The European Journal of Public Health, Vol. 28, No. 1, 55–60

doi:10.1093/eurpub/ckx048 Advance Access published on 25 April 2017

Migrant women living with HIV in Europe: are they facing inequalities in the prevention of mother-to-child-transmission of HIV?

The European Pregnancy and Paediatric HIV Cohort Collaboration (EPPICC) study group in EuroCoord*

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*This project forms part of the EuroCoord Migrants Work Package (WP14). The members of the EPPICC study group in EuroCoord are listed in the Funding.

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Background: In pregnancy early interventions are recommended for prevention of mother-to-child-transmission (PMTCT) of HIV. We examined whether pregnant women who live with HIV in Europe and are migrants encounter barriers in accessing HIV testing and care. **Methods:** Four cohorts within the European Pregnancy and Paediatric HIV Cohort Collaboration provided data for pooled analysis of 11 795 pregnant women who delivered in 2002–12 across ten European countries. We defined a migrant as a woman delivering in a country different from her country of birth and grouped the countries into seven world regions. We compared three suboptimal PMTCT interventions (HIV diagnosis in late pregnancy in women undiagnosed at conception, late anti-retroviral therapy (ART) start in women diagnosed but untreated at conception and detectable viral load (VL) at delivery in women on antenatal ART) in native and migrant women using multivariable logistic regression models. **Results:** Data included 9421 (79.9%) migrant women, mainly from sub-Saharan Africa (SSA); 4134 migrant women were diagnosed in the current pregnancy, often (48.6%) presenting with CD4 count <350 cells/μl. Being a migrant was associated with HIV diagnosis in late pregnancy [OR for SSA vs. native women, 2.12 (95% CI 1.67, 2.69)] but not with late ART start if diagnosed but not on ART at conception, or with detectable VL at delivery once on ART. **Conclusions:** Migrant women were more likely to be diagnosed in late pregnancy but once on ART virological response was good. Good access to antenatal care enables the implementation of PMTCT protocols and optimises both maternal and children health outcomes generally.

Introduction

In pregnant women with HIV, antenatal anti-retroviral therapy (ART) is crucial for viral suppression during pregnancy and at delivery and the prevention of mother-to-child-transmission (PMTCT).[1] It is recommended that women conceiving on ART should continue ART during pregnancy and that those untreated at conception—i.e. women who are newly HIV-diagnosed in pregnancy and those already HIV-diagnosed but not treated—should start ART in early pregnancy.[2] To ensure prompt antenatal ART start in women who are undiagnosed at conception it is recommended that HIV screening should be performed in early pregnancy.

Migrant populations living in Europe are disproportionally affected by HIV[3] but may face barriers in accessing HIV testing and care,[4–6] including pregnant women. Migrant women may be less likely to receive optimum antenatal care than native women,[7,8] potentially leading to delayed HIV diagnosis and delayed ART start with negative implications for mother-to-child-transmission (MTCT) risk and maternal health.

We aimed to assess whether migrant women with HIV encounter barriers in accessing HIV testing and care during pregnancy using contemporary data across several European countries. To do so, we compared three markers of suboptimal PMTCT interventions in migrant and native women: HIV diagnosis in late pregnancy in women undiagnosed at conception, late ART start in women diagnosed but untreated at conception and detectable viral load (VL) at delivery in women on antenatal ART. Late ART start in women diagnosed but not treated at conception may reflect challenges in retention in HIV care and suboptimal adherence,[9–12] whilst a detectable VL at delivery is a surrogate indicator of MTCT risk and delayed ART start.[13]

We addressed these objectives using data from 2002 to 2012 in the European Pregnancy and Paediatric Cohort Collaboration (EPPICC) in EuroCoord, a large collaboration of HIV observational studies in pregnant women and children.[14]

Methods

Study design and participants

Four cohorts across 10 European countries participating in EPPICC provided data on pregnancies of women diagnosed with HIV before

or during pregnancy. The western arm (which included Belgium, Denmark, Germany, Italy, Netherlands, Poland and Sweden) of the European Collaborative Study, the UK and Ireland National Study of HIV in Pregnancy and Childhood (NSHPC), NENEXP (Spain) and the Madrid Cohort of HIV-Infected Mother–Infant Pairs (Spain) submitted data on eligible pregnancies using a standardised format (modified HIV Collaboration Data Exchange Protocol, http://www.hicdep.org) to the coordinating centre. Each participating study centre was responsible for ensuring that ethics approval for the data merger and analysis was in place and for compliance with local and national data protection requirements.

We included women who delivered a singleton live birth in the cohort countries between 2002 and 2012; if a woman had repeated pregnancies during the study period, we included only the first one. We excluded women whose country of birth was unknown (445). We defined a migrant as a woman who delivered in a country different from her country of birth and a native (NAT) as a woman who delivered in her country of birth. We grouped countries of birth into seven world regions based on UN grouping categories:[15] Western Europe and other Western countries, including North America, Australia and New Zealand (WEWC), Eastern Europe (EE), North Africa and The Middle East (NAME), Sub-Saharan Africa (SSA), Latin America (LA), The Caribbean (CRB), Asia and Oceania (excluding Australia and New Zealand) (ASIA/OC).

Statistical analysis

We compared three markers of suboptimal PMTCT interventions in migrant and native women: (i) diagnosis in late pregnancy in women who were undiagnosed at conception; (ii) late ART start in women who were diagnosed and untreated at conception; (iii) detectable VL at delivery (up to 28 days before and 7 days after delivery) in women who were on ART in pregnancy and delivered at ≥37 gestation weeks (GW) to exclude pregnancies with short ART duration because of pre-term delivery.

We used 200 copies/ml as the cut-off for VL detectability due to changing use of assays with different detection limits over the study period. For similar reasons (i.e. changing guidelines over time and across European countries[9]), we defined a diagnosis in late pregnancy as a diagnosis at ≥20 GW and a late ART start as initiation after 28 GW. We defined the first CD4 count measured in pregnancy as the baseline CD4 count and assumed a baseline CD4 count < 350 cells/μl at antenatal diagnosis to be an indicator of late presentation for HIV care and a CD4 count < 200 cells/μl an indicator of advanced HIV disease.[16]

We fitted logistic regression models to investigate whether maternal region of birth was a factor associated with the above-mentioned markers of suboptimal PMTCT intervention. We adjusted the analyses for other factors known to be associated with late antenatal care presentation:[1] year of delivery (2002–06 vs. 2007–12), maternal age (in tertiles <28, 28–33, >33 years), parity at enrolment (no/yes), HIV transmission mode [injecting drug use (IDU), heterosexual, other/unknown] and country of delivery (Spain, UK/Ireland and other European countries). In addition, the analysis on VL at delivery included *a priori* the following factors associated with VL suppression:[17–19] time of ART initiation in pregnancy, baseline CD4 count and combination ART (≥three ART drugs) vs. a mono-dual ART (<3 ART drugs) regimen. Chi-square tests were performed to assess whether differences in proportions between native and migrant women were statistically significant ($P < 0.05$). Likelihood ratio test was used to determine if transmission category modified the association between diagnosis in late pregnancy and being a migrant woman.

Statistical analyses were carried out using STATA v13.1 software (Stata Corp, College Station, TX, USA).

Results

Characteristics of participants

There were 11 795 women who delivered a singleton live birth between 2002 and 2012. Of these women, 1188 (10.1%) delivered in Spain, 9317 (79.0%) in UK/Ireland and 1290 (10.9%) in other European countries; 9421 (79.9%) were migrants. The proportion of migrant women increased from 76.3% in 2002–06 to 83.8% in 2007–12. The most prevalent region of birth was SSA (8151, 69.1%); other regions of birth represented <3% each of all women but these proportions varied across European countries. In Spain, 20.7% of women were from SSA, 9.8% from LA and 62.9% were native. Maternal characteristics by world region of birth are presented in table 1.

Most women (9817, 83.2%) had acquired HIV heterosexually; among native women and women from WEWC, IDU acquisition was relatively common (21.1 and 16.8%, respectively). Overall, 152 women (1.3% of the whole dataset) were reported as being vertically infected, mainly native women (85) and women from SSA (55). Gestational age at delivery was available for 11 506 pregnancies, of which 14.8% (1704) were pre-term. Native women were more likely to deliver pre-term than migrant women (19.5 vs. 13.6%, $P < 0.001$).

Between 2002 and 2012, the MTCT rate declined from 1.78% (95% CI 1.07, 2.78) to 0.70% (95% CI 0.23, 1.63). There was no difference between the unadjusted MTCT rates in migrant and native women [0.96% (95% CI 0.77, 1.17) vs. 1.22% (0.82, 1.75) respectively, $P = 0.25$].

Markers of suboptimal PMTCT interventions

Of the 11 795 women, we identified 4797 women who were diagnosed in pregnancy; 31.9% (1529) of them were diagnosed at ≥20 GW, with this proportion varying by region of birth (table 2). We further identified 2253 women who were diagnosed and untreated at conception and who started ART during their pregnancy; 13.1% (295) of them started ART at >28 GW.

Migrant women were more likely to be HIV-diagnosed during pregnancy than native women [4134/9421 (43.9%) vs. 663/2374 (27.9%), $P < 0.001$] (maternal characteristics in Supplementary table S1). At antenatal diagnosis migrant women were also more likely to have CD4 < 350/μl (48.6 vs. 29.5%, $P < 0.001$) and more likely to have CD4 < 200 cells/μl (20.0 vs. 9.3%, $P < 0.001$). The proportions of women with low CD4 count at antenatal HIV diagnosis by region of birth are given in figure 1.

Native women were more likely to be diagnosed but untreated at conception than migrant women [602/2374 (25.4%) vs. 1651/9421 (17.5%); $P < 0.001$] (maternal characteristics in Supplementary table S2).

HIV diagnosis in late pregnancy in women undiagnosed at conception

Migrant women were more likely to be diagnosed in late pregnancy than native women [1367/4134 (33.1%) vs. 162/663 (24.4%), $P < 0.001$]. The proportion of those diagnosed in late pregnancy was highest among women from NAME (15/33, 45.5%) and lowest among women from WEWC (21/111, 18.9%) (table 2, Supplementary table S1). Analysis stratified by transmission mode ($P_{interaction} = 0.0087$) and adjusted for calendar year, age at delivery, country of delivery and parity indicated that women from EE, NAME and SSA were more likely to be diagnosed in late pregnancy compared with native women (women who acquired HIV by heterosexual mode only—table 3). The risk increased if a woman was parous, younger than 28 years, delivered before 2007 and in Spain. The small number of migrant women who acquired HIV by IDU and were diagnosed in late pregnancy ($n = 10$) precluded further analysis.

Table 1 Maternal characteristics of all women by world region of birth[a]

	NAT	WEWC	EE	NAME	SSA	LA	CRB	ASIA/OC	Total
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)
	2374 (20.1)	274 (2.3)	188 (1.6)	79 (0.7)	8151 (69.1)	198 (1.7)	252 (2.1)	279 (2.7)	11 795 (100.0)
Country of delivery									
Spain	747 (31.5)	5 (1.8)	27 (14.4)	21 (26.6)	246 (3.0)	116 (58.6)	22 (8.7)	4 (1.4)	1188 (10.1)
UK/Ireland	1235 (52.0)	248 (90.5)	109 (58.0)	31 (39.2)	7194 (88.3)	39 (19.7)	226 (89.7)	235 (84.2)	9317 (79.0)
Other[b]	392 (16.5)	21 (7.7)	52 (27.7)	27 (34.2)	711 (8.7)	43 (21.7)	4 (1.6)	40 (14.3)	1290 (10.9)
Year of delivery									
2002-2006	1466 (61.8)	116 (42.3)	70 (37.2)	49 (62.0)	4091 (50.2)	110 (55.6)	134 (53.2)	141 (50.5)	6177 (52.4)
2007-2012	908 (38.3)	158 (57.7)	118 (62.8)	30 (38.0)	4060 (49.8)	88 (44.4)	118 (46.8)	138 (49.5)	5618 (47.6)
Parity (*n* = 11 652)									
Yes	1205 (52.2)	114 (41.8)	59 (33.0)	40 (52.6)	4430 (54.7)	110 (59.8)	158 (63.5)	131 (47.5)	6247 (53.6)
Number of ART drugs in pregnancy									
<3 ART	280 (11.8)	23 (8.4)	19 (10.1)	6 (7.6)	594 (7.3)	16 (8.1)	23 (9.1)	16 (5.7)	977 (8.3)
≥3 ART	1939 (81.7)	242 (88.3)	154 (81.9)	67 (84.8)	7224 (88.6)	167 (84.3)	220 (87.3)	251 (90.0)	10 264 (87.0)
Unknown	155 (6.5)	9 (3.3)	15 (8.0)	6 (7.6)	333 (4.1)	15 (7.6)	9 (3.6)	12 (4.3)	554 (4.7)
ART at conception (*n* =11 245)									
No	1469 (68.1	193 (72.3)	136 (75.6)	56 (73.7)	5616 (71.3)	123 (69.1)	197 (80.1)	193 (71.8)	7983 (71.0)
Yes	688 (31.9)	74 (27.7)	44 (24.4)	20 (26.3)	2256 (28.7)	55 (30.9)	49 (19.9)	76 (28.3)	3262 (29.0)
CD4 (cells/μl) at baseline (*n* = 10 121)									
<350	552 (31.7)	65 (26.2)	60 (37.3)	23 (34.9)	3324 (45.6)	51 (39.5)	67 (28.3)	113 (44.8)	4255 (42.0)
<200	165 (9.5)	21 (8.5)	13 (8.1)	10 (15.2)	1179 (16.2)	14 (10.9)	17 (7.2)	39 (15.5)	1458 (14.4)

a: NAT, native population; WEWC, Western Europe and similar countries; EE, Eastern Europe; NAME, North Africa and the Middle East SSA-Sub-Saharan Africa; LA, Latin America; CRB, Caribbean; ASIA/OC, Asia and Oceania.
b: Belgium, Denmark, Germany, Italy, Netherlands, Poland, Sweden.

Table 2 Markers of suboptimal PMTCT interventions in women with HIV by world region of birth

	NAT	WEWC	EE	NAME	SSA	LA	CRB	ASIA/OC	Total
Women diagnosed in current pregnancy (*n* = 4797)									
Diagnosed at ≥ 20 GW	*n* = 663	*n* = 111	*n* = 89	*n* = 33	*n* = 3557	*n* = 74	*n* = 123	*n* = 147	*n* = 4797
	162 (24.4%)	21 (18.9%)	31 (34.8%)	15 (45.5%)	1206 (33.9%)	24 (32.4%)	32 (26.0%)	38 (25.9%)	1529 (31.9%)
Women diagnosed but untreated at conception (*n* = 2253)									
ART start >28 GW	*n* = 602	*n* = 60	*n* = 35	*n* = 16	*n* = 1423	*n* = 41	*n* = 50	*n* = 26	*n* = 2253
	83 (13.8%)	6 (10.0%)	2 (5.7%)	2 (12.5%)	183 (12.9%)	7 (17.1%)	8 (16.0%)	4 (15.4%)	295 (13.1%)
Women on antenatal ART with VL at delivery (*n* = 5323)[a]									
>200 copies/ml	*n* = 863	*n* = 143	*n* = 84	*n* = 34	*n* = 3858	*n* = 81	*n* = 130	*n* = 130	*n* = 5323
	133 (15.4%)	23 (16.1%)	13 (15.5%)	6 (17.7%)	579 (15.0%)	17 (21.0%)	17 (13.1%)	19 (14.6%)	807 (15.1%)

NAT, native; WEWC, Western Europe and similar countries; EE, Eastern Europe; NAME, North Africa and the Middle East; SSA, Sub-Saharan Africa; LA, Latin America; CRB, Caribbean; ASIA/OC, Asia and Oceania; GW, gestational weeks.
a: pre-term (<37 GW) deliveries excluded.

Late ART start in women diagnosed but untreated at conception

ART was started in late pregnancy in 13.8% (83/602) of native and 12.8% (212/1651) of migrant women table 2. In an analysis of 2193 women with full-term deliveries, adjusted for country of delivery, year of delivery, maternal age at delivery, mode of HIV transmission and parity, delivering before 2007 (OR 2.58, 95% CI 1.94, 3.42) and being parous (OR 1.45, 95% CI 1.11, 1.90) were associated with late ART start but not being a migrant from SSA (OR 0.98, 95% CI 0.69, 1.37) or from other world regions (OR 0.90, 95% CI 0.54, 1.48) (Supplementary table S3). In a sensitivity analysis including only women who acquired HIV heterosexually, being a migrant was not associated with late treatment initiation [OR (women from SSA vs. native women) 1.11, 95% CI 0.75, 1.64].

VL at delivery

Data on VL at delivery were available for 5323 (56.6%) of women who met our inclusion criteria (full-term delivery and on antenatal ART, *n* = 9406). Women who were native, delivered before 2007 and/or in Spain and/or started ART in early pregnancy were less likely to have data on VL at delivery. Of these 5323 women, delivery VL was above 200 copies/ml in 807 (15.1%) women, comprising 674/4460 (15.1%) migrant and 133/863 (15.4%) native (Supplementary table S4). As expected, multivariable analysis suggested that late ART start in pregnancy was the strongest factor associated with having a detectable VL at delivery. Other factors associated with increased risk of non-suppressed VL included delivering between 2002 and 2006 rather than 2007–12, having a baseline CD4 count < 350 cells/μl and use of mono/dual ART rather than cART (Supplementary table S4) but not being a migrant. Sensitivity analyses restricted to women starting treatment in pregnancy (*n* = 3705) confirmed the main analysis findings that being a migrant was not associated with a detectable VL at delivery (OR 1.06, 95% CI 0.79, 1.43) even after including only women who acquired HIV heterosexually (OR 1.20, 95% CI 0.86, 1.68). Among the sub-group of women starting ART late, 36% (271/754) of migrants delivered with a detectable VL vs. 39% (42/109) of native women ($P = 0.60$).

Discussion

Our study has identified a large proportion of HIV-positive women in Europe delivering a live birth in 2002–12 who were migrants, of

whom 44% were diagnosed with HIV in their current pregnancy. At antenatal diagnosis 49% of migrant women had CD4 < 350 cells/μl compared with 29.5% of native women suggesting that pregnancy is an important opportunity for undiagnosed migrant women to learn their HIV status.[20] Reassuringly, our analyses suggest that between 2002 and 2012 (our study period), PMTCT interventions have improved in both migrant and native women. Once on ART, migrant women had a good virological response and we did not observe any difference in the crude MTCT rate between migrant and native women. However, we found that migrant women, particularly those from SSA, NAME and EE were more likely to be diagnosed in late pregnancy but we did not identify delayed ART initiation among migrant women who were already diagnosed at conception but not on ART.

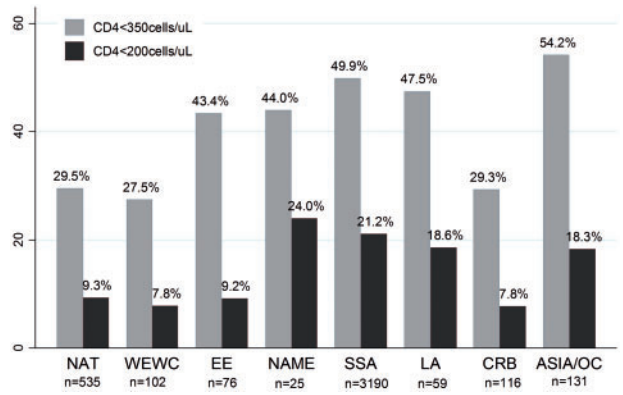

Figure 1 Percentage of women among those diagnosed in pregnancy having a baseline CD4 count below 350 cells/μl and below 200 cells/μl by world region of birth (*n*, total number of women diagnosed in pregnancy with available data for CD4 count; NAT, native; WEWC, Western Europe and similar countries; EE, Eastern Europe; NAME, North Africa and the Middle East; SSA, Sub-Saharan Africa; LA, Latin America; CRB, Caribbean; ASIA/OC, Asia and Oceania)

The observed differences between migrant and native women with respect to late antenatal HIV diagnosis partly agree with previous studies conducted in France[21] and Italy,[22,23] which reported that migrant women were more likely to receive late HIV screening and/or inappropriate antenatal care compared with native women, with higher rates of MTCT in migrant women. Although we found that migrant women were less likely to know their HIV status at conception, more likely to be diagnosed late in pregnancy and more likely to be diagnosed with low CD4 counts, there was no difference in the proportion achieving undetectable VL by delivery between native and migrant women among those receiving antenatal ART and delivering at term. This suggests that duration of antenatal ART was sufficient to reduce MTCT risk in these migrant women, consistent with the earlier French study where there was no difference in rates of uncontrolled viremia at delivery between African- and French-born women in the ART era.[21] Although outside the scope of this paper, it is also likely that among those mother–infant pairs with detectable maternal VL at delivery other PMTCT interventions were successfully applied, given the similar and low MTCT rates in migrant and native women.

Antenatal HIV screening is the cornerstone of PMTCT, with timely identification of previously undiagnosed women allowing application of optimum interventions. We showed that, among women with unknown HIV status at conception, migrant women from EE, NAME and SSA were more likely to be diagnosed after 20 weeks gestation than native women after accounting for other factors associated with late antenatal care presentation.[7] Although few Western European countries have routine repeat HIV testing for women with negative screens at antenatal booking, it is possible

Table 3 Factors associated with being diagnosed at ≥ 20 GW rather than earlier in women diagnosed in pregnancy

	Antenatal HIV diagnosis at < 20 GW	Antenatal HIV diagnosis at ≥ 20 GW	Crude OR (95% CI)	Adjusted[a] OR (95% CI) (Heterosexual only *n* = 4241)	Adjusted[a] OR (95% CI) (IDU only *n* = 81)
	***n* (%)** **3268 (68.1)**	***n* (%)** **1529 (31.9%)**			
World region of birth					
NAT	501 (75.6)	162 (24.3)	1.00	1.00	1.00
WEW	90 (81.1)	21 (18.9)	0.72 (0.43,1.20)	1.22 (0.69,2.16)	0.31 (0.05, 2.00)
EE	58 (65.2)	31 (34.8)	1.65 (1.03,2.65)	2.00 (1.11,3.62)	1.39 (0.23, 8.52)
NAME	18 (54.6)	15 (45.5)	2.58 (1.27,5.23)	3.16 (1.43,6.99)	–
SSA	2351 (66.1)	1206 (33.9)	1.59 (1.31,1.92)	2.12 (1.67,2.69)	0.49 (0.10, 2.45)
LA	50 (67.6)	24 (32.4)	1.48 (0.88,2.49)	1.56 (0.86,2.84)	–
CRB	91 (74.0)	32 (26.0)	1.09 (0.70,1.69)	1.21 (0.75,1.95)	–
ASIA/OC	109 (74.2)	38 (25.9)	1.08 (0.72,1.62)	1.45 (0.90,2.33)	–
Country of delivery					
UK/Ireland	2861 (68.9)	1294 (31.4)	1.00	1.00	1.00
Spain	143 (57.4)	106 (42.6)	1.64 (1.26,2.12)	1.76 (1.24,2.51)	1.50 (0.33, 6.81)
Other EU	264 (67.2)	129 (32.8)	1.08 (0.87,2.12)	0.89 (0.67,1.20)	1.13 (0.20, 6.41)
Year of delivery					
2002–06	1722 (62.5)	1033 (37.5)	1.00	1.00	1.00
2007–12	1546 (75.7)	496 (24.3)	0.53 (0.47,0.61)	0.88 (0.85,0.90)	0.90 (0.72, 1.12)
Maternal age at delivery (years)					
<28	1252 (65.3)	665 (34.7)	1.28 (1.10,1.49)	1.38 (1.18,1.62)	1.02 (0.35, 2.96)
28–32	1131 (69.9)	486 (30.1)	1.03 (0.88,1.49)	1.00	1.00
>32	867 (70.7)	360 (29.3)	1.00	1.01 (0.85,1.21)	1.63 (0.42, 6.38)
Parity					
Nulliparous	1810 (70.7)	750 (29.3)	1.00	1.00	1.00
Parous	1442 (65.2)	770 (34.8)	1.29 (1.14,1.46)	1.37 (1.19,1.58)	2.27 (0.77, 6.71)

GW, gestational weeks; IDU, injecting drug use; NAT, native population; WEWC, Western Europe and similar countries; EE, Eastern Europe; NAME, North Africa and the Middle East; SSA-Sub-Saharan Africa; LA, Latin America; CAR, Caribbean; ASIA/OC, Asia and Oceania.

a: Odds ratios adjusted for world region of birth, country of delivery, year of delivery, maternal age at delivery and parity and stratified by heterosexual mode and IDU (intravenous drug use) mode of HIV acquisition ($P_{interaction}$ = 0.0087).

that some women in this 'late screen' group acquired HIV in pregnancy and were diagnosed based on a second HIV test. Another finding was a higher rate of HIV diagnosis with severe immunosuppression among migrant women implying missing opportunities for earlier diagnosis and treatment. A recent Italian study has also reported similar findings, with women from SSA more likely to present with advanced HIV disease in pregnancy.[24] Previous studies have identified barriers to accessing HIV testing and care experienced by migrants, such as time or financial constraints, language and cultural barriers and living and working conditions.[4,5,25–27]

In Europe, a large and increasing proportion of pregnant women with HIV are already aware of their HIV status at conception.[1,28,29] Retention of patients in HIV care can be challenging, particularly postnatally, and a subsequent pregnancy often provides the means to re-establish a woman in HIV care.[17] We found that most diagnosed women not on treatment at conception started ART in the first or second trimester, and report no difference in risk of starting ART late between migrant and native women. Although we showed a nearly 6-fold increased risk of delivery with detectable VL in women who were not on ART until the third trimester, this was driven by women delivering in the early years (2002–07) reflecting changing guidelines.

Another reassuring finding was a significant decline in risk of late ART start over calendar time. Western Europe has recorded low MTCT rates for many years, with continuing declines driven by high uptake of antenatal screening, a large and increasing proportion of women on suppressive ART at conception, and prompt start of ART in pregnancy for untreated women. However, socio-economic disparities in access to health care exist,[30] and overall low MTCT rates do not preclude the existence of sub-groups at increased risk of poor outcomes, such as the one in six women here with non-suppressed VL at delivery or those who delivered pre-term. Given the benefits of early ART start for health and survival,[31,32,34] the considerable number of migrant women in Europe who access antenatal and HIV care services late is of public health concern.[6]

Our study had some limitations. We excluded women whose country of birth was unknown. As there is no universally agreed definition of the term 'migrant' we used country of birth (as reported by the mother) to determine whether a woman was a migrant, but we did not attempt to distinguish between country of birth, nationality or ethnic group. We did not consider the legal status of a migrant, time of arrival in the country of delivery or language spoken, which may affect the ability to access the local health care system, as such information was unavailable. Data were driven by the NSHPC, the largest dataset, and by women from SSA, who made up nearly 70% of the whole study population. We merged all women from SSA into one group, not acknowledging the rich cultural, ethnic and language diversity within SSA.[7,33] Although poor socioeconomic status may delay HIV diagnosis and start of ART[30] and increase risk of virological non-suppression in treated adults,[35] we were unable to adjust for socio-economic factors. As this study is of women diagnosed before or during delivery only, we could not explore migrant women's risk of delivering with undiagnosed HIV infection (e.g. due to testing decline or incident infection in pregnancy). Women from countries with a high HIV prevalence may remain at elevated risk of HIV acquisition post migration[36,37] (e.g. 30% of SSA women living with HIV in France are estimated to have acquired HIV while in France[37]); highlighting the importance of HIV testing current partners of pregnant women as well as HIV prevention measures for all women including those from high prevalence settings.

In conclusion, we have shown that although some migrant women were more likely to be diagnosed in late pregnancy, there was no overall difference between migrant and native women with respect to achieving an undetectable VL by delivery. Good access to antenatal care will not only enable the implementation of PMTCT protocols but also optimize both maternal and child health outcomes generally. Similarly, tailored screening programmes for migrant communities, whether antenatal or for the general population, are needed to help improve the cascade of HIV care and broaden HIV prevention programmes. Wider access to HIV testing and care would give migrant women an opportunity to know their HIV-status before conceiving and either reinforce prevention measures or start ART before conception thus optimizing PMTCT interventions and women's health. Our findings indicate that particular attention should be given to facilitate access to services for migrant women with children.

Supplementary data

Supplementary data are available at *EURPUB* online.

Funding

This work was funded by the EU Seventh Framework Programme (FP7/2007-2013) under EuroCoord grant agreement n° 260694.

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Conflicts of interest: H.B. has received funding from the International AIDS Society and Public Health England. F.B. has received honoraria and a project grant from Gilead Sciences Europe Ltd. C.T. has received grant funding from EU FP7, UK Medical Research Council, AbbVie, Public Health England, PENTA Foundation and has carried out paid consultancies for UNICEF. For the remaining authors none were declared.

Key points

- In Europe a large proportion of pregnant women with HIV are migrants—mainly from sub-Saharan Africa, albeit with some differences between European countries.
- 3When compared with pregnant native-born women, migrant women are less likely to know their HIV status at conception, more likely to be diagnosed in late pregnancy and at antenatal diagnosis, more likely to have low CD4 counts.
- Although some migrant women are more likely to be diagnosed in late pregnancy, among those on ART there is no overall difference between migrant and native women with respect to achieving an undetectable viral load by delivery, a proxy indicator of MTCT risk.
- Tailored screening programmes for migrant communities, whether antenatal or for the general population, are

needed to help improve the cascade of HIV care and broaden HIV prevention programmes.

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