# Increasing trends in HIV prevalence among people aged 50 years and older: evidence from estimates and survey data

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**Objective:** To present the most recent 2013 UNAIDS estimates of HIV prevalence among people aged 50 years and older, and to validate these estimates using data from national household surveys.

**Design:** Modelled estimates of HIV prevalence were validated against nationally representative household survey measures of HIV prevalence.

**Methods:** The UNAIDS 2013 HIV estimates were used to compute HIV prevalence and number of people living with HIV aged 50 years and older. Sex-specific HIV-prevalence rates by the 5-year age group were calculated from nationally representative household surveys conducted between 2003 and 2013, and were compared to prevalence rates from the modelled estimates. The ratios (Spectrum/Survey) of the prevalence rates from the two sources were analysed.

**Results:** In 2013, an estimated 4.2 million (4.0–4.5 million) people aged 50 years and older were living with HIV. The global HIV prevalence among older individuals more than doubled in almost all the 5-year age groups since 1995. There was a relatively good agreement between the modelled HIV-prevalence rates and the survey-based rates among men and women aged 50–54 years (0.90 and 1.00 median ratio, respectively), whereas for 55–59 year-olds, the differences were more notable (ratios of 0.63 for men and 0.90 for women).

**Conclusion:** Both data sources suggest HIV-prevalence rates among people aged over 50 have increased steadily in the recent years. Care and treatment services need to address the specific needs of older people living with HIV. Action is needed to incorporate older age groups into HIV surveillance systems.

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## Introduction

Recent reports suggest that the number of people living with HIV who are aged 50 years and older is increasing [1,2]. Additional data are needed to validate these reports and to understand the consequences of HIV infection among older populations as these populations potentially have different social and clinical needs than the other age groups [3]. The additional needs are a result of the higher levels of social isolation or accompanying comorbidities including non–communicable diseases [4,5]. A recent supplement by this journal described the additional research needs to improve services for the growing cohort of older people living with HIV in sub-Saharan Africa [2]. Documenting and planning for this shift in the HIV-positive population is important for countries as they develop their epidemic response.

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There are a number of potential reasons for an increase in the HIV population aged 50 years and older. Increased coverage of antiretroviral therapy (ART) allows people to live well past the age of 50. This, in conjunction with declining rates of new HIV infections among younger adults, reduces the proportion of people living with HIV in the younger adult age groups [3]. Whether HIV incidence is also increasing among this age group requires additional research. A recent study from Zimbabwe found that more than half of the adults aged 50 years and older in the study had seroconverted after their 50th birthday [6]. Knowing how to target prevention programmes to this age group requires information on new infections, as well as behaviour, knowledge, and attitudes among people over 50 years of age.

Most HIV surveillance systems do not include people aged over 50. Data collection focused on pregnant women attending antenatal clinics, the general population (15–49 years) in household surveys, and surveys of higher-risk populations often excludes people aged 50 years and older [7–9]. Although an increasing number of household surveys have included HIV testing among older men and women in recent years, there is still a dearth of information to understand the HIV epidemic in this population. As a result, modelled estimates have become the primary source of data.

The aim of this study is to present the most recent 2013 UNAIDS estimates of HIV prevalence among people aged 50 years and older and to validate these estimates using data from national household surveys.

## Methods

### HIV estimates
UNAIDS and partners support countries to develop annual country-specific HIV estimates using the Spectrum suite of models. Spectrum estimates the demographic impact of HIV based on an HIV incidence curve derived from HIV prevalence using the Estimation and Projection Package (Brown et al., this supplement, http://links.lww.com/QAD/A581). Demographic data from the UN Population Divisions' World Population Prospects 2012 provide the underlying population data for the model.

The primary data entered by users into Spectrum include HIV prevalence among persons aged 15–49 years, the number of people receiving ART (separately for people under 15 years and people aged 15 years and older), pregnant women receiving antiretroviral medicines to prevent vertical transmission, and the population sizes of key populations at increased risk to HIV. The source of the prevalence data used in the models depends on the type of surveillance in the country. For generalized epidemics, surveillance data are collected in household surveys and from pregnant women attending antenatal clinics. For concentrated epidemics, the prevalence data are collected primarily from HIV surveillance of at-risk populations including sex workers, MSM, and injection drug users (IDUs).

HIV incidence among people aged 15–49 years is estimated from trend data of HIV prevalence among people aged 15–49 years. The number of people receiving ART and the resulting changes in survival are used in the calculation of the incidence trends from HIV-prevalence data. No data on prevalence among persons aged 50 years and older are entered into the model. Spectrum uses a set of predefined incidence rate ratios to estimate the incidence rate among persons aged 50 and older. The predefined incidence rate ratios are chosen by the user depending on the type of epidemic in the country (generalized, concentrated primarily in IDUs, concentrated with few IDUs). Users can modify the age and sex incidence rate ratios if more appropriate data for the country are available. In generalized epidemics, age-specific incidence rate ratios are based on data from demographic surveillance sites from Eastern and Southern Africa (Stover et al., this supplement, http://links.lww.com/QAD/A581). For concentrated epidemics, the incidence rate ratios were derived to match age-specific patterns of prevalence from Brazil, Columbia, and Mexico. For IDU-driven epidemics, the incidence rate ratios were derived from patterns from Russia. Supplementary Fig. 1a and b (http://links.lww.com/QAD/A581) presents the incidence rate ratios for men and women and by epidemic type.

The number of people living with HIV is calculated from the non-HIV population in the previous year, the HIV incidence rate, and the survival of people from the previous year. The number of people living with HIV surviving from previous years is estimated based on the number of people receiving ART and the survival time among those receiving and not receiving ART.

Estimates of HIV prevalence among people aged 50 years and older were extracted from national Spectrum files submitted to UNAIDS in 2014. Uncertainty around the number of people aged over 50 living with HIV are based on region-specific uncertainty estimates for the population aged 15 years and older calculated in Spectrum. Uncertainty bounds are shown as shaded areas in the figures and in parentheses in the text.

### Population-based surveys
Data were drawn from the Demographic and Health Survey (DHS) website (www.dhsprogram.com) and reports from nationally representative household surveys. Only nationally representative household surveys with HIV sero-prevalence testing and respondents aged 50 years and older were included in this analysis. The analysis was limited to surveys in which the number of

respondents tested for the age group was larger than 50 (see Supplementary Table 1, http://links.lww.com/ QAD/A581 for the numbers of respondents tested for HIV by age and sex within the surveys). The HIV-prevalence rate was calculated according to the 5-year age groups and by sex. Age and sex-specific prevalence data for Botswana and South Africa were drawn from their national survey reports from 2008 and 2013 for Botswana, and 2008 and 2012 for South Africa.

## Comparison of data

The comparison between the UNAIDS 2013 HIV estimates and survey data is calculated as the ratio of the modelled prevalence rate and the survey prevalence rate according to sex-specific 5-year age groups for the respective survey year. After obtaining the country-specific ratios, the median value of all countries with available data was computed and reported.
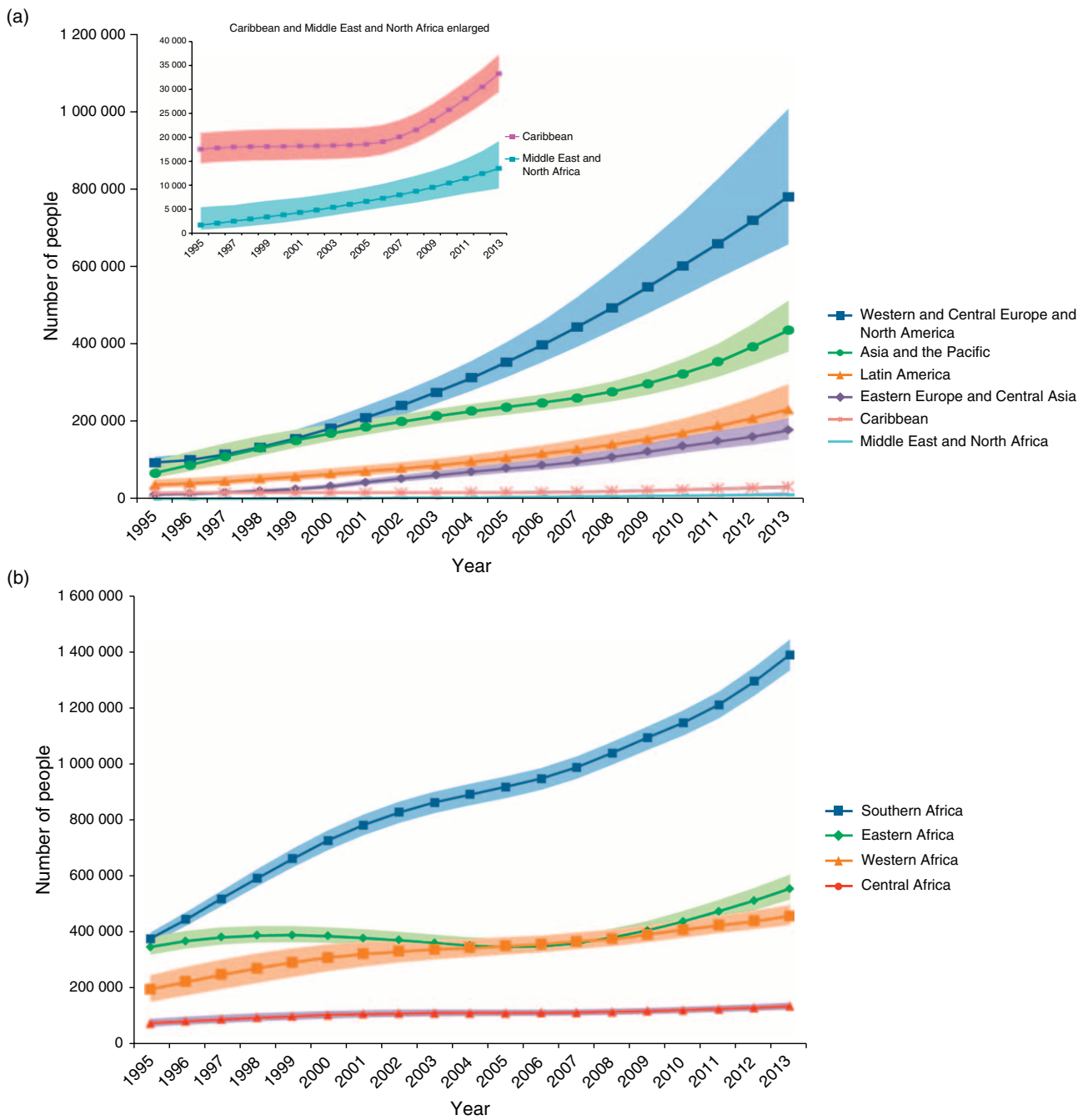


**Fig. 1. Estimated number of people living with HIV 50 years and over by region, 1995–2013.** (a) Trends by global regions; (b) trends by African regions.

# Results

## HIV burden among people aged 50 years and over

There was a steady increase in the number of people living with HIV aged 50 years and older between 1995 and 2013 (Fig. 1). Since 1995, this number has increased by more than two-fold globally. Current estimates suggest that in 2013, there were more than 4.2 million (4.0–4.5 million) people 50 years and older living with HIV. The highest burden [2.5 million (2.4–2.7 million)] of HIV among older adults was found in sub-Saharan Africa, whereas the smallest portion is represented by Middle East and North Africa [14 000 (9400–19 000)] and the Caribbean [33 000 (30 000–37 000)].

In Eastern Africa, there was an initial decline in the number of people living with HIV 50 years and older in the early 2000 and then a rise again around 2007. The decline is Likely due to people who were infected early in the epidemic (in the early 1990s), dying before ART became available. This pattern is not seen in other regions as the peak in new infections in other regions occurred in the late 1990s and were potentially able to receive ART. The pattern of an initial decline followed by a continued increase is observed in the entire age group 15 years and older and not just among adults aged 50 years and older.

Since 1995, the global HIV-prevalence rate among older people has increased steadily in all 5-year age groups over 50 years (Fig. 2). Among people aged 50–54 years, the prevalence rate doubled between 1995 and 2013,

reaching 0.51% (0.48–0.54) in 2013. Among people aged 55–59 and 60–64 years, the prevalence rate was 0.35% (0.33–0.37) and 0.23% (0.22–0.25) in 2013, respectively.

## Comparison of HIV-prevalence estimates and survey data

The ratio of the HIV-prevalence rate between the estimates and the survey data describe how well the two sources agree. Figure 3a and b depicts the ratios of sex-specific HIV-prevalence rates for persons aged 50 years and older for men and women using data from the most recent survey (for the comparison of all surveys, see Supplementary Table 2a, http://links.lww.com/QAD/A581). Among 50–54 year-old men the prevalence rates match fairly well: the median ratio was 0.90, suggesting that the modelled prevalence was 10% lower than the survey prevalence. Among 55–59 year-old men, the variation between the estimates and survey data was more apparent with a median ratio of 0.63. However, the small sample sizes among the age group 55–59 years make the comparison less robust. The comparison for the oldest age group of 60–64 years was hampered by surveys that present prevalence combined for people 60 years and older.

A limited number of countries collected HIV-prevalence data on women aged 50 years and older. For 50–54 and 55–59 year-old women, the average ratios of HIV-prevalence rates between the sources were 1.00 and 0.90, respectively. Country-specific data are displayed in Supplementary Table 2b (http://links.lww.com/QAD/A581).
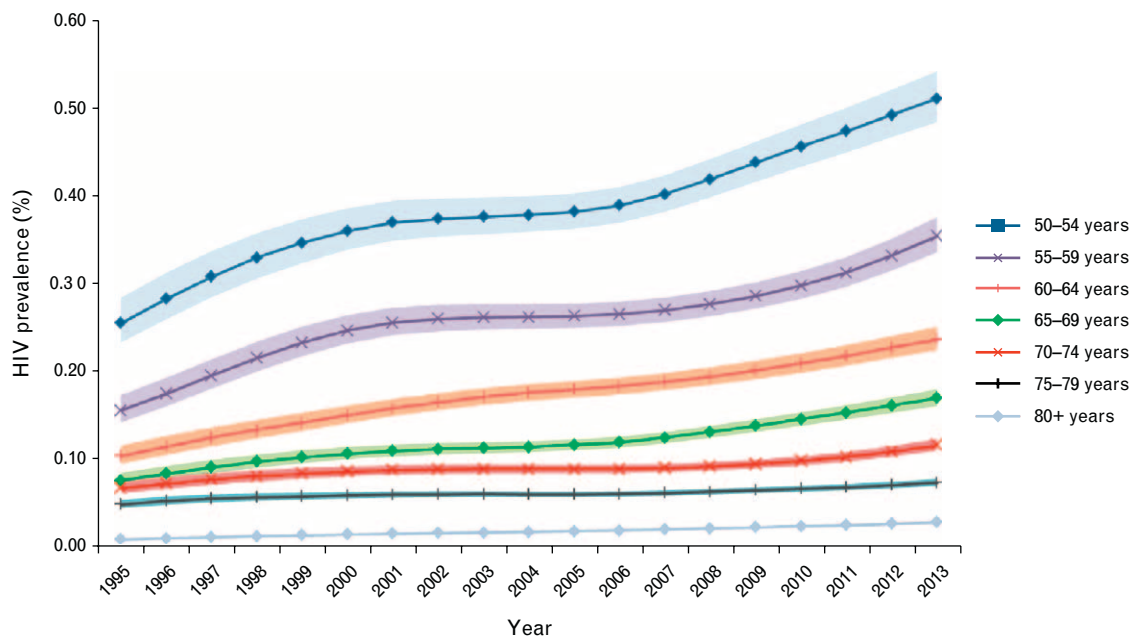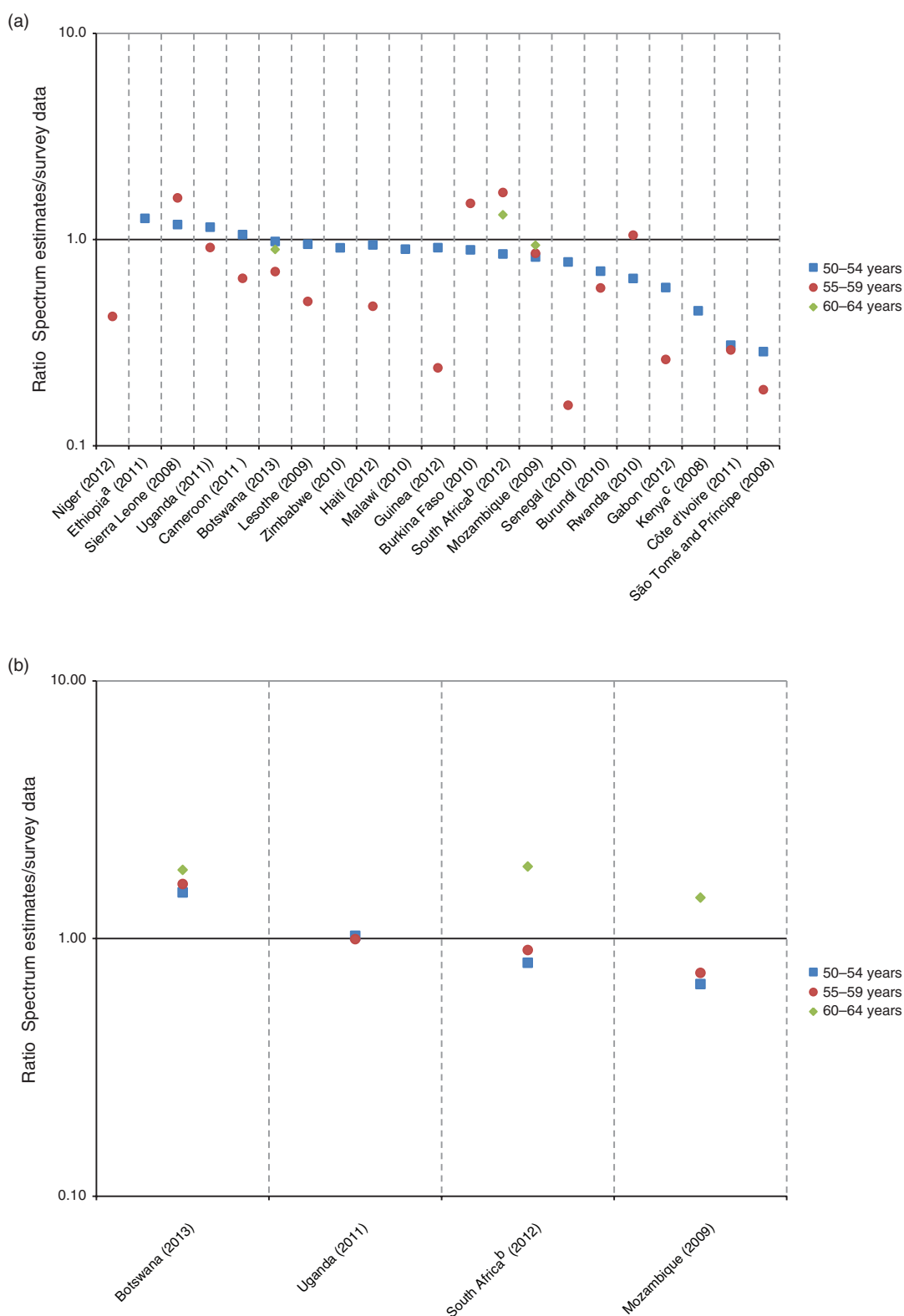


**Fig. 2.** Global estimates of HIV prevalence of people 50 years and over, by age categories, 1995–2013.

(a)



(b)



**Fig. 3. HIV prevalence ratios of Spectrum estimates with survey data among people aged 50 years and older.** (a) men (2008-2013); (b) women (2009-2013). [a] Outlier excluded for 55-59 year old men in Ethiopia (ratio was 23). [b] The 60-64 year category represents 60+ in the 2012 South African survey and in the estimates. [c] Age- and sex-disaggregated data were not available for the 2012 Kenya AIDS Indicator Survey at the time of publication.

UNAIDS estimates for women were generally closer to survey data than for men. When restricting the analysis to the four countries with data for women and men, the ratios were closer to parity for women than for men: 1.00 versus 0.85 for the age group 50–54 years, and 0.90 versus 0.87 for the age group 55–59 years.

Both sources show increases in HIV-prevalence rates among persons aged 50 years and older in the previous 10 years. The ratios of HIV prevalence were similar in the time period from 2003 to 2008 to the time period from 2009 to 2013 (see Supplementary Table 2a and b, http://links.lww.com/QAD/A581).

## Discussion

The number of people living with HIV aged 50 years and older is increasing. This trend is evident in the most recent UNAIDS estimates and is confirmed in the national household survey data. Globally, there are an estimated 4.2 million (4.0–4.5 million) people aged 50 years and older living with HIV, and this number has been steadily increasing since 1995. Comparing estimates with available survey data revealed a good approximation of HIV prevalence among women aged over 50 from household surveys, and a fairly good match with empirical survey data for men in the 50–54 year age group. However, for men in the 55–59 year age group, the estimates are significantly lower, suggesting that further investigation is warranted.

These results complement previous research which found the proportion of adults aged 50 years and older living with HIV is increasing around the world. For example, in 2001, approximately 17% of the people living with HIV in the United States were aged 50 years and older; in 2008, about 31% were aged 50 years or older [10]. The increase in recent years in estimated numbers of people 50 years and older living with HIV is also consistent with the overall trend in empirical observations from seven countries and data from a prospective study in South Africa [11]. The UNAIDS estimates are lower than the earlier estimates calculated by Negin and Cumming [3], according to which, in sub-Saharan Africa in 2007, there were approximately 3 million people aged 50 years and older living with HIV. The modelled estimates suggest there were 2.5 million in 2013 and 1.8 million in 2007.

The introduction of ART has a significant impact on survival. Data from high-income countries suggest that more than 50% of patients on ART can be expected to live beyond their sixties [11]. Studies of treatment outcomes among people over the age of 50 years in sub-Saharan Africa indicate that survival benefits are substantial, although somewhat smaller than that for younger people [12–14]. Whereas adherence tends to be better in this age group, people aged over 50 are slower to respond to treatment [15–17].

The estimates are slightly lower among older men than the survey results. This could be because assumptions in the models about survival in older men are too short or because the assumptions about new HIV infections among older men are too low. Data from household surveys suggest that people aged 50 years and older are less likely to have ever been tested for HIV than younger people aged 15–49 years [18,19]. Furthermore, older people are less likely to use condoms during the last intercourse than their younger counterparts [18], and women over the age of 50 are more vulnerable to HIV infection due to biological changes that accompany menopause [20]. More research into new infections among persons aged 50 years and older and survival among those people aged over 50 living with HIV is necessary to refine the assumptions in the models among older age groups.

The survey results once broken down by 5-year age groups are based on small sample sizes. Whereas some data are available for men aged 50–59 years, measures in populations over 60 years are sparse. There are very few studies incorporating HIV prevalence among women aged over 50 and it is not possible to make robust conclusions about the accuracy of estimates for older women.

In conclusion, a further increase in the relative importance of HIV infection among people aged over 50 is to be expected as ART continues to expand and people receiving ART in all age groups continue to increase. Services will need to expand to address the specific needs of people aged 50 years and older living with HIV, in managing their ART, as well as the comorbidities that are more frequent among people in this age group. Furthermore, efforts will need to be put in place to address the prevention needs of those over the age of 50 years who are not living with HIV, but are still sexually active. Finally, more effort should be made to collect data on older populations to understand the impact of HIV on these populations.

## Acknowledgements

### Conflicts of interest
There are no conflicts of interest.

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