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A systematic review of contraceptive continuation among women living with HIV

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Abstract

Background: Women living with HIV (WLHIV) experience high rates of unmet contraceptive need and unintended pregnancy. Contraceptive method-specific continuation rates and associated factors are critical for guiding providers tasked with both reproductive health (RH) and HIV care. We conducted this systematic review to determine whether contraceptive continuation rates differ between WLHIV and uninfected women and, for WLHIV, whether differences are impacted by method type, antiretroviral therapy (ART) use, or other factors.

Methods: We searched Ovid MEDLINE, POPLINE, and [PubMed.gov](https://pubmed.ncbi.nlm.nih.gov/) for studies published between January 1, 2000 and August 31, 2016. Inclusion criteria comprised prospective data of WLHIV, non-barrier method continuation as an outcome measure, and recorded method switching and/or discontinuation.

Results: Of 939 citations screened, 22 articles from 18 studies were eligible. For studies with comparator groups, data quality was moderate overall based on Grading of Recommendations, Assessment, Development and Evaluations (GRADE) and Newcastle-Ottawa Quality Assessment

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Conflict of interest

The authors declare that there is no conflict of interest.

(NOQA) Scales. Of four studies comparing women by HIV serostatus, two showed higher rates of contraceptive continuation among WLHIV versus uninfected women, while two others detected lower continuation rates for the same comparison. Generally, baseline method continuation exceeded 60% for studies with >12 months follow-up. Studies providing contraception had higher continuation rates than studies not providing contraception, while women allocated to contraceptive methods in trials had similar continuation rates to those choosing contraceptive methods. Across all studies, continuation rates differed by method and context with the copper intrauterine device showing greatest variability between sites (51–91% continuation rates at 12 months). Implant continuation rates were 86%, though use was low relative to other methods and limited to few sites.

Conclusions: Contraceptive continuation among WLHIV differs by method and context. More longitudinal studies with contraceptive continuation as a measured outcome following 12 months are needed to strengthen integration of RH and HIV care.

Keywords

HIV; contraceptive continuation; reproductive health; long-acting reversible contraception; contraceptive method switching

1.0 Introduction

Globally, there are more women living with HIV (WLHIV) than men, and the majority reside in sub-Saharan Africa [1]. Women often acquire HIV early in their reproductive years, necessitating both HIV management and contraceptive management to facilitate reproductive health throughout much of the reproductive lifespan [1–3]. Expanded ART ensures longer survival and improved physical well-being, evidenced by decreasing death rates and increased pregnancy rates from time of ART initiation or compared to women not yet using ART in several longitudinal assessments [1,4–6]. WLHIV especially need the support of their providers to achieve their reproductive intentions while preserving their health [7–9]. Thus, access to effective contraception as well as preconception and antenatal care are critically important [7–12], spurring recommendations, models, and policy changes for HIV and RH care integration [9,13–17].

The impact of HIV infection on contraceptive use and method choice appears to vary by setting as well as patient and provider factors,[18–20] though unplanned pregnancy among WLHIV is common across multiple countries [18–25]. In five of eight sub-Saharan African countries, WLHIV, comprised of both those who had been diagnosed with HIV and those estimated to likely be infected based on population prevalence and risk profiles, were found to have significantly lower rates of current contraceptive use compared to HIV-negative women aware of their status, based on Demographic and Health Survey results [25]. Further, several studies have documented that, compared to HIV-negative women, WLHIV who use contraception are more likely to rely solely on male condoms as their contraceptive method, with attendant greater risk of unintended pregnancy given difficulties associated with consistent and correct condom use [26–28]. This reliance on condoms for contraception may reflect: lack of provider information or absent or inadequate counseling including but not limited to counseling for condoms driven by HIV status and failing to counsel on the inferior

contraceptive effectiveness of condoms relative to other contraceptive options; limited access to a full spectrum of contraceptive methods; or women's and providers' concerns about interactions between ART and hormonal methods, transmission to a partner, or other safety concerns [21, 29–33]. Finally, HIV infection may impact continuation as WLHIV report a high degree of method dissatisfaction [34,35].

As the integration of RH services with HIV care is implemented, understanding contraceptive use among WLHIV is critical to inform services. It is possible WLHIV may face greater barriers to accessing a full range of contraceptive methods through provider- and system-imposed barriers. Additionally, as concerns arise surrounding safety and efficacy of contraceptives in the presence of new ART regimens,[36–40] WLHIV and/or their healthcare providers may impose limitations on method choice in response. We sought to determine whether there are consistent differences in contraceptive continuation, both objectively measured and self-reported, between WLHIV and women who do not have HIV and whether differences are impacted by method type, ART use, or other factors. Thus, we reviewed studies that reported contraceptive continuation and associated factors, such as ART use and contraceptive method among WLHIV.

2.0 Materials and methods

2.1 Literature search methods

This systematic review was performed in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidance [41]. Ovid MEDLINE, POPLINE, and [PubMed.gov](https://pubmed.ncbi.nlm.nih.gov/) were searched using combinations of the following terms: ((HIV seropositivity OR HIV infected OR HIV positive OR PLWHAs OR “persons living with HIV” OR HIV infections) AND women) AND (contraception OR family planning OR contraceptive method* OR contraceptive agents, female OR contraceptive devices, female) AND (accept* OR patient acceptance of health care OR continu* OR discontinu* OR contraception behavior) for the time period specific dates, and Popline was searched with: (HIV OR HIV infection OR AIDS) AND (contracept* OR “family planning”) AND (accept* OR continu* OR discontinu* OR “contraceptive usage” OR “family planning acceptors” OR “family planning nonacceptors” OR “family planning discontinuers”). The search was not restricted to title, key word, abstract, or MESH term but inclusive for all fields containing any of the listed terms for all databases. The searches were conducted on April 14, 2014 and August 31, 2016 with contiguous dates.

Observational studies, randomized trials, and project reports evaluating contraceptive continuation among WLHIV published in English, Spanish, or French between January 2000 and August 31, 2016 were considered. We did not include publications prior to 2000 due to limited ART use in low resource settings in the years preceding 2000. We recognize that there have continued to be substantial changes in HIV care since 2000 and that contraceptive use patterns may have changed in response to ART availability and thus be of greater relevance to the current context. Studies with the following criteria were included: (a) participants were women of reproductive age (14 to 50 years) with at least one group within the study having documented HIV infection (with disaggregation of results by HIV status for at least one follow-up visit beyond diagnosis in studies with participants with

positive and negative HIV serostatus); and (b) prospective longitudinal assessments of contraceptive use (any or method-specific and with use by self-report, clinic notes, or other measures). We did not consider fertility intention documentation in the inclusion criteria due to paucity of assessment of this variable in studies eligible by the stated criteria. Exclusion criteria were: (a) studies where condoms were the only contraceptive method examined due to difficulties in measuring condom use (e.g. perceived and experienced judgment from providers based on reported use), distinguishing condom use for contraception or for STI prevention, and necessity of partner agreement and action; and (b) studies where contraceptive discontinuation or switching were not reported. Due to a high degree of diversity between contraceptive continuation outcome measures and study design, we did not conduct a meta-analysis but instead proceeded with a qualitative comparison.

2.2 Article selection process

Title and abstract screening was performed independently by three reviewers (C.T., T.A., and S.L.) with arbitration by a fourth (H.J.), where necessary. Abstracts were screened for inclusion based on design, inclusion of WLHIV, and prospective contraceptive use as an outcome measure. Review articles among the initial group of selected abstracts were separated, the full article obtained, and the references screened for additional studies. Following collation of all relevant abstracts, full-text articles were retrieved.

2.3 Abstraction

For included articles, data abstraction forms were used to ensure systematic data representation from each study. Abstraction forms included study design, contraceptive continuation rates among WLHIV by method, factors associated with continuation, whether the study provided the methods or contraceptive use and continuation was based on self-report, and data on switching methods. Two reviewers independently extracted data (H.J. and C.T.) and differences were resolved by consensus and, as needed, discussion with a third reviewer (L.M.). Data from articles with a comparison group for contraceptive continuation were analyzed descriptively with a data quality assessment. The NOQA was used to assess non-randomized observational studies and GRADE criteria used for randomized trials [41–43]. For NOQA ratings, we used the same standards as Lopez *et al.* [44], whereby evidence was initially considered moderate quality and then downgraded for meeting fewer than six NOQA criteria or not controlling for any confounding (i.e., not having any stars for comparability).

3.0 Results

3.1 Inclusion screening results

The initial electronic search of the literature produced 939 citations, with an additional 44 identified from review articles; 45 citations were identical between different databases and these duplicates were removed (Figure 1). Following screening of 107 full-text publications, 22 were determined to meet inclusion criteria from 18 studies, with four studies each producing two separate publications with results relevant to contraceptive continuation among WLHIV [39,40,46–51]. Contraceptive continuation definitions varied between

studies, with participant report used by 18.2% (4/22), directly provided by the study site by 54.5% (12/22), or a mixture based on selected method by 27.3% (6/22).

Table 1 describes studies with a comparison group (n=13) [39,40,46–60]. Most of these studies (n=10) were conducted in sub-Saharan Africa [46–51,53–55,57–60], with the remaining studies each conducted in the United States [52], Brazil [49,50], and Thailand [56]. Seven of these studies were randomized trials and five were cohort studies, of which four were secondary analyses with the primary outcome(s) unrelated to contraceptive continuation [40,46,47,52,55,56,60]. Studies without a comparison group (n=5) reported continuation of single methods and are summarized in Table 2 [61–65].

Among studies with comparison groups, four compared contraceptive use over time between women by HIV serostatus [52,53,58], and eight compared continuation of either different contraceptive methods [46–51,54,56,60], a different dosing route [59], or a single contraceptive method with different ART regimens [39,40] among WLHIV. Two studies reported the effects of behavioral interventions to increase contraceptive uptake and use in discordant and concordant couples [55,57].

3.2 Contraceptive continuation

Most studies reported contraceptive continuation by method and had follow-up periods ranging from 4 months to 8 years (Tables 1 and 2). Two studies did not report continuation by specific method, instead using composite outcome variables [52,53].

3.2.1 Comparison of contraceptive continuation by HIV status—For the four studies comparing female participants by serostatus, two studies showed higher contraceptive continuation rates [52,57], while two showed lower continuation rates for WLHIV for all methods combined compared to HIV-negative women, with variation by method (Table 1) [53,58]. The two studies noting higher continuation rates for WLHIV included one study where continuation was measured solely based on participant report [52] and the other cross-checked reported use against clinic records for all methods except condoms and COCs [57]. For the two studies noting lower continuation rates for WLHIV, one provided the C-IUD and confirmed continuation through clinic records [58] while the other relied on participant report [53]. Differences in contraceptive continuation rates were unlikely to result from counseling differences based on HIV status for two reasons. For studies providing a contraceptive method [58] or a new counseling approach as the intervention [57], counseling was proscribed by allocated study arm, regardless of participant serostatus. In two studies where participants accessed methods from their usual health care providers [52,53], counseling approaches may have differed by HIV status. However, as one study had higher continuation rates among WLHIV while the other detected lower continuation rates among WLHIV compared to HIV-negative women, it is unlikely that counseling differences based on serostatus result in uniform contraceptive continuation differences between WLHIV and uninfected women.

Contraceptive continuation rates were fairly high across all studies. In the six studies comparing continuation rates between methods among WLHIV only, continuation of the method in use or selected at enrollment was generally greater than 60% for all methods with

at least 12 months follow-up [47,50,51,54,56], though low continuation rates for oral and injectable hormonal contraceptives were noted throughout a cohort period spanning up to eight years and varied substantially by country (Uganda vs. Zimbabwe) [47].

3.2.2 Comparison of continuation by method allocation and by study

provision of method—Allocation to methods at enrollment and/or randomization [48–51,54,59] compared to studies where participants could choose their method [46,47,52,53,55–57,60] did not result in substantially lower continuation rates for hormonal methods at 12 months. The 12-month follow-up interval represented a convergence between non-allocated and allocated methods groups, including two of four studies in the allocation group and four of eight in the participant choice group (Table 1). Only one study in each group [46,59] had follow-up terminating before 12 months (six months in both studies) and one study with allocated methods [48,49] and three studies with participant-chosen methods had follow-up durations exceeding 12 months.[47,55,57] As such, the diversity and small number of studies for follow-up durations less than or exceeding 12 months precludes comparison. There were no studies that had substantive enough numbers of women electively choosing IUD use to compare continuation rates between allocation and participant choice. For the eight studies assessing only one method, continuation rates were generally high, though most had short (4–12 months) follow-up periods [39,40,58,59,62,64,65], with some notable exceptions [62,63].

Thirteen studies provided most, if not all, of the permitted contraceptive methods to all participants [39,40,46–51,54,55,58,59,61–65] and one further study provided methods to two of three study arms [57], while the four remaining studies relied upon participant report of method choice and use [52,53,56,60]. Studies providing contraception to participants generally had higher continuation rates than those in which participants had to obtain contraception through other sources.

3.2.3 Continuation rates for specific contraceptive methods—Across all studies, continuation rates differed by method with the C-IUD showing the greatest variability, ranging between 51 to 91% at follow-up of 12-months duration or more [48–50,54,55]. Subdermal implant continuation rates were quite high (>86%) relative to other methods (Tables 1 and 2) [39,40,55,58,63,65]. There was substantial variability in reported continuation for oral contraceptive pills (OCPs) and injectable progestin contraceptives (INJs), though with more studies indicating higher [47–49,57,60] rather than similar [47] or lower [55] continuation rates for INJ relative to OCPs. In most studies where switching was recorded, switching between methods was a common event, occurring among at least 20% of participants [46–49,55,57,60].

3.2.4 Continuation rates within randomized studies only—In this section, we consider women randomized within the study structure, though not necessarily randomized to a contraceptive method. The differences in continuation based on contraceptive method allocation vs. choice is discussed in 3.2.2. Within randomized trials overall,[48–51,54,55,57,59] continuation rates varied widely and tended to cluster around method in several cases or by intervention type. Mark *et al.* reported the lowest continuation rates at 12 months for both OCPs and INJs; this was one of two randomized studies which involved

couples counseling and raises the question whether male involvement may alter fertility decisions [57]. The pregnancy incidence of 16–22% across all arms over 12 months reflects high discontinuation or low rates of uptake of more effective methods. Notably, time to desired pregnancy or any other stated intent for future fertility was not among the inclusion criteria for this study and dialogue within couples may have hastened efforts toward a new pregnancy. Even among WLHIV, who were significantly less likely to continue injectable methods, discontinuation rates at 12 months exceeded 25% [57]. Conversely, the other trial that included counseling as part of the intervention rather than method allocation had similar risk of discontinuation [55] as trials in which the method was allocated [48,49,54]. Of three randomized trials in which participants used C-IUDs, three found relatively lower (51–79%) continuation rates at 12 to 24 months [48,49,54,55] than a trial comparing C-IUD to the levonorgestrel IUD, for which continuation for both intrauterine methods was above 90% at 12 months [50,51]. All but one of these four studies allocated women to a contraceptive method, including the study with high continuation rates. INJ continuation rates were variable across studies and comparison is complicated by a wide range of follow-up duration [48,49,54,55,57,59].

3.3 Factors associated with contraceptive continuation

Prior contraceptive use, and/or being married or in a steady relationship increased the odds of continuation in five of the seven studies that included information on factors associated with continuation (Tables 1 and 2) [47,53,54,56,60]. The effect of bleeding and side effects on discontinuation rates were mixed. Bleeding, particularly heavy menstrual bleeding, and other side-effects (e.g. nausea and night sweats) were associated with depot medroxyprogesterone acetate (DMPA) INJ discontinuation in Zambia, Malawi, Uganda, and Zimbabwe and with C-IUD discontinuation in Malawi [47,54,55]. There was a substantial (91% vs. 68%) difference in C-IUD continuation at 12 months between participants in Uganda and in Malawi, despite similarly high rates of reported menorrhagia/heavy bleeding as a side effect [50,51,54]. The Zambian trial noted IUD continuation of approximately 75% at 12 months [48,49].

Few studies inquired about concerns surrounding method use and fertility intentions or male partner attitudes towards future fertility or contraceptive use. Of four studies comparing participants by serostatus, only Belzer *et al.* restricted eligibility based on fertility intentions, confining their retrospective analysis to female participants who stated they were not trying to become pregnant at each of three visits during the 12-month period analyzed [52]. Beyeza-Kashesya *et al.* also measured fertility intentions at baseline in their cohort of 15 – 24 year olds and found that uninfected participants were more likely to want children in the future than WLHIV (98 vs. 73%) but fertility intentions were not measured longitudinally or included in contraceptive continuation analysis [53]. In a comparison confined to couples where the female partner was living with HIV, Haddad *et al.* found that switching from a less to a more effective method was associated with the male partner's desire for no more children, while switching to a less effective method was independently predicted by the woman wanting more children in the next year and younger age [55]

3.4 Data Quality

Data quality for RCTs generally ranged from moderate to high (Table 3). For observational cohorts, three studies had moderate quality evidence. Low quality ratings were largely due to self-reported exposures and outcomes and bias in participant selection. As we deemed randomized trials of moderate to high quality, we did not separately consider contraceptive continuation by study quality but by randomized trial status (Section 3.2.4).

4.0 Discussion

4.1 Main findings not subject to heterogeneity and bias

Only 22 articles from 18 distinct studies were identified over a 16-year period, with just six reporting contraceptive use for 12 months or more as an outcome measure. More longitudinal studies with continuation as a standardized outcome and inclusion of long-acting reversible contraceptive (LARC) methods for periods of 12 months or more are needed to provide opportunities to identify common trends in continuation between methods in a context where patients are predominantly using ART and where HIV providers are tasked with addressing family planning needs.

Some findings regarding contraceptive continuation were consistent across studies, regardless of study design, setting, or ART availability. These findings include higher method continuation rates within studies that had no comparator group or focused solely on one method type; side effects, principally bleeding, as the predominant stated reason for discontinuation; and, for studies with longer follow-up periods, measurable pregnancy incidence. Higher continuation rates in single method type studies may reflect quality of counseling or treatment for side-effects among providers or selection into the study by women for whom the method was their first choice. Rather than having providers propose method discontinuation as a first option, studies where one method received emphasis and potentially more intensive provider training may have led to better-quality counseling and greater provider confidence in skills surrounding method initiation and managing side-effects. This factor may have contributed to observed high continuation rates among implant studies, as most of the studies inclusive of implants offered the implant as the sole method [63,65]. The need for provider intervention for method continuation may also have influenced discontinuation rates for implants. Greater consideration of provider-related factors, potentially through mixed method designs to better articulate reasons for discontinuation and provider attitudes surrounding various methods and comfort with using that method, are needed to better characterize consistency and optimize counseling.

Pregnancy incidence was measured in all cohorts lasting 12 or more months, with relatively high rates of pregnancy incidence in some of the lengthier cohorts, which represents change in fertility intentions, method failure, or failure to use a method correctly or at all and for which a qualitative component to explore method discontinuation would be extremely valuable. We believe this is particularly relevant in HIV care - as HIV and reproductive health services are increasingly merged and providers may not perceive that they have sufficient time or knowledge base to address contraceptive side effects or relative method benefits to guide best initial choices [14]

4.2 Continuation rate findings

Continuation of methods used at enrollment exceeded 60% for the six studies with 12 months follow-up. Implant continuation rates were high, though uptake was low relative to other methods, particularly compared to DMPA, in settings where the implant was available at the time of the respective study. We believe this method deserves greater documentation among WLHIV due to increasing availability of the implant, particularly in sub-Saharan Africa,[66] and with greater rigor and attention to safety and efficacy of hormonal methods in the presence of ART. This is particularly true for the etonogestrel implant, due to documented interactions compromising contraceptive efficacy with efavirenz-based ART [36–38]. Method switching and discontinuation were common, particularly within studies with longer follow-up periods, which potentially allowed for more attention to and recording of changes and also tended to assess contraceptive use overall rather than focus on one method. Some methods (e.g. C-IUD) had widely divergent discontinuation rates by context, even with similar side-effect rates. Future studies should assess both content and perceived quality of counseling at method initiation and follow-up and reasons for discontinuation, inclusive of contextual factors, that may strengthen counseling and method management. Different contraceptive counseling approaches for couples did not impact continuation overall, but were done prior to ART availability.

4.3 Continuation based on fertility intentions and ART use

Findings on perceptions surrounding future fertility intentions and contraceptive methods by women and their male partners were mixed. None of the studies that compared women by serostatus included fertility intentions as a variable when assessing contraceptive continuation, representing a probable confounder as one study found a substantial difference in reported desire for future pregnancy by HIV serostatus at baseline [53]. In a study confined to WLHIV that detected associations between fertility intentions and method perceptions, data were collected between 2002 and 2006 prior to widespread ART availability; ART use may alter these associations by changing fertility intentions and perceived need for contraception [55,67]. Cross-sectional quantitative and qualitative data indicate that fertility intentions and contraceptive use differ between women using ART and those not using ART [5,23,29,30,68]. Many studies in this review were conducted prior to widespread ART availability [46–49,55,57,58,60,65]. However, the literature currently indicates that pregnancy incidence may increase among women upon ART initiation for a host of probable biologic and behavioral reasons and that many of these pregnancies are unplanned or mistimed [5,18–20,68–70]. As universal access to ART increases and progress is made towards the last step of the cascade, high proportions of treated people living with HIV with undetectable viral loads, preference for condoms as a contraceptive method may wane, underscoring the need for moderated contraceptive counseling to emphasize safe, highly effective methods.

4.4 Impact of study method provision

Study provision of contraceptive methods to participants was not uniform. Studies that relied on self-reported method use generally had lower continuation rates and higher incident pregnancy rates, reflecting potential lack of access to more reliable or desired methods when

contraception is not provided by the study or mis-reporting of use to provide a socially-desirable response [52,53,57,60]. Providing family planning counseling and contraceptive methods is increasingly the standard of care within HIV services and offers an opportunity to familiarize health care workers with the evidence base surrounding methods.

While the majority of reviewed studies provided contraceptive methods, four of these provided methods that are not consistently or widely available in the public sector of resource-challenged settings [39,40,50,51,61–63] or are not widely available in at least one of the dosing routes [59]. As these methods, particularly the LARC methods, become increasingly available in resource-challenged settings, the need for studies with a follow-up duration 12 months are needed to determine continuation patterns among WLHIV in a context with identified ART-hormonal contraceptive interactions [66,71–73].

4.5 Limitations

Overall, there was a great degree of heterogeneity in various aspects of the included studies, particularly in measurement of contraceptive continuation, study design including provision of contraceptive methods, stated fertility intentions as an inclusion criterion, availability and use of ART which is known to impact fertility decisions, and contraceptive method mix [4–6,23,68]. This heterogeneity may explain some of the differences in contraceptive continuation rate estimates. The lack of uniform measurement and definition for contraceptive method continuation precluded a meta-analysis, which may be possible in the future if measures are harmonized. Nevertheless, this current review describes the range of estimates in the literature as a first step in understanding effective integration of contraceptive services with HIV care.

We did not explore the role of provider opinions and bias, which may shape method uptake and continuation. An illustrative case is the relatively high prevalence and uptake of sterilization among the Thai cohort, reflective of a context with a well-developed family planning program in which surgical sterilization for men and women is accessible in the public sector [53,74]. The existing studies did not include data on provider counseling or contextual changes in HIV care standards. This is an important limitation as women, irrespective of HIV status, considered provider recommendation as a leading factor in selecting a method in South Africa [75]. However, provider attitudes towards HIV infection and the consequent appropriateness of select contraceptive methods have been documented to impact and potentially bias or limit family planning counseling and service provision [76–79].

Not including studies with condoms as the sole method prevents capturing continuation rates for a popular method. However, we chose not to do so for difficulties determining motivations for condom use (e.g. contraception, preventing STIs, preventing HIV transmission to partners, or a combination of these reasons), as well as previously-stated reasons, all of which may introduce bias. Further, we did not consider fertility intention documentation in the inclusion criteria due to paucity of assessment of this variable in studies eligible by the stated criteria.

Further, we did not include publications from some large observational cohorts with extensive contraceptive use data [80–86]. The main reasons for not including these studies were either not disaggregating results by HIV status [80–82]; not measuring method continuation from time of initiation [83]; not including longitudinal data from women after HIV acquisition [84]; or not reporting method continuation or switching as a separate outcome [85,86]. The exclusion of these large studies based on the criteria of this review highlight the need for recommendations surrounding contraceptive use measures and study policies to guide future cohorts, broaden the evidence base, and potentially improve care, especially in settings where HIV care and family planning are integrated.

4.6 Conclusions and recommendations

In summary, contraceptive continuation among WLHIV varies greatly by method and context and may be impacted by method choice, access, and personal factors. While this statement is also true for women not living with HIV, a host of factors, including access to and use of ART, perinatal transmission risk, and provider background and comfort with family planning, change contraceptive considerations for WLHIV and affect method continuation. Some of these factors, like provider counseling approaches, may be addressed in programmatic interventions and should be evidence-based. Providing timely and comprehensive family planning services is essential for optimal integrated RH and HIV care and further research is needed to evaluate contraceptive continuation and acceptability in this evolving care model and guide future programmatic efforts.

Based on the findings of this review, we have several recommendations for improving research on contraceptive use among WLHIV. First, for studies in which contraceptive use is a key outcome, direct provision of the method by the study is recommended to reduce measurement error from self-report. These studies should also select a validated contraceptive use measure endorsed by an international body. One potential source are measures used in large population-based surveys such as Demographic and Health Surveys and Multiple Indicator Cluster Surveys, with data sufficient to estimate both overall and method-specific use. Additionally, fertility intentions should be measured longitudinally to allow for time-varying adjustment. Further, research around counseling approaches should be undertaken with integrated qualitative components. While studies included in this review did not detect many significant differences in contraceptive method continuation among the various counseling interventions tested, WLHIV were more likely to continue a method but the reasons for higher continuation rates were not described. We recommend future studies that develop and test behavioral interventions to increase contraceptive continuation should also include provider-related factors. The role of providers in confidence and attitudes towards method use among WLHIV may substantially alter likelihood of continuation and needs to be measured as a co-variate.

In summary, this review raises a number of important unanswered questions in contraception provision for WLHIV. Based on these findings, there is a clear and urgent need for empirical studies of the rates of and reasons for contraceptive discontinuation in this patient population, and a particular need for direct comparisons of different methods using

standardized measures. Ultimately, such data will play an important role in promoting effective and acceptable family planning for WLHIV.

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Figure 1.

Contraceptive continuation among HIV-infected women: flowchart depicting selection of study citations (Search Dates: January 1, 2000 – March 31, 2014).

Table 1:

Description of twelve studies assessing prospective contraceptive continuation among HIV-positive women with a comparison group of either HIV-negative women or different method use among HIV-positive women

Lead author, Year	Study design & location	Contraceptive continuation outcome measure(s)	Inclusion criteria	Comparison groups and sample size; duration of follow-up	Method(s) used & continuation rates	Factors associated with contraceptive continuation	Method s given by study?	Switching allowed? Rates of switching?	Limitations
Balkus J, 2007 [60]	PC; antenatal clinics in Nairobi, Kenya	Acceptability/c ontinuation of hormonal contraceptives.	HIV+ postpartum women using HC for 2 consecutive months	Women using HC>2 months (n=231) vs. using no contraception postpartum (n=88); 12 months	Continuation at 12 months: DMPA: 101/319 (44%) OCPs: 71/319 (31%)	Of 23 discontinuing HC, 6 were using DMPA, 12 were using OCPs, and 5 switched. Reasons included side-effects, no partner, or spousal request.	No	Yes; OCPs: 44 (19%) to DMPA: 15 (6%) to OCPs.	Participants self-selected cohort entry and may have been more motivated to initiate/continue postpartum. Only OCP and DMPA continuation measured, based on participant report.
Belzer M, 2001 [52]	PC; clinics for HIV+/at risk youth in 13 cities, United States	Prevalence of consistent reporting of effective methods (CREM) (male condoms, OCPs, DMPA, IMPC, IUD, BTL, or abstinence)	Women aged 14–18 years sexually active, not trying to conceive	HIV+ (n=154) vs. HIV-women (n=62); 12 months	For HIV+ women (% of visits): Perfect condom use: 51% DMPA: 34% OCPs: 7% IMP/BTL: 2%; Other: 2% No method: 4% CREM overall (HIV+ and HIV-): 120/213 (56%)	HIV+ women more likely to report CREM (AOR=4.0; 95% CI: 2.2–8.2; p<0.01) than HIV-women. CREM also associated with African-American race (AOR=2.7; 95% CI: 1.1–6.6) compared to Latino and Caucasian/other.	No	Allowed, not recorded.	Secondary analysis of data collected under other objectives. Lack of standardized contraceptive counseling through study clinic. Reliance on participant report for consistent method use, particularly for abstinence and condom use.
Bengston A, 2013 [47]	PC; study clinics in Kampala, Uganda; and Harare & Chitungwiza, Zimbabwe	Contraceptive continuation for DMPA vs. COC	Women 18–45 years who became HIV+ during follow-up	HIV+ women using DMPA (n=151) vs. those using COCs (n=80) at baseline; 96 months	Continuation at 12 months among HIV+ women: DMPA: 63% COCs: 64% For cohort period: DMPA: 27% COCs: 49% Median time to discontinuation: DMPA: 19 months (95% CI: 14, 24) COCs: 36 months [95% CI: 14 to 61]	COC users continued method twice as long as DMPA users in Zimbabwe, with no differences in Uganda. Discontinuation predicted by: DMPA: not having a sexual partner (AHR: 2.00; 95% CI, 1.12 to 3.58) & nausea (AHR: 1.84; 95% CI, 1.02 to 3.34). COC: living in Uganda [AHR: 2.56; 95% CI: 1.20–5.56] & not having a partner (AHR: 7.18; 95% CI: 3.05 to 16.88).	Yes	Yes, 29% (12/41) COC users switched: all to DMPA. 24% (26/110) DMPA users switched. 1/26 to BTL and 25/26 to COCs.	Study unable to account for multiple contraceptive method switches; only median time to first method switch evaluated. Fertility preferences were not included in continuation risk analysis.

Lead author, Year	Study design & location	Contraceptive continuation outcome measure(s)	Inclusion criteria	Comparison groups and sample size; duration of follow-up	Method(s) used & continuation rates	Factors associated with contraceptive continuation	Methods given by study?	Switching allowed? Rates of switching?	Limitations
Beyez-Kasheshy a J, 2011 [52]	PC; clinics for HIV+ and HIV- adolescents, Lampalo and Wakiso Districts, Uganda	Contraceptive use at baseline and continuation	Men and women aged 15-24 years	HIV+ (n=276) vs. HIV- (n=501) individuals; 12 months	Condoms (male and female participants): 72% of HIV+ participants used this method 21% HIV+ participants used an HC method, reported as aggregate use of OCPs, DMPA, IMP, or Net-En. Among HIV+ participants (male and female), 37/206 (18%) reported use of any contraceptive method throughout the cohort period.	Contraceptive use throughout cohort period associated with age 20 – 24 years (AOR=1.78, 95% CI: 1.16–2.74), male sex (AOR=1.64, 95% CI: 1.08 – 2.51), & married/in long-term relationship (AOR=1.70, 95% CI: 1.15 – 2.50). Contraceptive uptake (AOR 0.63, 95% CI: 0.44 – 0.91) & consistent use (AOR 0.63, 95% CI: 0.41 – 0.98) less likely for HIV+ youth. There was no difference in discontinuation by HIV status (OR 0.73, 95% CI: 0.44 – 1.22).	No	Yes, not recorded by specific method.	Study population selected from care seekers, which may limit applicability of the results. Contraceptive use was based on report and some recall bias may have been present. Purpose of condom use not distinguished between contraception and infection prevention. No disaggregation by sex among HIV+ participants. Definition of denominator for continuation through cohort and discontinuation are not consistent with reported values.
Haddad LB, 2013 [54]	RCT; HIV care clinic Lilongwe, Malawi	Contraceptive continuation for allocated method: C-IUD vs. DMPA	HIV+ women aged 18-45 years using ART	Randomized to receive C-IUD (n=99) vs. DMPA arm (n=101); 12 months	Contraceptive adherence at 12 months: DMPA: 66/101 (65%) C-IUD: 67/99 (68%)	Method not associated with adherence (continuation) in multivariate analysis, nor was concordance with first-choice method. Discontinuation of allocated method associated with heavy menstruation (aHR=2.6, 95% CI: 1.06–6.36) and no prior HC experience (aHR=1.96, 95% CI: 1.18–3.23); not associated with method (IUD vs. DMPA, AOR=0.95, 95% CI: 0.57 – 1.58).	Yes	Yes, but new method not recorded.	The DMPA arm had higher levels of education and lower rates of prior unintended pregnancy than the C-IUD arm (although this was controlled for in analysis).
Haddad LB, 2013 [55]	RCT; HIV testing centers, Lusaka, Zambia	Contraceptive method continuation and switching	Couples where the woman was HIV+; women aged 18-45 years, men with or without HIV aged 18-65 years	Receipt of video-based contraceptive counseling and provision interventions; four possible intervention	Incidence discontinuation among HIV+ women in cohort (/100 p-y): * DMPA/Net-En: 30.5 (25.8 – 36.0) OCP: 13.9 (10.7 – 18.0) C-	Of women upgrading from OCPs or DMPA (n=61), 34 did for more reliable method. Of women downgrading from DMPA, 78/145 did for bleeding irregularity.	Yes	Yes, C-IUD to: IMP (1), DMPA (3), OCP (8), nothing (1) OCP to: DMPA (32), BTL (2), C-	Potentially limited external validity of findings to populations outside context of couples services. Women lost to follow-up theoretically less likely to have continued

Lead author, Year	Study design & location	Contraceptive continuation outcome measure(s)	Inclusion criteria	Comparison groups and sample size; duration of follow-up	Method(s) used & continuation rates	Factors associated with contraceptive continuation	Methods given by study?	Switching allowed? Rates of switching?	Limitations
Kakaire O.2016 [50,51]	RCT; HIV clinic at referral hospital, Kampala, Uganda	Contraceptive method continuation	HIV+ women aged 18–49 years	Randomized to receive C-IUD (n=349) vs. LNG-IUD (n=354); 12 months	IUD: 21.0 (11.4 – 35.7) IMP: 8.4 (5.0 – 13.3) * 74% (n=785) continued chosen method until study end, while 24% (n=254) switched or discontinued method at least once. 21 women discontinued method because desired pregnancy.	Time to discontinuing/downgrading: younger age (AHR=0.94, 95% CI: 0.90 – 0.98), desire for more children within next year (AHR=5.78, 95% CI: 2.17–15.43), heavy menstrual bleeding (AHR=3.72, 95% CI: 2.10–6.59), bleeding between periods (AHR=2.88, 95% CI: 1.69–4.90) & cystitis/dysuria (AHR=3.14, 95% CI: 1.38 – 7.17). Time to upgrading: health concerns among women about IMP (AHR=1.80, 95% CI: 1.10 – 2.93) & male partners not wanting more children (AHR=2.08, 95% CI: 1.18 – 3.70). HIV status of woman or couple not predictive of switching/stopping.	Yes	No	the chosen method, resulting in potential selection bias. Some covariates potentially varying with time, including fertility intentions and fears about contraceptives, were only assessed at baseline. Several variables, particularly OCP adherence, based on participant report and potentially subject to inaccuracy.
					Continuation rate at 12 months: C-IUD: 91.4% (309/338) LNG-IUD: 91.9% (307/334) Discontinuation incidence rate ratio: 1.1 [95% CI 0.64–1.96])	Reasons for discontinuation: Heavy bleeding: C-IUD, 1.5% (5/338); LNG-IUD, 2.4% (8/334) (incidence rate ratio 0.9 [95% CI 0.24–3.05]). Cramping: C-IUD, 1.8% (6/338); LNG-IUD, 1.5% (5/334) (incidence rate ratio 1.2 [95% CI 0.31–5.09]). Vaginal discharge: C-IUD, 1.8% (6/338); LNG-IUD 1.8% (6/334); incidence rate ratio 1.4 (95% CI: 0.39–5.72). Pregnancies: 3 for C-IUD and 2 for LNG-IUD (incidence rate ratio 1.5 (95% CI 0.18–18.64)). Most participants elected continue IUD at study completion (C-IUD: 88.5% [309/349] and LNG-IUD: 86.7%			PID diagnosis was made basing on clinical assessment and may have overestimated cases and disproportionately ruled some women ineligible. Laboratory testing for plasma HIV load, genital HIV shedding, CD4 count, and complete blood count and hemoglobin were not conducted; thus, the study lacks the power to report on the effect of IUDs on HIV disease.

Lead author, Year	Study design & location	Contraceptive outcome measure(s)	Inclusion criteria	Comparison groups and sample size; duration of follow-up	Method(s) used & continuation rates	Factors associated with contraceptive continuation	Methods given by study?	Switching allowed? Rates of switching?	Limitations
Kanchev a Landolt N, 2013 [56]	PC (secondary analysis); HIV care clinic in Bangkok, Thailand	Uptake/continuation (as applicable) of reversible contraception and sterilization	HIV+ women 18–49 years of age	Comparison of method uptake and continuation between HC and sterilization among HIV+ women; n=196; 12 months	OCPs: 16/17 (94%) DMPA: 3/3 (100%) LNG IMP: 7/7 (100%)	[307/354]: incidence rate ratio 1.0 [95% CI 0.86–1.19]. 109/132 women completing follow-up reported continuous contraceptive use; 82 (75%) were sterilized and 27 used a reversible method (25%). Continuous users were more likely to be employed (AOR=5.5, 95% CI: 1.1 – 27.9) and, to have used contraceptives previously (AOR=7.5, 95% CI: 0.9–63.9).	No	No	Information regarding method choice and continuation and reasons for not using contraception were missing. High sterilization rate raises concern for possible coercion regarding method choice. Contraceptive use by self-report, high loss to follow-up rates, and retrospective reporting of method use prior to baseline may have resulted in bias.
Mark KE, 2007 [57]	RCT: HIV testing sites in Lusaka, Zambia	Contraceptive method uptake, continuation, and pregnancy incidence.	Men <60 years and women <38 years, with one HIV+ member of couple.	3 conditions: control (FP education and clinic referral); Intervention 1: Counseling & methods at study clinic; or Intervention 1 with program to reduce pressures of conceiving. Included 251 couples, within whom 132 women were HIV+; 24 months (median 12.2 – 14.3 months between arms)	% continuing method selected at study entry at 12 months follow-up: OCPs: 30/83 (36%) INJ: 28/73 (38%)	Nonbarrier method uptake was significantly greater in the two intervention arms (80% & 76%) compared to the control (33%; p<0.01), but did not vary between the intervention arms. INJ discontinuation lower among HIV+ women than HIV– women (27% vs. 39%). At 12 months, pregnancies had occurred in 22% of control, 22% of intervention 1, and 16% of intervention 2 group couples (p=0.24); there was no significant difference between arms in analysis confined to HIV+ women only. Pregnancy incidence lower among HIV+ women initiating INJ (p=0.02), but not among those initiating OCPs.	Methods supplied for Arm 1 & 2 couples	Yes: OCP (83) to: DMPA 3, Nothing 25, 13 became pregnant during follow-up. 25 became pregnant while reporting OCP use. INJ to: OCPs 12, of whom 5 became pregnant, nothing 29, 13 became pregnant. 4 became pregnant after first DMPA.	OCP and condom use by self-report; high incident pregnancy rate suggest reporting accuracy issues. Sample size restricted because recruitment limited to couples already involved in other studies at the research center. Randomization by day rather than by couple may have accentuated differential accrual rates in each group.

Lead author, Year	Study design & location	Contraceptive continuation outcome measure(s)	Inclusion criteria	Comparison groups and sample size; duration of follow-up	Method(s) used & continuation rates	Factors associated with contraceptive continuation	Method s given by study?	Switching allowed? Rates of switching?	Limitations
Morrison CS, 2001 [58]	PC; family planning clinics in Nairobi, Kenya	Proportion of complications following C-IUD insertion by HIV status over a two year period.	Reproductive-aged women	HIV+ (n=150) vs. HIV- (n=486); 4 months	C-IUD: 133/144 (92%) women continued the C-IUD through the 4-month follow-up period.	10.9% HIV+ women & 10.4% HIV- women overall complication (aHR=1.01; 95% 0.56-1.82) or infection-related complications (aHR=0.98; 95% CI 0.50-1.92). HIV+ women had higher proportion of C-IUD removals for bleeding, pain or infection (10% vs. 8.6%) but lower proportion of expulsions (2.7% vs. 4.9%). No incident pregnancies.	Yes	Switching not recorded.	Differential loss to follow-up 64% HIV+ vs. 78% HIV-; p<0.01) or returned for the 24 month visit (37% HIV+ vs. 47% HIV-; p=0.04); may have biased results. Possible selection bias may have resulted from not randomizing participants
Nanda K, 2011 [46]	PC; family planning clinics in Kampala, Uganda; Harare & Chitungwiza, Zimbabwe	Effect of HIV diagnosis on contraceptive use	Women aged 18-35 years seroconverting to HIV+ within parent cohort.	Using hormonal contraception (n=137) vs. non-HC using (n=57) at HIV diagnosis; 6 months post diagnosis (mean 5.8 months).	Continuation to 6 months following: HIV diagnosis: Of 57 non-HC users, 14 (25%) switched to HC use after receiving HIV diagnosis. Non-HC methods (135/137 (98%) (condoms): 43/57 (75%)	Two discontinuations for HC users due to lack of partner & side-effects. Of 57 non-HC users, 14 (25%) switched to HC use after receiving HIV diagnosis.	Yes	Yes: Non-HC to HC methods (14); 7 (50%) switched because desired more effective method, 1 (7%) for bleeding issues, & 6 (43%) for personal reasons.	Sexual behavior data by self-report & detailed discontinuation reasons not provided. HC use required at cohort entry thus was among experienced users, potentially limiting generalizability. Small number HIV+ women preventing analysis of correlates of method switching following HIV diagnosis.
Polis CB, 2014 [59]	Randomized cross-over trial; community-based HIV care clinics in Rakai, Uganda	Acceptability of Sayana Press (SQ DMPA) vs. intramuscular DMPA	HIV+ women aged 18-45 years	Comparison of acceptability of DMPA dosing route: n=179 to SQ then IM, n=178 to IM then SQ; 6 months duration	DMPA aggregate continuation: baseline: 323/332 (97%) (includes women declining to cross over). 3 months: 314/317 (99%) 6 months: 314 (88%) followed to 6 months. IM-DMPA: 113/314 (36%)* SQ-DMPA: 201/314 (64%)*	SQ dosing preferred (64% vs. 36%, p<0.01), due to less pain & fewer side effects. DMPA-IM had significantly more side-effects with exception of skin irritation, which occurred more with SQ. Most women (93%) reported no or very tolerable side effects.	Yes	Yes, at 6 months, no woman elected to switch from DMPA to another method. Of note, 2 women declined to cross over at 3 months & 1 failed to adhere to the protocol.	Only HIV+ women attending clinical HIV care were included, so results may not be applicable to HIV- women, women with unknown HIV status, or women without regular clinical contact.

Lead author, Year	Study design & location	Contraceptive continuation outcome measure(s)	Inclusion criteria	Comparison groups and sample size; duration of follow-up	Method(s) used & continuation rates	Factors associated with contraceptive continuation	Methods given by study?	Switching allowed? Rates of switching?	Limitations
Stringer EM, 2007 and 2009 [48,49]	RCT; antenatal clinics in Lusaka, Zambia	Safety and efficacy of the C-IUD among HIV-infected women	HIV+ postpartum women 16 years of age (mean age 26.1±4.9 years)	HIV+ women randomized to hormonal method (DMPA, COCs; n=303) vs. C-IUD (n=296); 24 months	continued DMPA use. Two incident pregnancies occurred in each arm. Method continuation at 24 months: DMPA: 147/190 (77%) OCPs (COCs, POPs): 69/112 (62%) C-IUD: 150/296 (51%) Rate discontinuation: IUD: 28.6 (24.4–33.7) Allocated hormonal method: 6.81 (4.95–9.35)	HRR for switching methods for women using DMPA was 0.44 (95% CI: 0.31–0.62) and OCPs was 0.94 (95% CI: 0.68–1.32) vs. C-IUD. Loss to follow-up/withdrawal, especially due to pregnancy, in DMPA and OCP groups (HR=1.47, 95% CI: 1.09–1.99; p<0.01 and HR=1.66, 95% CI: 1.19–2.31; p<0.01, respectively) significantly higher than C-IUD at 24 months.	Yes	Switching rate: C-IUD (146/504 p-y, switching rate 29.0/100 p-y; 95% CI: 24.6–34.0) DMPA (43/334 p-y (switching rate 12.9/100 p-y; 95% CI: 9.5–17.3) OCPs (43/163 p-y, switching rate 26.4/100 p-y; 95% CI: 19.6–35.6).	High & significantly different rates of loss to follow-up/withdrawal (esp. due to pregnancy) by method possibly resulted in informative censoring. Allowing HC users to select method & frequently switch may have resulted in bias.
Viera CS, 2014; Raggazini CS, 2016. [39,40]	Prospective cohort; university hospital and research clinic in Sao Paulo, Brazil	Evaluate 2 ART regimens (Efavirenz-based vs. ritonavir-boosted lopinavir-based vs pre-ART) on the ETN IMP pharmacokinetic parameters of the ETN IMP implant; secondary analysis of bleeding patterns by ART regimen.	HIV+ women aged 18–40 years with BMI 18–29.9, regular menstrual cycle, desiring ETN IMP and on current ART regimen or no regimen 3 months	HIV+ women receiving ETN IMP on two different ART regimens vs. no ART (n=15 each arm); 24 weeks	ETN IMP continuation 100% in all arms of 42 women completing the study through 24 weeks.	Progesterone levels after implant placement were lower than luteal cutoff levels (3 and 5 ng/mL) in non-ART and lopinavir groups. However, 2.8% and 5% of samples for the efavirenz group were above the 3 (P<0.01) and 5 ng/mL cutoffs (P = 0.02), and 5% were above the lower cutoff level (3 ng/mL) (P = 0.01), respectively. Amenorrhea and infrequent bleeding rates higher in lopinavir ART group (50% and 36%, respectively) than in the other groups (non-ART group, 36% and 29%, respectively; efavirenz ART group, 7% and	Yes	No	Progesterone is a surrogate marker for ovulation and cannot definitively indicate ovulation. Sample size was not calculated to compare differences in bleeding patterns.

Lead author, Year	Study design & location	Contraceptive continuation outcome measure(s)	Inclusion criteria	Comparison groups and sample size; duration of follow-up	Method(s) used & continuation rates	Factors associated with contraceptive continuation	Methods given by study?	Switching allowed? Rates of switching?	Limitations
						14.5%, respectively; p=0.01). Women using efavirenz ART more likely to have regular bleeding (71.5%) compared with lopinavir ART (7%) and non-ART groups (21%; p=0.01). Proportions of women with frequent and prolonged bleeding similar (p>0.05) between groups.			

AHR= adjusted hazard ratio; AOR= adjusted odds ratio; C-IUD= copper IUD; COC= combined oral contraceptives; DMPA= depot medroxyprogesterone acetate; ETN=etonogestrel; HR= hazard ratio; IMP= implant; IUD= intrauterine device; Net-En= norethisterone enanthate; OCP= oral contraceptive pill; OR=odds ratio; PC= prospective cohort; POP= progestin only pill; RCT= randomized controlled trial.

* Data specifically for HIV+ women generated by request to the authors.

Table 2:

Description of five studies assessing prospective contraceptive continuation among HIV-infected women with no comparator group.

Lead author, Year	Study Design & Location	Contraceptive continuation outcome measure(s)	Inclusion criteria & sample size; duration of follow-up	Method(s) used & continuation rates	Factors associated with contraceptive continuation	Methods given by study	Switching allowed? Rates of switching?	Limitations
Coleman JS, 2013 [61]	PC; family planning (and the HIV care services in Nairobi, Kenya	LNG-IUD continuation	HIV+ women aged 18 – 50 years with CD4 > 250 cells/mm ³ and no ART use within 90 days (n=30); 6 months.	Continuation at 6 months: LNG-IUD: 28/30 (93%)	No commentary on reasons for or alternate method chosen by women discontinuing	Yes	No	Small sample size and short follow-up duration. Exclusion of women with CD4 < 250 cells/mm ³ may limit generalization of results.
Heikinheimo O, 2011 [62]	Cohort with matched controls; gynecology clinic in Helsinki, Finland	Safety and continuation of LNG-IUD among HIV+ women	HIV+ reproductive-aged women (mean age LNG-IUD 36.7 ± 7.0 years, control 35.6 ± 6.7 years, p=.57) (n=40); 60 months.	Continuation at 60 months: LNG-IUD: 12/15 (80%)	Reasons for discontinuation did not result in need for new method (2 removals were for desire to conceive and 1 for increased bleeding at 48 months).	Yes	No	Small study group was selected retrospectively. Study group comprised women seeking care; thus, results may not be generalizable.
Kreitchmann R, 2012 [63]	PC; STD/HIV clinic in Porto Alegre, Brazil	Acceptability/continuation of ETN IMP (Implanon® 1 rod system)	HIV+ women with no age specification, median 29 (range 20 – 39 years); (n=79); 36 months	Continuation at 36 months: ETN IMP: 74/79 (94%)	5 discontinuations: 2 had BTL, 2 for heavy bleeding, & 1 hysterectomy	Yes	Switching allowed, not recorded.	Study group comprised women seeking care; thus, results may not be generalizable.
Landolt NK, 2013 [64]	PC; HIV care and research clinics in Bangkok, Thailand	Acceptability/continuation of C-IUD	HIV+ women aged 18–45 years (n=66); 6 months	Continuation at 6 months: C-IUD: 26/28 (93%)	Of 66 eligible women, 29 chose the C-IUD, of whom 28 had a successful insertion. Discontinuation reasons: spotting (1), heavy bleeding/dysmenorrhea (1), partner felt IUD during sex (1).	Yes	Switching not recorded.	During recruitment, counseling on or provision of other effective methods not provided, creating bias. Small sample prevents broad generalizations.
Taneepanichskul S, 2001 [65]	PC; family planning clinic in Bangkok, Thailand.	Continuation of LNG IMP (Norplant® 6 rod system)	HIV+ postpartum women (mean age 24.9 ± 4.5 years) (n=88); 6 months	Continuation at 6 months: LNG IMP: 80/80 (100%) of women completing follow-up.	Common side-effects were irregular bleeding (50, 62.5%) & amenorrhea (26, 32.5%); no resultant method discontinuation reported. Major side effects included headache	Yes	No discontinuation or switching reported.	Relatively high loss to follow-up rate (10%) over 6 months. Small sample prevents broad generalizations.

Lead author, Year	Study Design & Location	Contra ceptive continuation outcome measure(s)	Inclus ion criteri a & sampl e size; durati on of follow- up	Method(s) used & continuation rates	Factors associated with contraceptive continuation	Met hod s given by study	Switching allowed? Rates of switching?	Limitations
					(12.5%), hair loss (8.7%), nausea (5%), & acne/chloasma (3.8%).			

C-IUD=copper intrauterine device; DMPA=depot medroxyprogesterone acetate; ETN

IMP=etonogestrel implant; HC=hormonal contraception; LNG-IUD=levonorgestrel intrauterine device; OCP=oral contraceptive pill;
PC=prospective cohort; STD=sexually transmitted diseases.

Table 3.

Evidence quality assessment for randomized controlled trials and observational cohorts with contraceptive continuation among HIV-positive women as the primary outcome measure and with a comparison group.

<i>Randomized controlled trials[‡]</i>								
Article	Intervention	Baseline Equivalence: Demographics	Baseline Equivalence Outcome Measure	Major Data Limitations	Participant Selection?	Control of Confounders?	Follow-up rate >75 %	Evidence Grade
Haddad et al., 2013 [54]	Yes	Yes	Yes	None	Convenience	Yes, in adjusted analysis	No (66–68%)	High
Haddad et al., 2013 * [55]	Yes	Yes	Yes	Method discontinuation/switching by report in some cases. Possible self-selection for participation due to method interest.	Convenience	Yes, in adjusted analysis	No (70–71%)	Moderate
Kakaire et al., 2015 Kakaire [50, 51]	Yes	Yes	Yes	Date of discontinuation by report in some cases.	Convenience	Yes, in adjusted analysis	Yes	High
Mark et al., 2007 [57]	Yes	Yes	Yes	Condom/OCP use by self-report, high incident pregnancy rate diminishes reporting validity. Smaller sample size than intended and unequal arm sizes. Randomization by day of presentation rather than blockrandomization.	Convenience	Partial: Current IUD or HC users not eligible; arm assignment concealed from clinic staff; however, allowed entry regardless of fertility intentions and not adjusted for in analysis.	% not give n but median F/U rate for 24 month cohort was approx. 14 months.	Low
Polis et al., 2014 [59]	Yes	Yes	Yes		Convenience	Yes, stratified by current/past/never users of injectable contraception	Yes	High
Stringer, et al., 2007, 2009 [48, 49]	Yes	Yes	No (Prior IUD use among HC arm more likely (2 vs. 0.3%))	HC arm allowed to switch HC methods Only postpartum women enrolled.	Convenience	Yes, actual use and time to change for high rates of method change analyzed.	68% HC arm, 77% IUD arm	Moderate
Viera et al., 2014; Ragazzini et al., 2016 [39, 40]	Yes	No	Unclear (no baseline comparison of contraceptive history or bleeding patterns)		Convenience	Partial: age adjustment only due to significant variance at baseline; prior contraceptive use or dysfunctional bleeding not considered.	Yes	Moderate

<i>Observational Cohorts</i> [§]									
Article	Representativeness of exposed cohort	Selection of non-exposed cohort	Determination of exposure	Assurance outcome not present at study start	Comparability based on design or analysis	Assessment of outcome	Adequate duration of follow-up (12 mos)	Follow-up rate 70 %	Evidence Grade
Balkus et al., 2007 [60]	Partial, those using method were those with access	Potential reporting bias to determine those using no method.	Self-report	Yes	No	Self-report	Yes	Yes	Low (3 stars)
Belzer et al., 2001 [52]	Partial; HIV risk as eligibility for HIV–subjective	Drawn from same community, but potential bias from differences in risk behavior.	Self-report	No	Yes, partial	Self-report	No	100% (purposive selection for retrospective analysis)	Low (3 stars)
Bengtson et al., 2013 [47]	Yes	N/A; comparison of continuation between methods	Study clinic record	Yes	Yes, complete	Chart review/self-report	Yes	Overall follow-up not reported; median F/U time 15 months.	Moderate (6 stars)
Beyeza-Kashesya et al., 2011 [53]	Yes	No	Clinic record	Yes	Yes, partial	Self-report	Yes	Yes	Moderate (6 stars)
Kancheva Landolt NK, et al. 2012 [56]	Yes	No	Self-report	No	No	Self-report	Yes	No	Low (2 stars)
Morrison et al., 2001 [58]	Yes; possible bias by retaining women with IUD>4 months.	Yes	Clinic record	Yes	Yes, complete	Clinic notes	Yes	No	Mod rate (7 stars)
Nanda et al., 2011 [46]	Partial, only those seroconverting from original cohort included in secondary analysis	No, participants largely using same methods at time of HIV diagnosis	Clinic record/report	N/A; outcome present at HIV diagnosis	Yes, partial	Chart review/self-report	Yes	N/A; HIV diagnosis time-varying occurrence so no set follow-up time.	Low (4 stars)

* Consulted Wall et al. and Stephenson et al. for background data on cohort characteristics and F/U rates.

[†]GRADE criteria

[§]Newcastle Ottawa Quality Assessment Scale