	6.89
	Signif.	–	***	***
	Total	4.35	8.50	6.96
Men	HIV-positive	7.86	7.11	8.69
	HIV-negative	6.88	8.30	8.02
	Signif.	–	***	***
	Total	6.90	8.16	8.10
Total	HIV-positive	5.53	7.39	7.92
	HIV-negative	5.53	8.51	7.46
	Signif.	–	***	***
	Total	5.53	8.35	7.52

Note: p-value <0.1 *; p-value <0.05 **; p-value <0.01 ***.
Source: Authors' elaboration on DHS microdata.

Table 21. Literate respondents, by HIV status and gender (percentage)

		Liberia	Namibia	Zambia
Women	HIV-positive	38	82	60
	HIV-negative	40	87	59
	Signif.	–	**	–
Men	HIV-positive	70	74	77
	HIV-negative	63	81	73
	Signif.	–	**	**
Total	HIV-positive	51	79	68
	HIV-negative	51	84	66
	Signif.	–	***	–

Notes: p-value <0.1 *; p-value <0.05 **; p-value <0.01 ***.Literate corresponds to able to read whole sentence.
Source: Authors' calculations based on DHS microdata.

IMPACT OF HAVING FAMILY MEMBERS LIVING WITH HIV ON WORKING STATUS AND EDUCATIONAL LEVEL

Since unpaid caregivers represent a particularly relevant category of care work, it is useful to analyse the impact of having at least one family member living with HIV on the employment status and educational level of other family members. Previous studies applied to the African context show that the presence of people living with HIV in a household imposes a significant weekly care burden that will likely reduce working opportunities for caregivers (Hilhorst et al., 2006, ILO, 2018b). It is worth noting that in all the

THE PERCENTAGE OF WOMEN WORKING IS INFLUENCED BY THE PRESENCE OF A FAMILY MEMBER LIVING WITH HIV

countries analysed, the percentage of employed women appears to be influenced by the presence of relatives with HIV. As shown in table 22, in Namibia, 33 per cent of employed women have a family member living with HIV in the household, compared with 43 per cent with no one living with HIV. Statistically significant differences were not recorded for men (54 versus 57 per cent). In Zambia, both men and women with people living with HIV in the family recorded lower employment percentages, with only 37 per cent of such women employed.

Table 22. Respondents in employment, by HIV status of family members and gender (percentage)

		Liberia	Namibia	Zambia
Women	HIV-positive	49	33	37
	HIV-negative	55	43	50
	Signif.	–	***	***
Men	HIV-positive	65	54	52
	HIV-negative	72	57	75
	Signif.	–	–	***
Total	HIV-positive	54	49	44
	HIV-negative	63	39	62
	Signif.	–	***	–

Note: p-value <0.1 *; p-value <0.05 **; p-value <0.01 ***.
Source: Authors' calculations based on DHS microdata.

Table 23. Average years of education, by HIV status of family members and gender (percentage)

		Liberia	Namibia	Zambia
Women	HIV-positive	4.71	8.36	8.60
	HIV-negative	4.35	8.53	6.81
	Signif.	–	–	***
Men	HIV-positive	7.55	7.26	9.10
	HIV-negative	6.89	8.23	8.04
	Signif.	–	**	***
Total	HIV-positive	5.69	8.03	8.81
	HIV-negative	5.53	8.38	7.42
	Signif.	–	*	***

Note: p-value <0.1 *; p-value <0.05 **; p-value <0.01 ***.
Source: Authors' calculations based on DHS microdata.

Table 24. Literate respondents, by HIV status of family members and gender (percentage)

		Liberia	Namibia	Zambia
Women	HIV-positive	51	87	78
	HIV-negative	40	86	57
	Signif.	–	–	***
Men	HIV-positive	82	73	80
	HIV-negative	63	81	73
	Signif.	**	*	**
Total	HIV-positive	62	83	79
	HIV-negative	51	83	65
	Signif.	–	–	***

Notes: p-value <0.1 *; p-value <0.05 **; p-value <0.01 ***. Literate refers to being able to a read whole sentence.
Source: Authors' calculations based on DHS microdata.

The impact of having family members living with HIV on educational level is more controversial (tables 23 and 24). In Zambia, women and men living with HIV-positive family members seem to be slightly more educated. The opposite is true in Namibia.

Table 25 further illuminates the relationship between a family member's HIV status and the caregiver's probability of working, disaggregating the analysis by gender and residence area (rural/urban). Interestingly, the percentage

of people working was higher in rural areas for Liberia and Zambia. Women in rural Namibia and Zambia were more affected by the presence of people living with HIV in the household: the percentage of those employed fell from almost 31 to 21 per cent in Namibia, and from almost 54 to less than 42 per cent in Zambia. In rural areas of Liberia, Namibia and Zambia, even the status of the male labour force was affected by family members living with HIV in the household.

Table 25. Respondents in employment, by HIV status of family members, gender and residence area (percentage)

			Liberia	Namibia	Zambia
Women	Rural	HIV-positive	55.42	20.99	41.82
		HIV-negative	60.86	30.76	53.84
		Signif.	–	***	***
	Urban	HIV-positive	47.51	45.22	35.18
		HIV-negative	50.81	52.75	44.30
		Signif.	–	–	***
Men	Rural	HIV-positive	77.69	38.23	55.19
		HIV-negative	79.88	44.21	77.00
		Signif.	–	–	***
	Urban	HIV-positive	62.75	67.55	50.90
		HIV-negative	65.79	66.43	73.31
		Signif.	–	–	***
Total	Rural	HIV-positive	63.23	25.61	48.08
		HIV-negative	69.88	37.20	65.33
		Signif.	–	–	***
	Urban	HIV-positive	53.07	52.47	41.73
		HIV-negative	57.67	59.46	58.72
		Signif.	–	*	***

Note: p-value <0.1 *; p-value <0.05 **; p-value <0.01 ***.
Source: Authors' elaboration on DHS microdata.

2.3 HIV-affected households and working status: a multivariate analysis

The analysis proposed in the previous section suggests a relationship between caregivers' employment status and the presence of people living with HIV in the household. This section presents a multivariate analysis used to assess the extent of the impact of having at least one family member living with HIV in the household on the probability of being in employment. Indeed, other factors, such as educational level or living in rural areas, may have an impact on deciding whether or not to work for pay or profit. The complete list of variables is reported in table 26 and leads to the following logit regression:

$$\Pr(EMPLOYED = 1) = f(PLHIV;\ WOMAN;\ EDU_{LEVEL};\ RURAL;\ AGE;\ NAMIBIA;ZAMBIA)$$

The coefficient connected to the variable WOMEN allowed an analysis of the impact of being a woman on the probability of working. Two separate regressions were run on women and men to detect possible differentiated effects of having a relative living with HIV on the employment status of caregivers.

Table 26. Variable descriptions included in the logit regressions

Variable name	Description
EMPLOYED (dependent variable)	Equal to 1 if the respondent is currently employed, 0 otherwise
PLHIV_H	Equal to 1 if there is at least one person living with HIV in the respondent's household, 0 otherwise
WOMEN	Equal to 1 if the respondent is a woman, 0 otherwise
EDU_LEVEL	Education in single years
RURAL	Equal to 1 if the respondent lives in a rural area, 0 otherwise
AGE	Respondent's current age
LIBERIA	Equal to 1 if the respondent lives in Liberia, 0 otherwise
NAMIBIA	Equal to 1 if the respondent lives in Namibia, 0 otherwise
ZAMBIA	Equal to 1 if the respondent lives in Zambia, 0 otherwise

Source: Authors' elaboration.

THE BENEFITS OF USING A MULTIVARIATE APPROACH

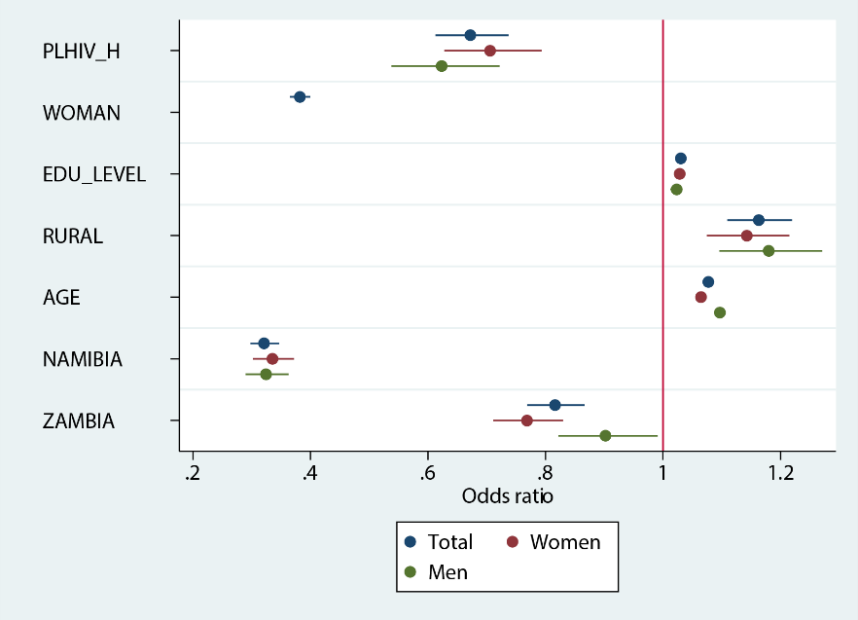
All coefficients were significantly different from zero (p-value <0.05). The sign in the coefficients reported in table 27 allowed for preliminary detection of the impact of the different regressors on the probability of working. It is evident that having a person living with HIV in the household decreases the probability of working, for men and women. However, higher educational level and age, and living in rural areas increase the probability of being in employment.

Table 27. Sign of the coefficients in the logit regressions

Variable	Total	Women	Men
PLHIV_H	-	-	-
WOMEN	-	n.a.	n.a.
EDU_LEVEL	+	+	+
RURAL	+	+	+
AGE	+	+	+
NAMIBIA	-	-	-
ZAMBIA	-	-	-

- = negative impact; + = positive impact; n.a. = data not available
Source: Authors' calculations based on DHS microdata.

Figure 7. Odds ratios of the logit regressions



Source: Authors' calculations based on DHS microdata.

DISCUSSION ON REGRESSION RESULTS

Results of the logit regressions can be easily interpreted by looking at the odds ratios (ORs) reported in figure 7.[15] The ORs provide a look not only at the sign of the impact, but also at its size. Further, the ORs represent the odds that an outcome (being in employment) will occur given a particular exposure.

THE IMPACT OF HAVING PEOPLE LIVING WITH HIV IN THE HOUSEHOLD

First, it is evident that the three regressions lead to consistent results in terms of size and significance of the coefficients. The main variable of interest for our purposes is people living with HIV. ORs connected to people living with HIV vary between 0.62 for the men logit regression to 0.70 for women logit regression. This means that HIV negative women when living with a family member with HIV have the odds of being employed 30 per cent lower than HIV negative women not living with HIV positive family members. Consequently, the presence of at least one person living with HIV in the household significantly and negatively impacts the probability of working for both men and women. Looking at the ORs for the variable WOMEN in the full sample logit regression, the strong negative impact of this variable suggests that, given all the other control variables, being a woman negatively affects the probability of working (OR is 0.38).

THE IMPACT OF EDUCATIONAL LEVEL

THE OVERALL IMPACT OF BEING A WOMAN

THE IMPACT OF LIVING IN URBAN VERSUS RURAL AREAS

In accordance with expectations, educational level impacts positively on the probability of working, and the same can be said for age. Living in rural areas also seems to have a positive impact on employment status. The ORs of the logit regressions for the full sample reveal that, all else being equal, rural residents have a greater probability of working than those living in urban areas. This is also true for households who have a person living with HIV. The ORs associated with the dummy variables of Namibia and Zambia are statistically significant, and both have a negative sign, which suggests differences in the probability of working depending on the country. For example, the probability of working is greater in Liberia than in Namibia or Zambia, both for women and men. .

COUNTRY FIXED EFFECTS

[15] Complete results are reported in Appendix 2.

3. CONCLUSION

THERE IS A HEAVY BURDEN ENDURED BY PEOPLE LIVING WITH HIV AND THEIR CAREGIVING FAMILY MEMBERS THAT AFFECTS MANY ASPECTS OF THEIR LIVES

This paper provides a comprehensive picture of the gaps and challenges in paid and unpaid healthcare work in sub-Saharan Africa, with particular reference to the six countries analysed, and characterized by generalized HIV prevalence.

Various data sources and methodological approaches were used to identify the socio-economic impact of HIV and of having relatives with HIV, and to examine the impact of paid and unpaid health-care worker shortages on achieving the UNAIDS three-part 90-90-90 treatment target, a precursor to ending the AIDS epidemic by 2030.

The findings confirm that, despite undeniable gains and improvements since 2010, a heavy burden is still being shouldered not only by people living with HIV, but also their relatives, which further affects their lives in many ways. In particular, the empirical analysis suggests that:

KEY POINTS

- Liberia and United Republic of Tanzania risk missing the 90-90-90 targets by 2020 if current programmes do not increase health-care system delivery and ART coverage.

- ART coverage is still inadequate, causing severe socio-economic consequences. Over the past 10 years, ART has significantly increased around the world, but more than 40 per cent of people living with HIV still do not have treatment.

- When left untreated, HIV causes progressive debilitation that reduces productivity and the ability to work. ART can invert this trend and improve CD4 counts.

- HIV results in a high loss of workdays. Each person living with HIV with a CD4 count lower than 350 loses an estimated 71.64 days of work per year. The estimated total yearly days of work lost due to HIV is

extremely high, ranging from 901,330 in Liberia to a debilitating 56,223,131 in South Africa.

- The expanding need for care is causing health-care delivery system failures and labour shortages. Excluding South Africa, the countries studied are experiencing a shortage of doctors, nurses and midwives. The SDG index threshold for health-care workers remains far out of reach.

- Improved medical workforce density and more HCT facilities are required to achieve the first 90 target. Only an adequate workforce, with sufficient HCT, can positively affect the percentage of people living with HIV who know their status. An extra health worker per 1,000 people would lead to a 4.6 percentage point increase in the share of people living with HIV being diagnosed. Additional resources must be invested to ensure the first target is reached and to avoid the negative cascading effects on achieving the second and third 90 targets.

- HIV negative women and men living with a HIV positive person miss opportunities in accessing paid work, education and other socio-economic activities compared with those without HIV positive family members.

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Appendix 1. Linear regression

Table A.1.1. Regression output workforce and facilities

Variable	Coef.	Standard error	t-value	p-value
Workforce	4.6093	2.1370	2.16	0.039
Facilities	0.6075	0.3438	1.77	0.087
R^2				0.175

Source: Authors' calculations based on DHS microdata.

Appendix 2. Logit regression

The first logit regression was estimated using the complete data set (men and women) obtaining the following results:

WOMEN AND MEN

$$\Pr(EMPLOYED = 1) = -1.13 - 0.40PLHIV - 0.96WOMAN + 0.03EDU_{LEVEL} + 0.15RURAL + 0.07AGE - 1.14NAMIBIA - 0.21ZAMBIA$$

Table A.2.1. Odds-ratios of the regression run on men and women

Variable	OR	Standard error	t-value	p-value
PLHIV	0.672	0.032	-8.43	0.000
WOMAN	0.383	0.009	-41.94	0.000
EDU_LEVEL	1.030	0.003	9.3	0.000
RURAL	1.165	0.028	6.32	0.000
AGE	1.077	0.001	63.06	0.000
NAMIBIA	0.320	0.012	-29.5	0.000
ZAMBIA	0.812	0.025	-6.84	0.000
CONSTANT	0.322	0.016	-22.49	0.000

Source: Authors' calculations based on DHS microdata.

The second and third regressions were estimated, respectively only on women and men, and, consequently excluding the WOMEN variable (see Table 27), with respect to the first regression, and obtaining the following results:

WOMEN

$$\Pr(EMPLOYED = 1) = -1.71 - 0.35PLHIV + 0.03EDU_{LEVEL} + 0.13RURAL + 0.06AGE - 1.09NAMIBIA - 0.26ZAMBIA$$

Table A.2.2. Odds Ratio of the regression (women sample)

Variable	OR	Standard error	t-value	p-value
PLHIV	0.706	0.042	-5.830	0.000
EDU_LEVEL	1.028	0.004	6.570	0.000
RURAL	1.143	0.036	4.250	0.000
AGE	1.065	0.002	41.000	0.000
NAMIBIA	0.335	0.018	-20.620	0.000
ZAMBIA	0.768	0.030	-6.680	0.000
CONSTANT	0.181	0.011	-27.020	0.000

Source: Authors' calculations based on DHS microdata.

MEN

$$\Pr(EMPLOYED = 1) = -1.62 - 0.47PLHIV + 0.02EDU_{LEVEL} + 0.17RURAL + 0.09AGE - 1.13NAMIBIA - 0.10ZAMBIA$$

Table A.2.3. Odds Ratio of the regression (men sample)

Variable	OR	Standard error	t-value	p-value
PLHIV	0.623	0.047	-6.300	0.000
EDU_LEVEL	1.023	0.005	4.410	0.000
RURAL	1.180	0.045	4.380	0.000
AGE	1.097	0.002	46.720	0.000
NAMIBIA	0.324	0.019	-19.610	0.000
ZAMBIA	0.901	0.043	-2.190	0.029
CONSTANT	0.199	0.015	-20.720	0.000

Source: Authors' calculations based on DHS microdata.

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