Postnatal retention in HIV care: insight from the Swiss HIV Cohort Study over a 15-year observational period*

K Aebi-Popp, R Kouyos, B Bertisch, C Staehelin, C Rudin, I Hoesli, M Stoeckle, E Bernasconi, M Cavassini, C Grawe, TD Lecompte, M Rickenbach, C Thorne, B Martinez de Tejada, and J Fehr for the Swiss Mother and Child HIV Cohort Study and the Swiss HIV Cohort Study†

1Division of Infectious Diseases, University Hospital Bern, Bern, Switzerland, 2Division of Infectious Diseases & Hospital Epidemiology, University Hospital Zurich, University of Zurich, Zurich, Switzerland, 3Division of Infectious Diseases, Cantonal Hospital St Gallen, St Gallen, Switzerland, 4University Children’s Hospital Basel, Basel, Switzerland, 5University Women’s Hospital Basel, Basel, Switzerland, 6Division of Infectious Diseases, University Hospital Basel, Basel, Switzerland, 7Division of Infectious Diseases, Regional Hospital, Lugano, Switzerland, 8Division of Infectious Diseases, University Hospital Lausanne, Lausanne, Switzerland, 9University Women’s Hospital Zurich, Zurich, Switzerland, 10Division of Infectious Diseases, University Hospital Geneva, Geneva, Switzerland, 11Data Centre of the Swiss HIV Cohort Study, Institute for Social and Preventive Medicine, University of Lausanne, Lausanne, Switzerland, 12Population, Policy and Practice Programme, UCL Institute of Child Health, University College London, London, UK and 13Department of Obstetrics and Gynaecology, University Hospitals of Geneva and Faculty of Medicine, Geneva, Switzerland

Objectives
The aim of this study was to quantify loss to follow-up (LTFU) in HIV care after delivery and to identify risk factors for LTFU, and implications for HIV disease progression and subsequent pregnancies.

Methods
We used data on pregnancies within the Swiss HIV Cohort Study from 1996 to 2011. A delayed clinical visit was defined as >180 days and LTFU as no visit for >365 days after delivery. Logistic regression analysis was used to identify risk factors for LTFU.

Results
A total of 695 pregnancies in 580 women were included in the study, of which 115 (17%) were subsequent pregnancies. Median maternal age was 32 years (IQR 28–36 years) and 104 (15%) women reported any history of injecting drug use (IDU). Overall, 233 of 695 (34%) women had a delayed visit in the year after delivery and 84 (12%) women were lost to follow-up. Being lost to follow-up was significantly associated with a history of IDU [adjusted odds ratio (aOR) 2.79; 95% confidence interval (CI) 1.32–5.88; P = 0.007] and not achieving an undetectable HIV viral load (VL) at delivery (aOR 2.42; 95% CI 1.21–4.85; P = 0.017) after adjusting for maternal age, ethnicity and being on antiretroviral therapy (ART) at conception. Forty-three of 84 (55%) women returned to care after LTFU. Half of them (20 of 41) with available CD4 had a CD4 count <350 cells/µL and 15% (six of 41) a CD4 count <200 cells/µL at their return.

Conclusions
A history of IDU and detectable HIV VL at delivery were associated with LTFU. Effective strategies are warranted to retain women in care beyond pregnancy and to avoid CD4 cell count decline. ART continuation should be advised especially if a subsequent pregnancy is planned.

Correspondence: Dr Karoline Aebi-Popp, Department of Infectious Diseases, University Hospital Bern, CH-3010 Bern, Switzerland. Tel: +41 31 632 2745; fax: +41 31 632 31 76; e-mail: karoline.aebi-popp@insel.ch

*The data in this article were presented, in part, at the International Congress on Drug Therapy in HIV Infection, 2–6 November 2014, Glasgow, UK.
†See Appendix.
Introduction

Prevention of mother to child transmission (PMTCT) of HIV is the ‘gateway’ to HIV treatment and care for pregnant women newly diagnosed with HIV infection and a chance to re-engage for those who have previously lost contact with HIV services. The majority of women living with HIV are of childbearing age [1] and are seeking care during pregnancy. The use of combined antiretroviral therapy (ART) for PMTCT has reduced the rates of perinatal HIV infections from 20–30% to <0.5% [2–4], and HIV-infected women are generally very motivated to adhere to ART during pregnancy to protect their offspring [5]. However, the opportunity to preserve their health is lost if women are not retained in HIV care after delivery. According to current data, partly based on research from resource-limited settings, competing factors such as family, work and child care commitments can interfere with continuity of care for women who engaged in HIV treatment during their pregnancy [6–9]. If women need to continue ART postpartum for their own health, measurement of loss to follow-up (LTFU) is one of the key indicators for the effectiveness of an ART programme and there has been growing interest in LTFU as a cohort outcome for childbearing women [10,11]. Retaining women in care beyond delivery not only has a potential benefit for their HIV-related health but also allows referral to linked services, including gynaecological screening and family planning, and avoidance of an increased risk of HIV transmission to future sexual partners. Therefore, efforts to improve retention in care are essential to preserve maternal health and prevent adverse outcomes of subsequent pregnancies [5,12–14].

In 2012, the World Health Organization (WHO) declared the option B+ as the recommended strategy in all settings. This entails lifelong continuation of triple combination ART after pregnancy and the postpartum period [15]. In this context, it is crucial to understand risk factors for the high rates of disengagement from treatment and care services for HIV-infected women after delivery in resource-limited and resource-rich settings [7,8,13].

The aim of this study was to evaluate the proportion of women in the Swiss HIV Cohort Study (SHCS) who were lost to follow-up in HIV care after pregnancy and delivery. Secondary aims were to analyse risk factors and possible reasons for not attending specialized HIV services after having a baby and the impact of being lost to follow-up on viral load (VL) and CD4 cell count development in the mother.

Methods

Study population and data collection

The SHCS is a multicentre observational study for interdisciplinary HIV research in Switzerland. Since 1988, HIV-positive adults have prospectively and continuously been enrolled and followed at seven cohort centres, affiliated hospitals and private practices collaborating with the centres. Over 18 000 HIV-infected individuals have been included since, corresponding to approximately 70% of all HIV-infected individuals in Switzerland (for more details, consult http://www.shcs.ch). At a semi-annual follow-up structured anamnestic, clinical and laboratory data are obtained. Clinicians or study nurses collect data on sociodemographic and clinical characteristics, ART, comorbidities including injecting drug use (IDU) and noninjecting drug use and comedications based on a predefined questionnaire. Results for CD4 cell count and HIV VL tests, performed at routine follow-up visits, are collected at least every 6 months. Patients who do not attend follow-up visits are actively traced and re-invited to attend by letter. The cohort study has been approved by all local ethical committees and written informed consent was obtained from all participants. The Swiss Mother and Child HIV Cohort Study (MoCHIV) contains detailed information about pregnancy, delivery and the newborn and is fully integrated in the SHCS. In contrast to most national HIV pregnancy cohorts, longitudinal data for the postpartum period are therefore available. We included all deliveries between 1 January 1996 and 31 December 2011 for which information about medical follow-up after delivery was available.

Outcome variables and definitions

CD4 cell count was categorized as <200, 200–349, 350–499, ≥500 cells/μL. The last VL obtained during pregnancy and within 8 weeks prior to delivery was considered as the VL at delivery. Gestational age was reported to the nearest completed week based on ultrasound or last menstrual period. The first trimester was defined as 1–12 weeks, the second trimester as 13–27

Keywords: HIV, lost to follow-up, pregnancy, retention in care

Accepted 25 June 2015
weeks, and the third trimester as 28 weeks of gestation onwards. The period of interest was the period after delivery and the main outcome was the time interval between clinical visits in the year after delivery. Our analysis included deliveries up to 30 December 2011 to exclude women who were last seen in 2012 as their follow-up status would be incomplete at database closure in December 2014. We used the following definitions for postnatal follow-up: delayed clinical visit was defined as more than 180 days without contact with HIV services since the last clinical encounter after delivery in the year following delivery. For the definition of an LTFU event, we used a period of more than 365 days with no contact with HIV medical care in the year following delivery.

Statistical methods

We analysed data for women with intervals of >180 or 365 days between clinical visits during the first year after delivery. Women who re-presented to services after an LTFU period of > 365 days were included in the analysis as a subgroup to identify reasons for their re-presentation and to assess their clinical status. We assessed factors associated with an LTFU event with univariable and multivariable logistic regression. These models were also used to assess time trends in retention in care by including calendar year as a covariate. The factors affecting CD4 values at a subsequent pregnancy (such as ART between pregnancies, time between pregnancies, and CD4 count at first pregnancy) were assessed using univariable and multivariable linear regression models. A \( P \)-value of <0.05 was considered to represent a statistically significant difference. We used STATA version 13.1 (StataCorp, College Station, TX) for data management and analyses.

Results

Characteristics of pregnancies in HIV-infected women

There were 738 deliveries reported, of which 43 were excluded because the delivery took place outside the time of SHCS participation. Clinical and demographic characteristics for 695 pregnancies in 580 women included in this study are presented in Table 1 according to follow-up status. Median maternal age at delivery was 32 years (interquartile range (IQR) 28–36 years), and 104 (15%) births were to women who had reported a history of IDU. The majority of women (504; 73%) had received their HIV diagnosis before pregnancy, most of whom (446 of 504; 88%) had been diagnosed with HIV infection more than 2 years before pregnancy and two-thirds of whom (321 of 504; 64%) were already on ART at the time of conception.

Among women diagnosed before pregnancy, the percentage on ART at conception increased over time from 48% for the years 1996–1999 to 60% for 2000–2003, 64% for 2004–2007 and 74% for 2008–2011 (\( P_{\text{trend}} < 0.001 \)).

The sequence of HIV-related care

Figure 1 summarizes data on clinical visits for deliveries between 1996 and 2011, from HIV diagnosis to retention in care after delivery. The last HIV-related clinical visit prior to conception of known HIV-positive women took place during the last 3 months before conception in two-thirds (357 of 524; 69%) of women. However, 62 (12%) of them had their last HIV visit more than 6 months before becom-
ing pregnant. The overall mother to child transmission (MTCT) rate was 2.1% during the years 1996–2011, dropping from 3.6% in 1996–2004 to 0.9% in 2005–2011. There was a trend towards a higher MTCT rate in women who were lost to follow-up after delivery (3.7%) than in those retained in care (1.9%), although this difference did not reach statistical significance ($P = 0.2$). Among births with known information on continuation of ART after delivery (659), therapy was stopped after delivery in 23.7% of cases. However, there was a decreasing proportion of women who stopped their ART after delivery over calendar years, from 28% and 29% for 1996–1999 and 2000–2004, respectively, to 23% for 2005–2009 and 11% in 2010–2011, partly reflecting the changes in recommendations for ART over time.

Factors associated with loss to follow-up

Overall, there were 233 of 695 (33.5%) births with an interval to the first follow-up visit after delivery of > 180 days in the year after delivery, including 84 (12.1% of total) who were lost to follow-up for > 365 days. Table 2 presents the results of adjusted and unadjusted analyses of factors associated with being lost to follow-up. The proportion of women lost to follow-up was lower among women already on ART at conception compared with women who initiated ART during pregnancy (odds ratio (OR) 0.57; 95% confidence interval (CI) 0.35–0.92; $P = 0.02$). There was no influence of maternal age, ethnicity or timing of maternal HIV diagnosis. However, being lost to follow-up was significantly associated with IDU history (adjusted odds ratio (aOR) 2.79; 95% CI 1.32–5.88; $P = 0.007$) and not achieving an undetectable HIV VL at delivery (aOR 2.42; 95% CI 1.21–4.85; $P = 0.017$) after adjusting for maternal age, ethnicity, IDU history and being on ART at conception. In a sensitivity analysis (Table S1), we additionally adjusted for the date of delivery and found qualitatively similar results, the main difference being that the association between VL at birth and LTFU reached only the trend level of significance (OR 1.93; 95% CI 0.92–4.1; $P = 0.09$). This analysis also revealed that a later year of delivery was strongly associated with decreasing rate of LTFU ($P = 0.002$; see Table S1 for ORs).

![Fig. 1 Pregnancies of HIV-infected women in the period 1996–2011 and subsequent clinical visits in HIV care (n = 695). LTFU, loss to follow-up (> 365 days).](image)

Table 2 Factors associated with loss to follow-up (LTFU)

<table>
<thead>
<tr>
<th>Factor</th>
<th>OR (95% CI)</th>
<th>P-value</th>
<th>Adjusted OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17–24 years</td>
<td>1</td>
<td>0.690</td>
<td>1</td>
<td>0.791†</td>
</tr>
<tr>
<td>25–32 years</td>
<td>2.65 (0.79, 8.93)</td>
<td></td>
<td>2.95 (0.85, 10.16)</td>
<td></td>
</tr>
<tr>
<td>&gt;32 years</td>
<td>2.12 (0.62, 7.20)</td>
<td></td>
<td>2.14 (0.59, 7.71)</td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>0.56 (0.33, 0.96)</td>
<td></td>
<td>0.83 (0.42, 1.63)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>0.27 (0.06, 1.15)</td>
<td></td>
<td>0.36 (0.08, 1.68)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>0.61 (0.14, 2.74)</td>
<td></td>
<td>0.83 (0.17, 4.04)</td>
<td></td>
</tr>
<tr>
<td>History of IDU</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>&lt;0.001</td>
<td></td>
<td>1</td>
<td>0.007</td>
</tr>
<tr>
<td>Yes</td>
<td>2.93 (1.62, 5.29)</td>
<td></td>
<td>2.79 (1.32, 5.88)</td>
<td></td>
</tr>
<tr>
<td>VL at delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undetectable</td>
<td>1</td>
<td>0.009</td>
<td>1</td>
<td>0.017</td>
</tr>
<tr>
<td>Detectable</td>
<td>2.54 (1.32, 4.88)</td>
<td></td>
<td>2.42 (1.21, 4.85)</td>
<td></td>
</tr>
<tr>
<td>ART at conception</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>0.132</td>
<td></td>
<td>1</td>
<td>0.125</td>
</tr>
<tr>
<td>Yes</td>
<td>0.67 (0.39, 1.13)</td>
<td></td>
<td>0.63 (0.35, 1.14)</td>
<td></td>
</tr>
</tbody>
</table>

†Test for trend.
ART, antiretroviral therapy; CI, confidence interval; IDU, injecting drug use; OR, odds ratio; VL, viral load.
in the univariable analysis but that this effect became weaker ($P = 0.07$) in the multivariable model, suggesting that this time effect is partly mediated by changes in other cofactors (in particular the frequency of IDU).

Clinical, immunological and virological characteristics of women re-presenting to care after being lost to follow-up

Forty-six (55%) of 84 women who were lost to follow-up subsequently returned to clinical care (median time interval 688 days; IQR 476–1309 days). There was no association between being completely lost to follow-up (as opposed to returning after >365 days) and ethnicity, maternal age, CD4 cell count at delivery, VL at delivery, time of HIV diagnosis or report of IDU (data not shown). Among those who did not return, 16 women (42.1%) did not respond to invitations, eight (21.1%) had emigrated, five had stopped participation in the SHCS, four had changed clinic/physician and three had died within 1 year after delivery (the reason for no return in two cases was unknown). The three deaths occurred in the years 1999, 2001 and 2004: one was attributable to end-stage AIDS, one to pneumonia and one to unknown circumstances.

Half of the women with a documented CD4 cell count at their return after LTFU (20 of 41) had CD4 counts < 350 cells/μL and 15% (six of 41) had CD4 counts < 200 cells/μL. The median difference between CD4 cell counts at delivery and at return after LTFU was a loss of 80 cells/μL (IQR −230 to 30) (Fig. 2). More than two-thirds (70%; 19 of 27) of women had a decrease in their CD4 count during their CD4 count period ($P = 0.05$; signed-rank test) and in 30% (eight of 27) the CD4 count decrease was > 200 cells/μL. The first measurement of VL at their return was < 400 HIV-1 RNA copies/ml in nine women (23%), between 400 and 1000 copies/ml in four (10%) and > 1000 copies/ml in the majority (27; 68%) of women.

Subsequent pregnancies

A total of 115 subsequent pregnancies (115 of 695; 17%) were reported overall in this cohort. There was no difference in the proportion of women with undetectable VL at the subsequent delivery between women with delayed follow-up and those with continuous follow-up after pregnancy (data not shown). However, while 9% (nine of 105) of the women with regular follow-up after their first pregnancy were lost to follow-up after their subsequent pregnancy, the number increased to 40% (four of 10) in the case of LTFU after the first pregnancy ($P = 0.014$).

The median inter-pregnancy interval was 990 days (IQR 693–1455 days). Women who had stopped ART after delivery had a mean CD4 count decline of 170 cells/μL at their first measurement during the subsequent pregnancy compared with the last measurement in the index pregnancy. In contrast, women continuing ART postpartum had a mean increase in CD4 count of 58 cells/μL compared with the last measured CD4 count around delivery of the index pregnancy ($P < 0.001$).

Discussion

In Europe, the unproblematic access to drugs for effective control of HIV infection, resulting in a nearly normal life expectancy and very low rates of MTCT of HIV under optimal circumstances, encourages HIV-infected women to have children. However, our study demonstrates that follow-up of women with HIV infection is insufficient after delivery. We found that 34% of women had a delayed clinical visit in HIV care of > 180 days and 12% were lost to follow-up in HIV care for more than 1 year after delivery. In our analysis of data for childbearing women, a history of IDU and a failure to suppress viral replication by delivery were associated with an increased risk of dropping out of HIV care. This reflects an increased disengagement of women with greater social vulnerability and of those who were less adherent to ART during pregnancy and/or presented late during pregnancy with delays in combination antiretroviral therapy (cART) initiation. Interestingly, ethnicity was not associated with higher rates of LTFU. Women who started ART during pregnancy were also more likely to disengage from postnatal HIV care compared with women who were on ART before pregnancy.

The last finding is consistent with results of a South African study, where LTFU was associated with initiation of ART during pregnancy [16]. These results highlight the importance of evaluating and observing readiness for therapy in an individual patient. According to different European guidelines, which vary between countries, ART...
should be started during pregnancy at around 14–26 weeks of gestation depending on VL [17]. In order to prevent MTCT of HIV, the decision to start ART in time is crucial and there should be optimal support for the patient to achieve this goal. In addition, pregnant women who start ART for PMTCT only constitute a special HIV treatment group having ‘baby’s health’ as their main motivation for adherence during pregnancy. As a consequence of this, asymptomatic HIV-infected women with high CD4 cell counts, and therefore lacking a strict indication to start ART, might decide to discontinue not only the medication but also HIV care in the postpartum period.

Results related to medical appointment attendance after childbirth in HIV-infected women across the world vary considerably. In a study from Texas, LTFU rates (defined as no visit in the first year after delivery) were 39% and were associated with younger age, black race and late entry to prenatal care [18]. A report from France showed that 14% of women attended clinical visits irregularly after childbirth (fewer than four visits in 2 years) and 11% attended less than once per year [19]. However, comparison is difficult as the definition of LTFU in the postpartum period differs between studies. We applied the two most commonly used definitions of no visit for 180 and 365 days in our study.

Higher rates of postnatal LTFU have been described in African countries: a study from South Africa [8] reported that LTFU was 47.9% (95% CI 41.2–54.6%) within 6 months after delivery, and 57.5% (95% CI 51.6–63.3%) of women were lost between HIV testing and 6 months post-delivery. In another South African study, Wang et al. showed that younger age (≤ 30 years) [hazard ratio (HR) 2.14; 95% CI 1.05–4.38] and being pregnant (HR 3.75; 95% CI 1.53–9.16) were significantly associated with higher LTFU rates [9]. Kaplan et al., in another study in South Africa, reported that pregnant women had a substantially higher risk of LTFU both pretreatment and on-treatment compared with non-pregnant women [20]. In Tanzania, poor linkage of HIV-infected women to the HIV clinic was documented in a recent study [21]: of those who tested positive at antenatal clinics, only an estimated 51% attended their referral to an HIV clinic and only 18% of the women eligible for ART received this within 4 months after delivery. Distance to the clinic, transportation costs, travel and non-disclosure were cited as the most common reasons for missed visits in sub-Saharan settings.

In our cohort, one-quarter of women stopped their ART after delivery. In Europe, repeated pregnancies in HIV-infected women after diagnosis are common, and monitored within well-established PMTCT programmes. Data from the UK and Ireland showed that the proportion of subsequent pregnancies increased from 20.3% (32 of 158) in 1997 to 38.6% (565 of 1465) in 2009 (P < 0.001) [22]. We found that 17% of women in our cohort had a subsequent pregnancy. A recent study from the UK showed that HIV-infected women not on ART at conception of their second pregnancy were nearly five times more likely to have a detectable VL at delivery, the pre-eminent risk factor for MTCT [23]. This implies that lack of continuity between antenatal and general HIV care and long periods of LTFU after childbirth can cause delays in women re-accessing HIV care and starting ART during their subsequent pregnancy.

Another important finding in our study was that half of our patients who returned after LTFU after delivery for > 1 year had a CD4 count < 350 cells/μL. This shows that women with LTFU after delivery are at an increased risk with respect to their own health as they miss regular monitoring to ensure that treatment is started in a timely manner once it is indicated by reaching the CD4 threshold or because of HIV-associated diseases even at high CD4 counts. The UK and Ireland National Study of HIV in Pregnancy and Childhood showed that nearly 40% of women had an immunological indication for ART at the start of their second pregnancy, of whom nearly half had reported CD4 counts ≥ 350 cells/μL at their first pregnancy [23]. A Brazilian study revealed that a baseline CD4 cell count of 200–500 cells/μL was a significant predictor of progressing to clinical WHO stage 2 and 3 for women who stopped ART after delivery [24]. These data gave rise to the question of whether women should continue ART after delivery if they were planning to have more children in the future and if they were motivated to do so. This was one of the rationales for option B+ for countries in which access to care and laboratory facilities is limited. WHO option B+ calls for the administration of combined ART to all pregnant HIV-infected women regardless of CD4 cell count and lifelong continuation of therapy [15]. Another important reason to continue ART is to protect their negative sexual partners; VL rebound after stopping ART is associated with an increased risk of HIV transmission to negative partners [25]. Option B+ has not been routinely applied in Europe to date, where an individual decision about treatment continuation is taken. In Switzerland, the physician’s decision to discontinue treatment after delivery is based on clinical performance, nadir CD4 cell count, VL, their judgement about the patient’s readiness and ability to adhere to ART and patient preferences. According to our findings, interventions to keep postpartum women in care are crucial. Our data provide good reasons to apply option B+ also in the setting of the SHCS, alongside specifically targeted and intensified counselling efforts (according to the algorithm for assessing readiness to start and continue on ART proposed by the European Aids Clinical Society.
(26) in the identified risk groups, namely women with a new HIV diagnosis during pregnancy and women with a history of IDU.

This study has several limitations. First, it is possible that some patients who dropped out of the SHCS might have continued care in other facilities not reporting to the SHCS. However, most Swiss HIV specialists are linked to the SHCS and generally report this change of HIV care and this should not affect many women regarding their follow-up status. Secondly, for treated women who are highly adherent, the gap of 6 months between two clinical visits may not have relevant implications for their health. We therefore included a second and broader definition of LTFU of no visit for > 1 year in our study. Some patients could not be contacted, probably because of a change of address or migration.

The strengths of the study include the availability of 15 years of longitudinal high-quality data from the SHCS and the Swiss MoCHIV study, allowing analysis of information before and after delivery and data on subsequent pregnancies. The full integration of a pregnancy cohort into a prospective adult HIV-infected cohort is unique, to our knowledge. This study can therefore provide more insight into the question of the mother’s engagement in HIV care beyond pregnancy.

Future considerations

There is a need to optimize interventions to counsel women regarding the importance of postnatal retention in HIV care. In view of the recent development reflected in different updated treatment guidelines to treat virtually all HIV-infected individuals, we would like to stimulate the discussion to explore scenarios of option B+ also outside resource-limited settings.

Acknowledgements

Members of the study groups of the Swiss Mother and Child HIV Cohort Study and the Swiss HIV Cohort Study contributed to data collection and article review. All centres collected data for the Swiss Mother and Child HIV Cohort Study for the Swiss HIV Cohort Study. We thank all the participant patients and their partners.

Source of funding: This study was financed in the framework of the Swiss HIV Cohort Study (SHCS), supported by the Swiss National Science Foundation (SNF) (grant 33CS30_134277; SHCS project #736). RK was supported by SNF#PZ00P3-142411.

Conflict of interests: KA-P has received travel grants from Abbvie and Bristol-Myers Squibb. EB is a member of advisory boards of Abbvie, Bristol-Myers Squibb, Gilead Sciences, Merck Sharp & Dohme, Janssen, and ViiV Healthcare. He has received travel grants from Gilead Sciences, Bristol-Myers Squibb, and Merck Sharp & Dohme. BB has been a member of advisory boards for Gilead Sciences and Bristol-Myers Squibb. She has received travel grants from Abbvie, Bristol-Myers Squibb, Gilead Sciences, Janssen, Merck Sharp & Dohme and ViiV Healthcare. MC has been a member of advisory boards for Abbvie, Bristol-Myers Squibb, Boehringer-Ingeheim, Gilead, Merck Sharp & Dohme and ViiV Healthcare and has received travel grants from Bristol-Myers Squibb and Gilead. JF is a member the Federal Commission of Sexual Health, and he is also member of the advisory boards of Abbvie, Boehringer-Ingeheim, Bristol-Myers Squibb, Gilead Sciences, Merck Sharp & Dohme, Janssen, Roche, and ViiV Healthcare. He has received restricted/unrestricted grants and travel grants from Abbvie, Boehringer-Ingeheim, Bristol-Myers Squibb, Gilead Sciences, Merck Sharp & Dohme, Janssen, Roche and ViiV Healthcare. CG has received travel grants from Janssen. IH and MR have no conflicts of interest to declare. TL has received travel grants from Abbvie and MSD and board membership grants from Bristol-Myers Squibb. CR has received unrestricted grants from ViiV Healthcare and has been a member of advisory boards for Janssen. CS has been a member of advisory boards for Gilead Sciences, Abbvie and Merck Sharp & Dohme. She has received travel grants from Gilead Sciences, Janssen Cilag and Merck Sharp & Dohme. CT has received funding from AbbVie, UNICEF, the European Union Framework 7, the UK Medical Research Council and Public Health England (grants and consultancies).

Author contributions

KAP, RK, JF, BB, CT, CR, BMT and CS contributed to study conception, study design, study performance, data analysis and article writing. KAP, RK, JF, CT CS, BB and MR contributed to study conception and article review. All authors were involved in data interpretation and revised the article critically.

Appendix: members of the Swiss HIV Cohort Study (SHCS)

References


Supporting information
Additional Supporting Information may be found in the online version of this article at the publisher’s web-site:

Table S1. Factors associated with loss to follow-up (LTFU)-Sensitivity analysis.