SUBSTANTIVE REVIEW

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Unintended Pregnancy in Women Living with HIV in Sub-Saharan Africa: A Systematic Review and Meta-analysis

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Abstract

In 2014, about 1.5 million pregnancies occurred among HIV-positive women in low and middle-income countries. To pool magnitude and factors associated with unintended pregnancy in women living with HIV in sub-Saharan Africa, a systematic search of electronic databases was undertaken in November 2016. Pooling the magnitude of unintended pregnancy reported by 14 studies yielded a crude summary prevalence of 55.9%. The magnitude of unwanted pregnancy and mistimed pregnancy in six studies ranged from 14 to 59 and 9 to 47.2%, respectively. Contraceptive failure was an important factor for many unintended pregnancies. The magnitude of unintended pregnancy was significantly higher in HIV-positive women than for HIV-negative women in three out of six studies. The available evidence suggests that there is a high magnitude of unintended pregnancy in this population. Improving effective contraceptive utilization is thus a priority to address unintended pregnancies and to prevent mother to child transmission of HIV. PROSPERO Number: CRD42016051310.

Abbreviations

ANC	Antenatal care
ART	Antiretroviral therapy
AOR	Adjusted odds ratio
APR	Adjusted prevalence ratio
CI	Confidence interval
JBI	Johanna Briggs Institute
MeSH	Medical subject headings
OR	Odds ratio
PLHIV	People living with HIV
PMTCT	Prevention of mother to child transmission
WLHIV	Women living with HIV

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Introduction

HIV/AIDS is a global public health problem. In 2015, about 36.7 million people were living with HIV. Sub-Saharan Africa is disproportionally affected by HIV; in 2015, this region accounted for 69.4% of people living with HIV (PLHIV) globally [1]. About 1.5 million pregnancies occurred among HIV-positive women in low and middle income countries which was mainly in sub-Saharan Africa [2]. In 2014, an estimated 170,000 new HIV infections occurred among children [3] and 90% of new HIV infections in children were through perinatal transmission [4]. In many of these countries, women often learn of their HIV diagnosis and pregnancy at the same time [5], though, many women living with HIV (WLHIV) are choosing to have children following awareness of their HIV status [6].

Early in the HIV epidemic, WLHIV were discouraged from having children due to the risks associated with transmission of disease. The rights of WLHIV to make reproductive decisions have been violated [7, 8], with coerced sterilization being documented in South Africa, Namibia

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and Chile [9]. However, with improved health status and the prevention of mother to child transmission (PMTCT), there have been improvements in addressing WLHIV's reproductive rights [10, 11].

The PMTCT is a global public health agenda [3]. Though the prevention of unintended pregnancy is among the four key strategies of PMTCT, this strategy has not been effectively utilized in sub-Saharan Africa [12]. Attention is focused on antiretroviral (ARV)-mediated PMTCT among HIV-positive pregnant women [13]. However, studies estimate that prevention of unintended pregnancies is more effective and efficient than prevention during pregnancy [14, 15]. Unintended pregnancy in WLHIV is therefore an ongoing challenge to the elimination of mother to child transmission of HIV (MTCT) [16].

An unintended pregnancy is one that is either unwanted or mistimed. Unwanted pregnancy refers to cases where a woman does not want a child at all, while mistimed pregnancy refers to a woman becoming pregnant earlier than desired [17, 18]. Understanding the magnitude of unintended pregnancy is an important first step in the public health approach to prevent it. To date, only a handful of studies have assessed the prevalence of unintended pregnancy, and no systematic review has been carried out on WLHIV in sub-Saharan Africa.

In general, unintended pregnancy can result from unmet needs for contraception [19], contraceptive failure [20, 21], intimate partner violence [22] or sexual violence [22, 23]. WLHIV who have unmet needs are those who want to stop or delay childbearing but are not using any method of contraception [24]. Unintended pregnancies are associated with adverse outcomes such as abortion, stillbirths, low birth weight, and adverse social and health outcomes after birth [19, 25]. In WLHIV, there is additional risk of HIV transmission to the child [26]. Moreover, serodiscordant couples face hard choices concerning sexuality, parenthood desires and family life [27, 28]. In serodiscordant couples, an increase in HIV-1 risk during pregnancy [29] might override their intention to have a child [7, 30].

Although a systematic review by Barbara et al. indicated that fertility desire among HIV-positive women is lower than HIV-negative women [7], studies have indicated that antiretroviral therapy (ART) utilization increases fertility rates [31, 32]. Myer et al. documented that pregnancy incidence in ART users is about 74% higher than among women who have not yet started ART [32] which might be due to the improvement in quality of life and restoration of fertility in line with restoration of health [33].

Although the reproductive rights of WLHIV were neglected historically in many settings [9, 34], there has been shifts in perception and attitude around the reproductive rights of WLHIV [27]. It is important to not only prevent unintended pregnancy but also help these women

plan their pregnancies in line with their intentions. Qualitative studies reported unintended pregnancy in WLHIV [35, 36]. A qualitative study from South Africa found that timing and stigma strongly influenced disclosure of unintended pregnancy and/or HIV [35]. Another study from the same country demonstrated that personal, social, and relationship dynamics shaped planned versus unplanned pregnancies in WLHIV [37]. A further qualitative study from Uganda revealed a lack of control when making decisions were factors associated with unintended pregnancy [36]. Although fertility rates have been improving in WLHIV [31], the rate of unintended pregnancy in WLHIV have not been systematically reviewed.

Despite the fact that the majority of PLHIV in sub-Saharan Africa are women [4] with a high unmet need for family planning, no review has systematically examined how unintended pregnancy varies by HIV status, ART utilization, contraceptive use, age and gender. Therefore, the aim of the present study is to determine the magnitude of unintended pregnancies in WLHIV in sub-Saharan Africa and to summarise findings on factors associated with unintended pregnancies in these women.

Methods

Protocol and Registration

This systematic review conforms to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis guideline (PRISMA) [38] (Supplement S1). The systematic review protocol was registered with PROSPERO on November 15, 2016, Number CRD42016051310.

Eligibility Criteria

Studies reporting unintended pregnancy in WLHIV in sub-Saharan Africa were eligible. Articles published in English since 2005 were included, as this was the year when survival rates for HIV-positive people in sub-Saharan Africa started to improve due to increased ART accessibility [1, 39, 40]. In order to assess higher quality evidence, only cross-sectional and cohort studies were included, with case studies, qualitative studies, editorials, letters of correspondence, opinions and commentaries excluded from the review. Studies that focused on a subset of WLHIV such as those involving serodiscordant couples or contraceptive users only were deemed ineligible, as these were not representative of WLHIV and might bias the pooled magnitude of unintended pregnancy. Studies conducted solely among serodiscordant women were ineligible for pooling the magnitude of unintended pregnancy because the risk of infection to a partner [41] might override the intention to have a child [30]. Studies focused

on safer conception were not eligible for inclusion due to their focus on efficacy, effectiveness, safety, and acceptability of pre-exposure prophylaxis, limiting condomless sex to peak fertility, male circumcision, STI treatment, in vitro fertilization, sero-discordant relationship, semen processing.

Information Sources

The following electronic databases were searched: MEDLINE, PubMed, Embase, PsychINFO, Scopus and CINAHL, with additional articles searched in Google Scholar and the African Index Medicus through the World Health Organization database. Furthermore, bibliographies of selected articles were scanned for relevant studies. All searches were carried out by the first author (TRF) in November, 2016.

Search Strategy

For database searches, Medical Subject Headings (MeSH) terms were used to identify relevant articles. The first author (TRF) developed the search strategy which was then reviewed by MLH and DL. Finally, the search strategy was reviewed and modified with assistance from the Faculty of Health and Medicine Librarian. The search terms included ((("*Unintended Pregnancy*"[*All Fields*] *OR* "*Unwanted Pregnancy*"[*All Fields*]) *OR* "*unplanned Pregnancy*"[*All Fields*]) *OR* "*accidental Pregnancy*"[*All Fields*]) *AND* ("*HIV*"[*MeSH Terms*] *OR* "*HIV*"[*All Fields*]). These terms were used with some modification from one database to another.

For Ovid interface (MEDLINE, Embase and PSYCHINFO), we used a faceted search (Supplement S2). The search strategy for Medline was

1. pregnancy, unplanned/or pregnancy, unwanted/
2. ((unintended or unwanted or unplanned or "not planned" or un-planned) adj2 pregnan*).tw.
3. 1 or 2
4. exp HIV/
5. Antiretroviral Therapy, Highly Active/or antiretroviral therap*.mp.
6. Anti-retroviral agents/or HIV infections/
7. Anti-HIV agents/
8. 4 or 5 or 6 or 7
9. 3 and 8
10. limit 9 to yr = "2005 -current"

Selection and Data Collection Process

The literature search results were downloaded into END-NOTE X7 software (Thomson Reuters (Scientific) Inc., New York City, New York, USA). Duplicates were removed and screening was conducted by titles and abstracts (see Fig. 1).

Articles were screened based on the inclusion and exclusion criteria. Studies were assessed for eligibility, with screening of title and abstracts followed by retrieval and screening of full texts. If an abstract was eligible, the whole article was read. We developed a data extraction sheet by modifying the Johanna Briggs Institute (JBI) data extraction template. Two authors (TRF and ASM) extracted the data independently. Any disagreement was resolved through discussion between the reviewers. Where a consensus could not be reached between the two authors, a third reviewer (MLH) resolved these discrepancies by discussion. A summary of the included studies is shown in Table 1.

The data extraction sheet contains the name of the first author, year of publication, country of study, study design, study settings, participant characteristics, key findings, and limitations of the study (Supplement S3).
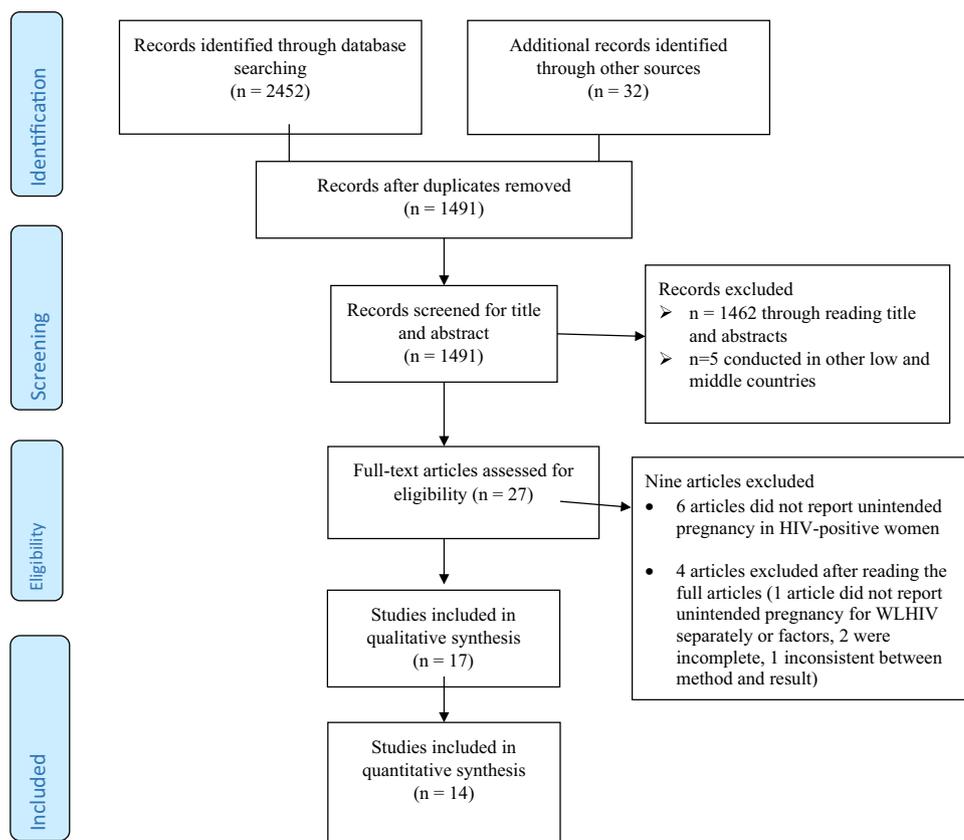
Risk of Bias in Individual Studies

Assessment of risk bias in the individual studies was conducted using the JBI Prevalence Critical Appraisal Tool designed for a systematic review of observational epidemiological studies reporting prevalence [42]. This tool assesses nine methodological criteria using Yes, No, and Unclear. To assess the risk of bias, two authors (TRF and ASM) rated each of the nine items according to the dichotomous ratings: Yes and No/Unclear, where a maximum value of 9 could be obtained. Studies with a higher score indicated lower risk of methodological bias. Study quality based on these scores were then categorized into low (1–3), medium (4–6) and high (7–9) (Supplement S4).

Data Synthesis

The prevalence estimate of unintended pregnancy in WLHIV was calculated by pooling the study specific estimates of unintended pregnancy using random effect meta-analysis that considered heterogeneity between studies. Due to data being collected from different settings and participants, it was not sufficiently homogeneous. The data were collected from antenatal care (ANC) clients, post-partum women, family planning units, and HIV clinics. Two studies were community-based surveys. The pooled estimates and the 95% confidence interval were conducted based on individual studies. Chi square (χ^2) tests and the I^2 statistic to assess in heterogeneity in between studies, $I^2 \geq 75\%$ indicating heterogeneity was used.

We then performed a sensitivity analysis to determine the effect of individual studies on the overall effect of the magnitude of unintended pregnancy by serially excluding each individual study. Finally, subgroup analyses were conducted to investigate the sources of heterogeneity (for quality of study, and participant type). OpenMeta Analyst software

Fig. 1 Selection process

Identification

Records identified through database searching
(n = 2452)

Additional records identified through other sources
(n = 32)

Records after duplicates removed
(n = 1491)

Screening

Records screened for title and abstract
(n = 1491)

Records excluded
➢ n = 1462 through reading title and abstracts
➢ n=5 conducted in other low and middle countries

Eligibility

Full-text articles assessed for eligibility (n = 27)

Nine articles excluded
• 6 articles did not report unintended pregnancy in HIV-positive women
• 4 articles excluded after reading the full articles (1 article did not report unintended pregnancy for WLHIV separately or factors, 2 were incomplete, 1 inconsistent between method and result)

Studies included in qualitative synthesis
(n = 17)

Included

Studies included in quantitative synthesis
(n = 14)

was used for all analyses. We reviewed mistimed versus unwanted pregnancy, age, HIV status and ART utilization, as well as gender, and contraception impact on unintended pregnancy.

Results

Study Characteristics

In total, 2484 articles were identified through the searching criteria and 2467 articles were excluded (n = 990 for being duplicates, n = 1467 through title and abstracts and n = 10 through reading full article). Seventeen studies (5253 participants) in 11 countries were included for qualitative data synthesis (see Fig. 1). Among the seventeen studies included, fourteen studies reported on the magnitude of unintended pregnancy in WLHIV. These studies were illustrated using forest plots. A further study reported on unwanted pregnancy only. This was retained for inclusion in the comparison of unwanted versus mistimed pregnancy. A further study reported only on factors associated with unintended pregnancy in WLHIV and another study focused on unintended pregnancy among HIV-positive adolescents. The included studies came from the Democratic Republic of the Congo (n = 1), Rwanda (n = 1), Swaziland (n = 1), Zimbabwe

(n = 1), Botswana (n = 1), Nigeria (n = 1), Kenya (n = 2), South Africa (n = 2), Malawi (n = 3) and Uganda (n = 3). A further study [43] was conducted in Nigeria and Zambia. Only two studies were population based [18, 43]. The studies involved various types of participants: pregnant (n = 3), post-natal (n = 6), both pregnant and post-natal (n = 1), HIV-positive women cohort study at health institutions (n = 2), retrospective information on most recent pregnancies (n = 4), and adolescents (aged 15–19 years) (n = 1) (see Table 1). Although we searched for studies published since 2005, all the publications were between 2010 and 2016. The studies covered a period between 2003 and 2014 with most data concentrated after 2010.

Unintended Pregnancy in Women Living with HIV

Fourteen studies selected for pooled prevalence of unintended pregnancy in WLHIV were geographically diverse (nine countries). The magnitude of unintended pregnancy ranged from 37.2 to 75% among WLHIV. The pooling of the magnitude of unintended pregnancy in WLHIV yielded 55.9% (2506/4662; 95% CI 50.2–61.6%) with significant evidence of heterogeneity (Q = 204.684, $\tau^2 = 0.011$, $I^2 = 93.65\%$, p < 0.001) (see Fig. 2). Sensitivity analysis noted that no individual study affected the pooled magnitude

Table 1 Characteristics of the eighteen studies selected for unintended pregnancy review in sub-Saharan Africa

Study details	Study methods	Participants	Key findings	Limitations of study
Author and Year: Akelo et al. (2013) [45] Country: Kenya Design: Cross sectional (baseline) Setting: ANC clinics of two hospitals	Recruitment period: Jul 2003–Nov 2006 Data collection: Interview Sampling methods: All potential participants	Total participants: 522 HIV +ve pregnant women Age: Med 23 years (15–43) Sample: 522 Type of respondents: -34 to 36 weeks of gestational age -HIV status is confirmed	Unintended pregnancy: 59% (45% mistimed vs. 14% unwanted)	-Recall bias -Social desirability bias
Author and Year: Bankole et al. (2014) [43] Country: Nigeria and Zambia Design: Cross-sectional Setting: Household survey in three provinces in Zambia and four States in Nigeria	Recruitment period: Nov 2009–May 2010 Data collection: Survey Sampling methods: Systematic sampling	Total participants: 2451 HIV +ve women and HIV-ve women Age: women 18–49 years and men 18–59 years Sample: 101 pregnant women Type of respondents: -71% in a union -HIV status-self report	-No difference between HIV positive and HIV negative in unintended pregnancy or abortion. -HIV-positive women were 3.2 (AOR) times HIV negative women to have been using a contraception at the time their unintended pregnancy was conceived	-Self reported bias -Abortion underreporting in face to face survey - Post pregnancy change in intention
Author and Year: Crede et al. (2012) [47] Country: South Africa Design: Cross-sectional (baseline) Setting: Four primary health care and one clinic	Recruitment time: Feb–May 2009 Data collection: Interview Sampling methods: Consecutive sampling	Total participants: 265 HIV-positive and 273 HIV-negative Age: Median 27 years (≥ 18 years) Sample: 265 Type of respondents: postpartum women who have infants less 6 than months and had ANC	Unintended pregnancy: 61.5% -63.2% pregnancies were unintended in HIV negative women	
Author and Year: Ezugwu et al. (2015) [44] Country: Nigeria Design: Cross sectional Setting: Two government tertiary hospitals	Recruitment period: March 1–Aug 31, 2012 Data collection: Interview Sampling methods: All prenatal care clients	Total participants: 180 pregnant women Age: 30.54 (20–40 years) Sample: 180 Type of respondents: -180 pregnant contacted at PMTCT unit -19.8% pregnant since aware of status	Unintended pregnancy: 37.2% -Married/cohabiting women had higher rate of unintended pregnancy (40.3% vs. 14.3%, P = 0.029) -Age, parity, educational level, and current ART use did not show any association	-Small sample size -Recruitment at prenatal clinics thus abortion was not captured - unwanted versus mistimed not determined
Author and Year: Gutin et al. (2014) [46] Country: Uganda Design: Cross-sectional Setting: family planning clinics of two Referral hospital	Recruitment period: Mar–Sep 2007 Data collection: Interview Sampling methods: Consecutive sampling	Total participants: 403 post-partum women Age: 27.3 years (18–49) Sample: 403 Type of respondents: -Postpartum women -4 to 12 weeks post-delivery seeking post-natal care unit of hospital	Unintended pregnancy: 45.4% (25.6% mistimed vs. 18.9% unwanted)	-Social desirability bias -Reporting bias - Self reported bias

Table 1 (continued)

Study details	Study methods	Participants	Key findings	Limitations of study
Author and Year: Haddad et al. (2015) [50] Country: Malawi Design: Cross sectional (baseline) Setting: Two family planning clinics	Recruitment period: Aug–Dec 2010 Data collection: Survey Sampling method: Convenience sampling	Total participants: 200 women Age: mean 32 (18–45 years) Sample: 200 Type of respondents -18 to 45 years of age, HIV + and on ART for at least 6 months -Those who desire to avoid pregnancy -Post-partum women	Unplanned pregnancy: 68.5% - Among all births, 15.7% women reported using contraception at the time of their last conception (45.2% condoms, 38.7% DMPA and 16.1% oral contraceptive pill). -Inconsistent condom use was main factor among contraceptive users	-Social desirability bias -Retrospective reporting bias -Recall bias
Author and Year: Kikuchi et al. (2011) [54] Country: Rwanda Design: Cross sectional Setting: Two health centres	Recruitment period: 25 July–17 Aug 2007 Data collection: Interview Sampling methods: Convenience sampling	Total participants: 567 HIV women under ART Age: median: 35.8 years (20–49) Sample: 132 pregnancies Type of respondents -All women screened, 132 pregnancies occurred after aware of HIV positive status -Not pregnant on interview date	Unintended pregnancy: 62.9% Factors: -2 or more children (AOR = 3.83; 95% CI 1.30–11.30) - Under ART years (AOR = 1.15; 95% CI 0.45–2.90) -Reasons: Unwillingness of partner to use condom (26.8%), desire to have a child by partner (17.1%), and condoms breakage (15.9%)	-Recall bias

Table 1 (continued)

Study details	Study methods	Participants	Key findings	Limitations of study
Author and Year: Mayondi et al. (2016) [51] Country: Botswana Design: Cross sectional (baseline) Setting: 28 ANC clinics and 5 maternity wards	Recruitment period: 2010–2012 Data collection: Interview Sampling methods: Not clear	Total participants: 475 HIV-uninfected and 474 HIV-infected Age: Median 27 years (18–49) Sample: 475 HIV-positive women Type of respondents -Antepartum 84.8% and within 7 days of delivery 15.2%. -HIV status was confirmed at enrolment	Unintended pregnancy among HIV positive women: 49.1% Unintended pregnancy among HIV negative women: 38(168/446) Factors significantly associated with unintended pregnancy -HIV-positive but not aware of HIV sero-status prior to becoming pregnant (AOR = 1.7; 95% CI 1.2–2.5) -Having 2 prior pregnancy (AOR = 1.56; 95% CI 1.04–2.34), 3 (AOR = 3.45; 95% CI 2.07–5.75), 4 or more (AOR = 4.76; 95% CI 2.62–8.65 (regardless of HIV status) -25 to 29 years (AOR = 0.62; 95% CI 0.41–0.94), 30 to 34 years (AOR = 0.57; 95% CI 0.31–1.06) Factors not significantly associated with unintended pregnancy ◆ Aware being HIV positive (AOR = 1.30; 95% CI 0.91–1.86) ◆ No association between knowing HIV status and contraceptive use prior to unintended pregnancy -Among the 416 (HIV positive women and HIV negative women) who reported that the current pregnancy was unintended, 64% using a contraception around the time of conception (contraceptive misuse/failure) of whom 81% were using male condoms, 13% were using oral contraceptives and 5% were using DMPA injectable	-Self reported HIV status -Unwanted and mistimed pregnancy was not identified -Social desirability bias

Table 1 (continued)

Study details	Study methods	Participants	Key findings	Limitations of study
Author and Year: McCoy et al. (2014) [18] Country: Zimbabwe Design: Community based cross sectional (National PMTCT) Setting: Catchment of 157 health facilities	Recruitment period: Apr-Sept 2012 Data collection: Interview Sampling methods: Random selection (two stage sampling)	Total participants: n = 8797 (n = 1059HIV +ve and 7738 HIV −ve) Age: Mean 26.7 years (≥16 years old) Sample: 1059 HIV-positive women Type of respondents -Self reported HIV status -9 to 18 months postpartum women -Mother infant pairs	Unintended pregnancy: 44.9% (9% mistimed vs. 35.9% unwanted) •Known HIV +ve (584), unintended 44.1% (9.4% mistimed vs. 34.8% unwanted) •HIV-positive but unware of status at conception (475), unintended 45.9% (8.4% mistimed vs 37.5% unwanted) •HIV negative (n = 7738), unintended 33.8% (9.2% mistimed, vs. 24.6% unwanted) -HIV infected were more likely to report unintended pregnancy compared to HIV negative (44.9% vs. 33.8%, p, 0.01), -47.5% of the unintended pregnancy was related to contraceptive failure/misuse (47% among HIV negative, 58% among HIV positive who were aware of their status, and 49% among HIV positive but unaware of their status) -Unintended birth and not using contraception prior to unintended pregnancy was not associated with HIV-positive women who aware of their status (APR = 0.87; 95% CI 0.73–1.04), HIV positive women but unaware of their status (APR = 0.97; 95% CI 0.82–1.15) compared to HIV negative/unknown	- Reporting and recall bias - Abortion and miscarriage to be missed -Not specifically designed method
Author and Year: Obare et al. (2012) [57] Country: Kenya Design: Cross sectional Setting: Four HIV clinics in four regions of Kenya	Recruitment period: 2008–2009 Data collection: Interview Sampling methods: Through HIV/AIDS programs	Total participants: 757 HIV-positive female adolescents Age: 15–19 years Sample: 394 HIV-positive women Type of respondents -394 of the girls had ever been pregnant -24% of them had multiple pregnancies	Unintended pregnancy: 73.9% Factors not significantly associated with unintended pregnancy -Higher parity (AOR = 1.2; 95% CI: 0.8–2.0) -Marital unions (AOR = 0.1; 95% CI: 0.1–0.2)	-Non-random selection - Under-reporting of pregnancies that resulted in abortion, stillbirths and early neonatal deaths

Table 1 (continued)

Study details	Study methods	Participants	Key findings	Limitations of study
Author and Year: O'shea et al. (2015) Country: Malawi Design: Cross sectional (baseline) Setting: Postpartum unit of one hospital	Recruitment period: May to Oct 2013 Data collection: Survey Sampling methods: All eligible HIV infected	Total participants: 210 HIV +ve and 424 HIV –ve (1:2 ratio) Age: 18–45 years Sample: 210 HIV-positive women Type of respondents: Postpartum women, live birth at ≥28 weeks gestational age within the past 4 weeks	Unintended pregnancy: 49% -HIV-positive women were more likely to report unintended pregnancy (49% vs. 37%, p=0.004) and using contraception at the time of conception (30% vs. 20%, p=0.005). -Among this, HIV-positive women vs. HIV-negative women using condoms (63% vs. 34%, p<0.001)	-Only women who had cell phone were included -Self reporting bias -Social desirability bias -Recall bias -Sampling bias
Author and Year: O'shea et al. (2016) [6] Country: Malawi Design: Cross-sectional Setting: ANC clinic of one hospital	Recruitment period: March–July 2014 Data collection: Interview Sampling methods: Convenience sampling	Total participants: 220 women Age: 18–45 years Sample: 220 HIV-positive women Type of respondents: HIV-positive women on ART for at least 6 months prior to the current pregnancy	Unintended pregnancy: 75% (16% mistimed: vs. 59% unwanted) - Women on ART for longer than 2 years were more likely to report unintended pregnancy (79% vs. 65%, p=0.03) by χ^2 -173(79%) of women were using FP at the time of conception (91% condoms, 9% injectables and 9% implant). -Partner pregnancy intendedness was 51% (13% mistimed vs. 38% unwanted). Factors not significantly associated with mistimed pregnancy -Age (AOR = 1.0; 95% CI 0.93–1.07) -Number of living children (APR = 1.26; 95% CI 0.98–1.93) -On ART for greater than 2 years (APR = 1.07; 95% CI 0.60–1.91) Factors significantly associated with unwanted pregnancy -Number of living children (APR = 1.18; 95% CI 1.09, 1.28) Factors not significantly associated with unwanted pregnancy -Age (APR = 1.01; 95% CI 0.99–1.04) -On ART for greater than 2 years (APR = 1.08; 95% CI 0.85, 1.37)	- Current health status was not collected

Table 1 (continued)

Study details	Study methods	Participants	Key findings	Limitations of study
Author and Year: Schwartz et al. (2012) [55] Country: South Africa Design: Prospective cohort study Setting: Two ART initiation sites and two ART down-referral sites	Follow up period: Aug 2009–March 2011 Data collection: Interview Sampling methods: not clear	Total participants: 850 Age: 30 (18–35 years) Sample: 170 pregnancies in HIV-positive women Type of respondents -170 pregnancies among 850 women at ART clinic - Not pregnant, had not delivered within the 3 months prior, not breast-feeding, on ART or being initiated into ART, sexually active in the past 12 months	Unintended pregnancy: 61.8% (IR: 16.1/100 PY [95% CI 13.2–19.7) -By two years on ART, 25% of women had at least one unintended pregnancy and increased to 35% by three years on ART -Women with a baseline unmet need for reliable contraception had a higher incidence of unintended pregnancy (log-rank p, 0.01) - When considering time-varying contraceptive use and incidence of unplanned pregnancy, women reporting condom use alone to prevent pregnancy had similar cumulative incidence rates of unplanned pregnancies to women reporting no reliable method use	- Selection bias
Author and Year: Wanyenze et al. (2011) [53] Country: Uganda Design: Cross sectional Setting: 12 HIV clinics	Recruitment period: July–Oct 2009 Data collection: Interview Sampling method: systematic sampling	Total participants: 1100 HIV infected (441 men and 659 women) Age: 15–49 years Sample: 216 HIV-positive women Type of respondents: attended the health facility for at least 6 months -216 pregnant women, 123 of the men reported their partner being pregnant since their HIV diagnoses	Unintended pregnancy: 52.8% - 26% of men reported unintended pregnancy	-PLHIV who had been in HIV care for at least six months.
Author and Year: Wanyenze et al. (2015) [52] Country: Uganda Design: Cross sectional Setting: Two clinics with different model of FP	Recruitment period: Feb–Jun 2011 Data collection: Interview Sampling method: Systematic sampling	Total participants: 797 HIV-infected men and women Age: ≥ 18 years Sample: 224 HIV-positive women Type of respondents: individuals who were ≥ 18 years -Attended clinic for at least 6 months	Unintended pregnancy: 47.8% (17.4% mistimed vs. 30.35% unwanted) -Unintended pregnancy among HIV-positive men was 26.4% (24/91)	- The potential impact of provider stigma and judgmental attitudes on unmet need for family planning was not assessed

Table 1 (continued)

Study details	Study methods	Participants	Key findings	Limitations of study
Author and Year: Warren et al. (2013) [49] Country: Swaziland Design: Cross sectional (baseline for cohort) Setting: Post-natal unit of four multi country study	Recruitment period: Feb–Aug 2010 Data collection: Interview Sampling methods: Consecutive sampling	Total participants: 386 HIV-positive women and 483 HIV-negative women Age: 18–45 years Sample: 386 HIV-positive women Type of respondents - Samples of women who were at least 18 years old, lived in the facility's catchment area, had given birth within the previous 10 weeks and were receiving postnatal care	Unintended pregnancy: 67.9% (47.2% mistimed vs. 20.7% unwanted) Factors for unintended pregnancy - Being HIV-positive (AOR = 0.96; 95% CI 0.70–1.32) -Younger age among both HIV positive and HIV negative (AOR = 1.23; 95% CI 1.02–1.47) Factors for unwanted pregnancy -20.7% among HIV-positive women versus 13.5% among HIV negative women (p = 0.004) when adjusted (AOR = 1.43; 95% CI 0.92–1.91) -Used family planning when recent pregnancy unwanted between HIV positive and HIV negative (62.5% vs. 47.7%, p value = 0.074); injectables only 26.0% vs. 29.0%; male condoms only 68.0% vs. 32.3% Factors for mistimed pregnancy -Younger women (AOR = 0.30; 95% CI 0.11–1.91) - Used family when recent pregnancy mistimed between HIV positive and HIV negative (45.1% vs. 36.9%, p value = 0.08); injectables only 35.4% vs. 34.7%; male condoms only, 51.2% vs. 41.5%	-Post-partum women at PNC is not representative of women in general community -Self-reported

Table 1 (continued)

Study details	Study methods	Participants	Key findings	Limitations of study
Author and Year: Yotebieng et al. (2015) [56] Country: DR Congo Design: Cohort study Setting: One health centre	Recruitment period: Nov 2011 to May 2012 Follow-up period: Nov 2011 to June 2013 Data collection: Interview Sampling methods: women attending routine care	Total participants: 699 HIV-infected women Age: Median 33 Sample: 96 pregnancies in HIV-positive women Type of respondents -699 HIV infected, 96 became pregnant	Unwanted pregnancy: 22% Factors significantly associated with unwanted pregnancy -Every ten years increase in age (adjusted rate ratio (ARR)=0.29; 95% CI 0.10–0.85) Factors not significantly associated with unwanted pregnancy -Time since enrolment (ARR=1.02; 95% CI 0.99–1.05) - Number of live children (ARR=1.02; 95% CI 0.72–1.45) -A third of unwanted pregnancies occurred in women who were using injectables (missed an injection) or condoms (may have experienced a condom break)	-Inability to capture in change in fertility intention -Only pregnancies known to health care professionals were included

of unintended pregnancy in WLHIV by more than 1.5% (Supplement S5).

We carried out subgroup analyses of unintended pregnancy in WLHIV by the methodological quality of the studies. The pooled prevalence of unintended pregnancy among HIV-positive women was 56.1% (664/1361; 95% CI 42.7–69.6%) (Q = 29.64, I^2 = 93.25%, P < 0.001) for high quality, 53.8% (1542/2836; 95% CI 46.4–61.2%) (Q = 133.8 I^2 = 94.02%, P < 0.001) for medium quality and 64.9% (300/465; 95% CI 58.0–71.7%) (Q = 2.48, I^2 = 59.64%, P = 0.115) for low quality studies (Supplement S6).

We also carried out subgroup analyses by participant type. The prevalence was 57.2% (540/922; 95% CI 38.1–75.7%) (Q = 66.47, I^2 = 96.99%, P < 0.001) among HIV-positive pregnant women and 56.1% (1324/2523; 95% CI 46.8–65.5%) (Q = 107.97, I^2 = 95.37%, P < 0.001) among postpartum HIV-positive women. The pooled prevalence of unintended pregnancy was 61.8% (105/170; 95% CI 54.5–69.1%) among the WLHIV whose pregnancy intention was evaluated before pregnancy. The prevalence of unintended pregnancy was 54.1% (304/572; 95% CI 46–65.2%) (Q = 7.960, I^2 = 74.87%, P < 0.019) among HIV-positive women who were assessed for the most recent pregnancy (see Fig. 3).

Because the studies were heterogeneous (Higgin's I^2 showed 93.65%), it is important to describe each one. For three studies involving HIV-positive pregnant women, the prevalence of unintended pregnancy ranged from 37.2 to 75%. All the studies involving HIV-positive pregnant women were cross-sectional in nature. A study from Nigeria among 180 HIV-positive pregnant women (19.85% being aware of HIV status before the pregnancy) showed 37.2% (67/180) of the pregnancies were unintended [44]. Similarly, a baseline study in Kenya among HIV-positive pregnant women [45] indicated that 59% (308/522) of pregnancies were unintended. The highest magnitude of unintended pregnancy in this population (75% (165/220)) was reported in Malawi, which involved HIV-positive pregnant women attending ANC who initiated ART at least six months prior to their current pregnancy [6].

A further six studies assessed the magnitude of unintended pregnancy among HIV-positive postpartum women across five countries, all of which were cross-sectional studies. The prevalence of unintended pregnancy in these studies ranged between 44.9 and 68.5%. A baseline survey among HIV-positive mothers in Zimbabwe [18] indicated that 44.9% (476/1059) of pregnancies were unintended. Further, a Ugandan study among HIV-positive postpartum women who gave birth in the previous 4 weeks noted that 45.4% (183/403) of pregnancies were unintended [46]. Another study assessing knowledge and use of long acting reversible contraception among HIV-positive and HIV-negative women in South Africa [47] indicated that
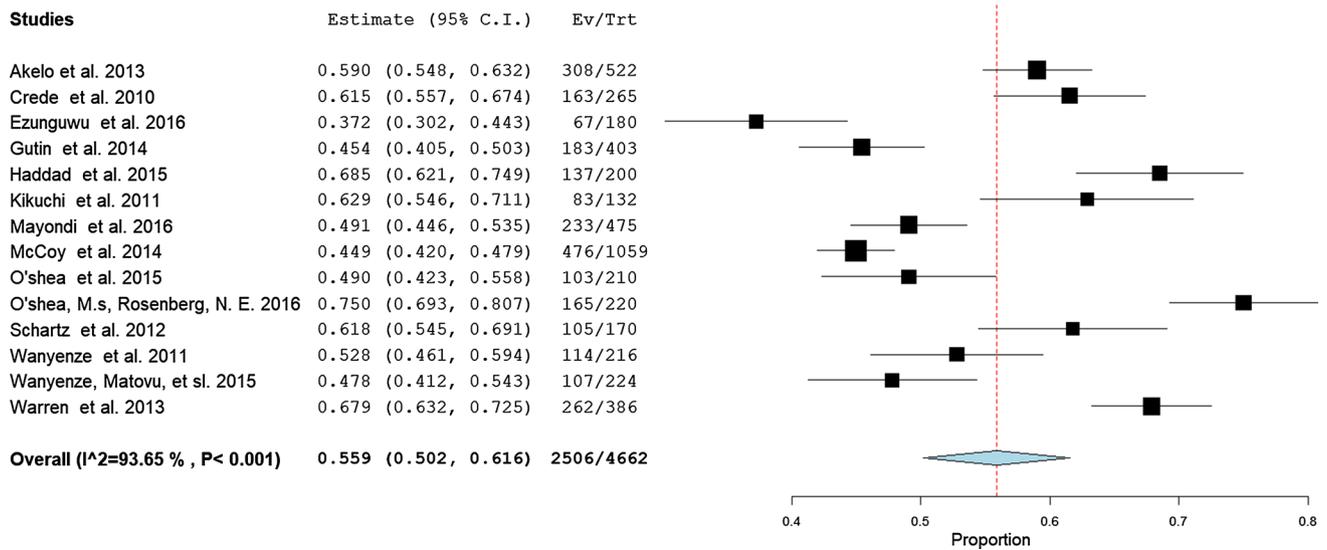
Fig. 2 Pooled estimate of unintended pregnancy in women living with HIV in sub-Saharan Africa
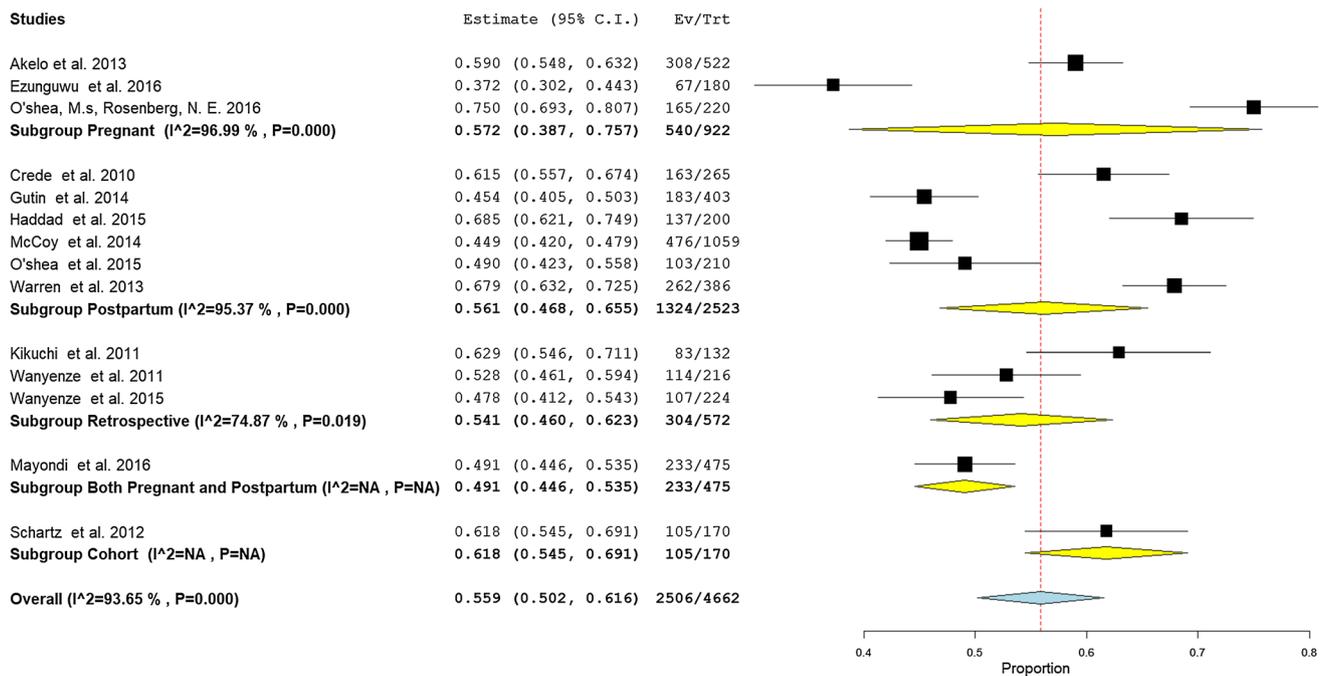

Fig. 3 Subgroup analysis of unintended pregnancy in women living with HIV by participant type

61.5% (163/265) of recent pregnancies in HIV-positive women were unintended. The magnitude of unintended pregnancy among HIV-positive postpartum women was 49% (103/210) in Malawi [48] and 67.9% (262/386) in Swaziland [49]. Finally, a baseline study concerning family planning in Malawi indicated that among HIV-positive post-partum women [50] who intended to use an Intrauterine Contraceptive Device, 68.5% (137/200) of pregnancies were unintended.

A study in Botswana involving both HIV-positive pregnant (84.8%) and postpartum women indicated that 49.1% (233/475) of pregnancies were unintended [51]. Furthermore, four cross-sectional studies measured the magnitude of unintended pregnancy for the most recent pregnancy (including a current pregnant). The magnitude of unintended pregnancy ranged between 47.8 and 62.9%. A study from Nigeria and Zambia indicated included outcomes such as abortion, but not included the magnitude of unintended

pregnancy [43]. Nevertheless, a study from Uganda [52] indicated that among 512 HIV-positive women, 224 pregnancies occurred after HIV diagnosis. Of these, 47.8% (107/224) were unintended. A Ugandan study [53] also indicated that among 659 HIV-positive women, 216 pregnancies had occurred since HIV diagnosis, 52.8% (114/216) of these pregnancies were unintended. Another study in Rwanda [54] noted the magnitude of unintended pregnancies among HIV-positive women who became pregnant after becoming aware of their HIV status indicated that 62.9% (83/132) of the pregnancies were unintended.

Finally, two studies were prospective cohort studies. A prospective cohort of women on ART in South Africa [55] indicated that 170 pregnancies occurred, 61.8% of which were unintended. This is the most reliable source of information on the magnitude of unintended pregnancy for women who were on ART. A cohort study among HIV-positive women in the Democratic Republic of the Congo [56] also indicated that among 699 WLHIV, 96 pregnancies occurred; 22% of the pregnancies were unwanted. One additional study in Kenya [57] noted that 73.9% of pregnancies among HIV-positive adolescents were unintended.

Mistimed Versus Unwanted Pregnancy in Women Living with HIV

Mistimed and unwanted pregnancies were reported separately in six studies. A further study [56] reported unwanted pregnancy in WLHIV as the sole outcome. In three studies [6, 18, 52], the magnitude of unwanted pregnancy was higher than the magnitude of mistimed pregnancy. The magnitude of unwanted pregnancy in WLHIV ranged from 14%

[45] to 59% [6] while mistimed pregnancy ranged from 9.9% [18] to 47.2% [49].

The pooled prevalence of unwanted pregnancy in WLHIV was 29.5% (829/2811) (95% CI 27.8–31.2%) while the pooled prevalence of mistimed pregnancy in WLHIV was 25.6% (689/2715) (95% CI 24–27.8%) (see Fig. 4). The highest difference between mistimed and unwanted pregnancy in WLHIV was reported in Malawi (16% vs. 59%) [6].

Contraceptive Failure as a Factor for Unintended Pregnancy

Ten studies assessed contraceptive use in relation to unintended pregnancy in WLHIV. Four studies compared the effect of contraception use between HIV-positive and HIV-negative women. In all of the studies, contraceptive failure was higher among HIV-positive women compared to HIV-negative women, though the difference was not significant in some of the studies. A study in Nigeria and Zambia indicated that HIV-positive women were 3.2 more likely than HIV-negative women to use contraception at the time of conceiving an unintended pregnancy [43]. In Malawi, HIV-infected women were more likely than HIV uninfected women to have been using contraception at the time of conception (30% vs. 20%, p = 0.005). At conception, the percentage of condom use was 63% for HIV-positive women compared to 34% for HIV-negative women (p < 0.001) [48].

In contrast, a study in Swaziland indicated that the difference in the use of contraception when a recent pregnancy was unwanted between HIV-positive and HIV-negative women was not significant (62.5% vs. 47.7%, p value = 0.074) [49]. Another study from Zimbabwe indicated

Fig. 4 Prevalence of mistimed versus unwanted pregnancy in women living with HIV in sub-Saharan Africa
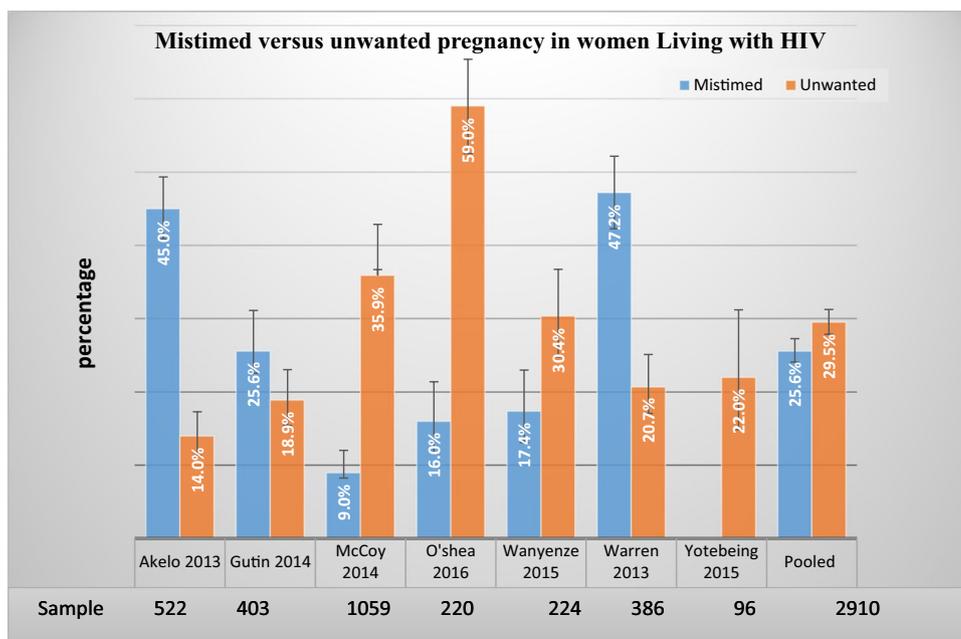
that not using contraception during conception was not significantly associated with being HIV positive (AOR = 0.87; 95% CI 0.73–1.04) [18]. Contraceptive failure among all unintended pregnancies was 47.5% (47% among HIV-negative women, 58% among HIV-positive women, and 49% among HIV-positive women who were unaware of their status before conception) [18].

In six studies, contraceptive failure was assessed among WLHIV. In Malawi, 15.7% of all births were related to contraceptive failure (45.2% condoms, 38.7% the Depot Medroxyprogesterone Acetate injectables, and 16.1% pills). Inconsistent condom use was identified as a main factor for contraceptive failure [50]. In another study from the same country, it was found that 79% of HIV-positive pregnant women on ART for 6 months were using contraception at the time of conception (condoms, 91%) [6]. Similarly, in the Democratic Republic of the Congo a third of unwanted pregnancies were related to condoms (condoms tearing) and injectable failure/misuse (late or missed shots) [56]. The unwillingness of a partner to use condoms (26.8%) and condom breakage (15.9%) were stated as the main reasons for unintended pregnancy in Rwanda [54].

A study from Botswana among postpartum women indicated that there was no association between contraception use before pregnancy and awareness of HIV status. However, among the 416 HIV-positive and HIV-negative women who reported that their current pregnancy was unintended, 268 (64%) used contraception around the time of conception. Of the women who experienced possible contraceptive failure, condoms accounted for 81%, oral contraceptives for 13%, and the Depot Medroxyprogesterone Acetate injectable for 5% [51].

A South African cohort study noted that WLHIV who had an unmet need for reliable contraception at baseline had a higher incidence of unplanned pregnancy compared to women who reported using a more effective contraceptive (i.e. hormonal contraception, consistent condom use, or both) (log-rank p, 0.01) [55].

Unintended Pregnancy in HIV-Positive Versus HIV-Negative Women

Six studies compared the magnitude of unintended pregnancy between HIV-positive and HIV-negative women. In three studies, the magnitude of unintended pregnancy was significantly higher among HIV-positive women compared to HIV-negative women. However, in three studies there was no significant difference.

A study in Botswana indicated that women who were HIV-positive but were not aware of their HIV serostatus prior to conception were more likely to report their pregnancy as unintended (adjusted odds ratio (AOR) = 1.7; 95% CI 1.2–2.5) compared to women who knew that they were HIV-negative [51]. However, awareness of HIV-positive status prior to conception was not significantly associated with unintended pregnancy (AOR = 1.30; 95% CI 0.91–1.86) [51]. A study in Zimbabwe indicated that the proportion of unintended births between those women who were aware of their HIV-positive status before pregnancy and became aware after falling pregnant showed little difference. This study indicated that HIV-infected women were more likely to report unintended pregnancy compared to HIV negative women (44.9% vs. 33.8%, p 0.01) [18]. Another study among postpartum women in Malawi indicated that HIV-positive women were more likely to report unintended pregnancy compared to HIV-negative women (49% vs. 37%, p = 0.004) [48].

However, a study in Swaziland showed no differences between HIV-positive and HIV-negative post-partum women in their most recent unintended pregnancy (OR = 0.96; 95% CI 0.70–1.32) [49]. A study from South Africa among postpartum women also indicated that there was no difference in the magnitude of unintended pregnancy between HIV-positive and HIV-negative women (61.6% vs. 63.2%) [47]. A Zambian and Nigerian household-based survey indicated that there was no difference by HIV status in the odds of unintended pregnancy and abortion [43].

Unintended Pregnancy by ART Status

Five studies assessed the relationship between ART utilization and unintended pregnancy. In two studies, in bivariate analysis, WLHIV on ART for more than 2 years were more likely to report unintended pregnancy compared to women on ART for shorter period. A study carried out in Malawi noted that women who were on ART for two or more years were more likely than those who had been on ART for less than 2 years to report an unintended pregnancy (79% vs. 65%; p = 0.03) [6], although this figure was not significant at a multivariate level. The same trend was noted by a prospective cohort study in South Africa, which showed that 25% of women who were on ART had at least one unplanned pregnancy within 2 years, and 35% within 3 years of use [55]. In studies from Nigeria [44], Rwanda [54] and the Democratic Republic of the Congo [56]; however, current ART use had no significant association with unintended pregnancy.

Impact of Parity on Unintended Pregnancy in Women Living with HIV

Six studies assessed the effect of parity on unintended pregnancies in WLHIV. In three studies, the magnitude of unintended pregnancies was higher among WLHIV with higher order births. In Rwanda, having two or more children was associated with a four-fold increase (AOR = 3.83; 95% CI 1.3–11.3) in experiencing an unintended pregnancy [54].

This is consistent with a study from Botswana among HIV-positive men and women in which having two (AOR = 1.56; 95% CI 1.04–2.34), three (AOR = 3.45; 95% CI 2.07–5.75), and four or more (AOR = 4.76; 95% CI 2.62–8.65) prior pregnancies were significantly associated with unintended pregnancy [51]. In Malawi, the odds of an unwanted pregnancy was higher with increased number of living children (Adjusted PR for unwanted vs. intended pregnancy (PR = 1.18; 95% CI 1.09–1.28), but not significant for mistimed pregnancy [6].

Despite this, two studies conducted in Kenya (AOR = 1.2; 95% CI 0.8–2.0) [57] and Nigeria [44] found no significant association between higher order pregnancies and the unintended pregnancy in WLHIV. In addition, a study from the Democratic Republic of the Congo indicated that parity had no association with the rate of unwanted pregnancy (AOR = 1.02; 95% CI 0.72–1.45) [56].

Age and Gender as Factors for Unintended Pregnancy in Women Living with HIV

The effect of age on unintended pregnancy was assessed in four studies. The magnitude of unintended pregnancy in Kenya among HIV-positive female adolescents (aged 15–19 years) was 73.9% [57]. A study among postpartum women (aged 18–45 years) in Swaziland found that younger women (HIV-positive and HIV-negative) were more likely to have an unintended pregnancy (AOR = 1.23; 95% CI 1.02–1.47) [49] compared older aged women. A study from Botswana indicated that WLHIV aged 25–29 years (AOR = 0.62; 95% CI 0.41–0.94) were less likely to have an unintended pregnancy compared to WLHIV aged 18–24 years [51]. However, a study from the Democratic Republic of the Congo indicated that younger HIV-positive women were less likely to report unwanted pregnancies compared to older HIV-positive women (adjusted rate ratio = 0.29; 95% CI 0.10–0.85) [56]. On the other hand, a study in Nigeria (20–40 years) [44] found that age was not significantly associated with unintended pregnancies.

A few of the studies assessed unintended pregnancy among HIV-positive men and HIV-positive women. Unintended pregnancy among HIV-positive men mean pregnancies conceived by men participants, that they considered unintended. In terms of the relationship between gender and unintended pregnancy in WLHIV, men reported lower unintended pregnancy in all three of the included studies. The magnitude of unintended pregnancy was 51% among HIV-positive men and 75% HIV-positive women in Malawi [6]. In a Ugandan study, the reported magnitude of unintended pregnancy was 26% in HIV-positive men and 53% in HIV-positive women [53]. Another cross-sectional study from the same country examining unintended pregnancy since HIV diagnosis showed HIV-positive women were more

likely to report unintended pregnancy than HIV-positive men (47.75% vs. 26.4%, p value ≤ 0.0001) [52].

Discussion

This review is the first to examine unintended pregnancy among WLHIV. More than half of women in this position reported an unintended pregnancy, which is of concern, considering the vital role contraception plays in the provision of appropriate therapy for preventing vertical HIV transmission, and other adverse effects on maternal and child health. While there was considerable variability, a few studies (coming largely from health institutions) indicated that about a third of the pregnancies were reported as unwanted and a quarter were mistimed. All of the included studies were conducted in countries with restrictive abortion laws, with the exception of South Africa [58]. Given 15% of all pregnancies end in abortion in the general population in Africa [59] and 38% of unplanned pregnancies in WLHIV end in abortion and stillbirth in South Africa [55], this estimation based on HIV-positive women at postpartum, ANC, family planning or HIV clinics may underestimate the magnitude of unintended pregnancies. Enhancing true family planning offers an excellent opportunity to reduce unintended pregnancy and improve safer conception in this population.

Importantly, there are considerable evidence that women learn of their HIV status at the time of pregnancy [35, 60, 61]. This may have complicated the interpretation of the data. A study from South Africa demonstrated that the timing and stigma strongly influenced double-disclosure of pregnancy and HIV [35]. However, with improved health prospects, WLHIV are also choosing to become pregnant following a HIV diagnosis [62]. When interpreting the pooled magnitude of unintended pregnancy in WLHIV, it is also important to recognize that the data synthesized in this review were derived from cross-sectional studies with the exception of one study in South Africa, which evaluated pregnancy planning before conception [55]. All others were retrospective evaluations of pregnancy intendedness that might introduce reporting bias for unintended pregnancy measurement. Moreover, reporting of unintended pregnancy in WLHIV may be influenced by the stigma towards WLHIV planning children post-diagnosis [63], with these women less likely to acknowledge an intentional pregnancy. Whereas, infertile women, a woman with no child face severe social stigma and marital strain [64]. While post hoc questions about pregnancy plans may be a factor associated with under-reporting of unintended pregnancy, recent diagnosis of HIV and stigma towards PLHIV having children favour over-reporting of unintended pregnancy in WLHIV.

The pooled prevalence of unintended pregnancy was more than half for each participant type: HIV-positive pregnant

women, HIV-positive postpartum women, and HIV-positive women who were followed before conception. Though the progress associated with the elimination of MTCT may have reduced the stigma and many WLHIV are considering safer conception, the review could not show a clear difference over time. Recently, many WLHIV choose to have children, which may be a result of improvements in HIV care including progress with elimination of MTCT though WLHIV's reproductive rights were neglected in many settings in the early HIV era. Taken together, this systematic review indicates that either mistimed or unwanted pregnancy still poses a challenge to the elimination of MTCT and one of the urgent need for prevention. While more than a half the pregnancies were unintended, the remaining were intended (ranged from 25 to 62.8%), true family planning involves not only providing contraception to those who do not wish to become pregnant but to support women who do wish to conceive to ensure that the health of the woman and the child are the priorities [25].

Although unintended pregnancies in WLHIV have been partially driven by an unmet need for contraception, contraceptive failure contributes to a portion of unintended pregnancies. Relying only on condoms [51], missing pills and overdue injections [6] and the potential interaction with ART raises a concern for reduced effectiveness [43] which may have contributed to many unintended pregnancies, although the evidence for reduced effectiveness due to hormonal contraceptive use is mixed. A systematic review has shown the interaction between efavirenz-based ART drugs and hormonal contraception diminishes the effectiveness of hormonal contraception thereby increasing the risk of unintended pregnancies [65]. A study from South Africa indicated that the failure rate of injectable users under typical use conditions was 4.4% compared to 19.3% among pill users and 19.7% among condoms users [66]. Therefore, the use of effective contraception, especially those that are less susceptible to user error (e.g. implants and IUDs) are key to the reduction of unwanted pregnancies. Although this review did not focus on method failure, policies have to consider these gaps because poor knowledge regarding long acting reversible contraception is more likely to contribute to the low uptake of the reversible contraceptive methods [47].

Health system limitations such as lack of healthcare providers to provide contraception, lack of fit between available and preferred methods, a climate of fear surrounding the methods, provider refusal to offer contraception [67], and concerns regarding drug–drug interactions [65] have been found to be associated with low contraceptive uptake. Reliance on condoms (failure rate is 18% in a typical use) has also been observed which was due to fear of reinfection over fear risk of pregnancy though implants and IUD are more effective (failure rate is less than 1%) [68]. PLHIV were more likely to report condom utilization; however, this has been due to social desirability bias [69]. In order to prevent mother to child transmission of HIV, there has been sterilization of WLHIV in many settings [8]. Given the history of coerced sterilization early in the HIV epidemic reported in South Africa, Namibia and Chile [9] and the rights of WLHIV to make reproductive decisions has been violated [7], it is important to respect their rights regarding family planning choice. With improved quality of life and the PMTCT programs, there have been progress in addressing WLHIV's reproductive rights, though still falling short of meeting the rights of WLHIV [10, 11]. These highlight the vital role of improved access to effective contraceptive methods that align with fertility desire and that decrease or eliminate the everyday adherence. Educating and supporting health care providers to provide appropriate reproductive health care in a respectful and non-coercive way is crucial. Health systems also need to invest in maintaining supplies and distribution of a variety of contraceptive methods that suit the needs of women. In general, to achieve the global target of ending HIV prevalence by 2030, improving interventions on effective family planning is crucial in addition to other HIV prevention methods.

Benefits of using the most effective family planning is decreasing HIV positive births at a lower cost than ART. In 2009, globally, it was estimated that if all women in need accessed effective PMTCT, it would prevent over 300,000 infant HIV infections at estimated cost of $208 million annually. Nevertheless, almost 90,000 infant HIV infections would still occur that could have been averted by preventing unintended pregnancies with effective family planning, at a cost of $33 million [14]. This gap could be bridged by long acting reversible and permanent methods given women's high unwanted pregnancy and lower stated fertility intention indicating they do not desire children or wish to wait some years before their next pregnancy.

Our review highlights that HIV-status was found to be an important factor in relation to unintended pregnancies. This could be a result of ambivalence towards pregnancy among HIV-positive women than HIV-negative women [43]. However, a review on the impact of ART on fertility rates has revealed the number of HIV-positive women who became pregnant has grown in sub-Saharan Africa. In addition, there has been a reduction in the fertility gap between HIV-positive and HIV-negative women due to improved survival of HIV-positive women [31], though many of the pregnancies in WLHIV could be unintended. It is important to note that the included studies were not purposely selected to compare the prevalence of the unintended pregnancy. Service deliveries therefore have to be strong to support WLHIV so that all pregnancies and births are intended. The review also showed the need for more detailed information on how WLHIV access family planning.

It was reported that the unmet need for effective family planning was about four times higher in HIV-positive people compared to HIV-negative people [15]. Studies in sub-Saharan Africa have indicated that the desire for more children is lower in HIV-positive women than in HIV-negative women [7, 70]. Though pregnancy intention might change post-HIV diagnosis, there is a high-unmet need for effective contraception for both HIV-positive and HIV-negative women. It is also important to evaluate how the available contraception meets the family planning needs of WLHIV.

This review showed that the unintended pregnancies occurred to HIV-positive younger WLHIV. Given a third of new HIV infections were among young people aged 15–24 years, it is important to focus on their contraceptive needs. Addressing the family planning needs of HIV-positive younger women is also crucial because pregnancies in young women are more likely to be unintended.

The magnitude of unintended pregnancy was lower in HIV-positive men than HIV-positive women. This may indicate that men have a greater desire for having children and take family planning decisions out of women's hands, which contributes to the unintended pregnancy level [48]. This is supported by the cultural beliefs in which the patrilineal nature of the societies force women to bear more children against their intention [71]. Unmet needs for family planning, which results in unintended pregnancy, is also more likely to be reported among HIV-positive women than HIV-positive men [15]. With respect to women's decision-making, men are considered as the main decision makers in sub-Saharan Africa, and women have less power in deciding healthcare seeking including family planning [72]. Therefore, couples counselling is important for joint decision making to reduce the rate of unintended pregnancies [45].

Concerning the methodological issues, most of the studies were cross-sectional and conducted in health institutions. An important issue is whether ANC clients and postpartum WLHIV can accurately state their pregnancy intention retrospectively. In the majority of studies, participants were selected by non-random sampling at HIV, ANC, or family planning clinics. In addition, standard and validated measurement of unintended pregnancy was not used in many of the identified studies, making comparison difficult. Thus, we cannot conclude that the level of evidence is strong. Further studies are needed to identify the barriers to family planning use to identify the factors.

This review has important limitations. First, only articles in English were included. Second, there is substantial heterogeneity of studies, as different groups of participants were included for estimation of magnitude of unintended pregnancy. The studies included HIV-positive women who were pregnant, post-partum, or breast-feeding. Third, studies did not document pregnancy intentions before conception, masking desire or ambivalence that can influence reporting

of unintended pregnancy retrospectively. High perceived stigma in these countries with respect to HIV, and potential hesitancy to admit to an intentional pregnancy as a result may have impacted on the validity of the findings. Fourth, since women in this geographic region often learn of their HIV-positive status and pregnancy during a single clinic visit, this complicates the interpretation of the original studies. Fifth, studies that focused on a subset of WLHIV such as those involving sero-discordant couples and safe conception were excluded, as these were not representative of WLHIV. Finally, biases were reported in the majority of studies: self-reporting bias (n = 8), selection bias (n = 7), social desirability bias (n = 5), recall bias (n = 3), and small sample size (n = 1).

Conclusions

The current evidence indicates that a substantial number of pregnancies in WLHIV in sub-Saharan Africa were unintended, being unwanted or mistimed. However, this conclusion is mainly based on cross-sectional surveys and the studies are mainly derived from HIV clinics, ANC and postpartum units of health institutions. The contraceptive failure was a significant predictor of unintended pregnancy among WLHIV.

Because of the high magnitude of unintended pregnancy in WLHIV, there is a need for additional studies to identify the root causes of unintended pregnancy in this population. Further research is needed as to whether stigma towards childbearing in WLHIV, other social reasons, and attitude of health providers affects pregnancy intentions. Policy makers and service providers should be aware that the majority of pregnancies and births in HIV-positive women are unintended. For those WLHIV intending to have a child, impartial extensive discussion with health care providers is required to reduce the risks. ART drugs for HIV-positive women greatly reduce HIV positive births, while ensuring family planning is more effective at a lower cost. Given that all studies published since 2010 found that the majority of pregnancies were unintended, it is imperative to strengthen family planning services to reduce unintended pregnancy.

the search strategy, the selection criteria, the strategy for assessment of risk of bias, and data abstraction form: TRF, MLH, and DL. Involved in the screening, assessment of eligibility, selection of studies and critical appraisal as well as data extraction: TRF, MLH, ASM, and DL. Contributed to analysis and interpretation of the data: TRF, MLH, ASM, and DL. Involved in drafting the manuscript and revising it critically: TRF, MLH, ASM, and DL. All authors have given final approval for the manuscript to be published.

Compliance with Ethical Standards

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