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Trends in contraceptive use according to HIV status among privately insured women in the United States

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Abstract

BACKGROUND: There is limited information on the patterns and trends of contraceptive use among women living with HIV, compared with noninfected women in the United States. Further, little is known about whether antiretroviral therapy correlates with contraceptive use. Such information is needed to help identify potential gaps in care and to enhance unintended pregnancy prevention efforts.

OBJECTIVE: We sought to compare contraceptive method use among HIV-infected and noninfected privately insured women in the United States, and to evaluate the association between antiretroviral therapy use and contraceptive method use.

STUDY DESIGN: We used a large US nationwide health care claims database to identify girls and women ages 15–44 years with prescription drug coverage. We used diagnosis, procedure, and National Drug Codes to assess female sterilization and reversible prescription contraception use in 2008 and 2014 among women continuously enrolled in the database during 2003 through 2008 or 2009 through 2014, respectively. Women with no codes were classified as using no method; these may have included women using nonprescription methods, such as condoms. We calculated prevalence of contraceptive use by HIV infection status, and by use of antiretroviral therapy among those with HIV. We used multivariable polytomous logistic regression to calculate unadjusted and adjusted odds ratios and 95% confidence intervals for female sterilization, long-acting reversible contraception, and short-acting hormonal contraception compared to no method.

RESULTS: While contraceptive use increased among HIV-infected and noninfected women from 2008 through 2014, in both years, a lower proportion of HIV-infected women used prescription contraceptive methods (2008: 17.5%; 2014: 28.9%, compared with noninfected women (2008: 28.8%; 2014: 39.8%, $P < .001$ for both). Controlling for demographics, chronic medical conditions, pregnancy history, and cohort year, HIV-infected women compared to HIV-noninfected women had lower odds of using long-acting reversible contraception (adjusted odds ratio, 0.67; 95% confidence interval, 0.52–0.86 compared to no method) or short-acting hormonal contraception method (adjusted odds ratio, 0.59; 95% confidence interval, 0.50–0.70 compared to

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no method). In 2014, HIV-infected women using antiretroviral therapy were significantly more likely to use no method (76.8% vs 64.1%), and significantly less likely to use short-acting hormonal contraception (11.0% vs 22.7%) compared to HIV-infected women not using antiretroviral therapy. Those receiving antiretroviral therapy had lower odds of using short-acting hormonal contraception compared to no method (adjusted odds ratio, 0.45; 95% confidence interval, 0.32–0.63). There was no significant difference in female sterilization by HIV status or antiretroviral therapy use.

CONCLUSION: Despite the safety of reversible contraceptives for women with HIV, use of prescription contraception continues to be lower among privately insured HIV-infected women compared to noninfected women, particularly among those receiving antiretroviral therapy.

Keywords

antiretroviral therapy; contraception; HIV

Introduction

It is estimated that as of 2014, 25% of people living with HIV in the United States were women.[1] Access to accurate contraceptive method information and a full range of effective options is important for HIV-infected women not only to prevent unintended pregnancy, but also to prevent vertical transmission of HIV. According to the US Medical Eligibility Criteria for Contraceptive Use (MEC),[2] all contraceptive methods are considered safe or generally safe for use by HIV-infected women. Further, concern regarding drug interactions may limit providers from recommending hormonal contraceptives. In contrast, the most recent US MEC guidelines do not recommend limiting any contraceptives based on antiretroviral therapy (ART) use. An exception to this recommendation is the infrequently prescribed protease inhibitor fosamprenavir. For women using fosamprenavir, current recommendations state that the risks of combined hormonal contraception outweigh the benefits.[3] HIV-infected individuals are encouraged by their providers to use condoms to prevent HIV transmission to uninfected partners. While there is increasing use of effective prescription contraceptive methods in the general population,[2] specifically long-acting reversible contraceptives (LARC) (which include intrauterine devices [IUDs] and implants), some data suggested that women with HIV are more likely to use less effective contraceptive options such as condoms.[4] High rates of female sterilization[2] and reduced overall pregnancy rates during early stages of the HIV epidemic may not have continued. Among women with HIV, ART use has increased due to efforts to improve access to testing and ART and guidelines suggesting earlier initiation of ART.[5] Due to increasing ART use, improved health outcomes, and the lower perceived HIV transmissibility associated with viral load suppression, the trends in contraceptive use among HIV-infected women may be becoming more similar to those among noninfected women.

Our aim was to evaluate prescription contraceptive use among HIV-infected women compared to noninfected women in the United States in 2008 and 2014. Specifically, we aimed to examine differences in the pattern of prescription contraceptive methods based on HIV infection status and to explore the impact of ART use on contraceptive method use.

This information will provide contemporary contraceptive trends and explore the associations between HIV and ART use and contraceptive practice patterns.

Materials and Methods

We analyzed data from the Truven Health MarketScan Commercial Claims and Encounters databases. These databases consist of a large convenience sample of individuals with employer-based health insurance and include individual-level health care claims information from employer health plans with both inpatient and outpatient diagnoses and procedure codes and links to filled outpatient prescription drug claims. All claims for a particular individual can be linked even if the employer changes insurance plans, but may not be linked if the individual changes employment. The average number of female enrollees in the database is approximately 11.4 million per year in years 2003 through 2008 and approximately 24 million per year in years 2009 through 2014. These databases undergo quality assessments to maintain validity of the data.[6] As the databases are deidentified, the institutional review board of the Centers for Disease Control and Prevention determined that this was not human subjects research.

We evaluated 2 cohorts of women to determine contraceptive use for index years 2008 and 2014. For each index year, we included women continuously enrolled for 5 years prior, to account for previously initiated LARC methods or sterilization. Specifically, for 2008, we included women continuously enrolled from 2003 through 2008; for 2014, we included women continuously enrolled from 2009 through 2014. Girls and women were included if they were ages 15–44 years and had health plans with prescription drug coverage. We excluded women who had a prior diagnostic or procedure code for hysterectomy from the analysis of contraceptive method use. Notably any women with a hysterectomy code identified in the 2003 through 2008 period, thus excluded in 2008, were also excluded from the 2014 cohort. To identify the exposures, outcomes, and covariates, such as pregnancy and chronic medical conditions, we used *International Classification of Diseases, Ninth Revision, Clinical Modification* (*ICD-9-CM*) and *Current Procedural Terminology* codes (see Appendix for specific coding for conditions and medications).

Our primary exposures of interest were HIV infection status and ART use (among HIV-infected women). HIV infection was defined by meeting 1 of the following 4 criteria: (1) 2 outpatient visits with HIV diagnosis codes separated by ≥30 days; (2) 1 outpatient diagnosis code for HIV and at least 1 antiretroviral drug (see list in Appendix of ART medications considered; medications typically used for preexposure or postexposure prophylaxis without concomitant other ART medication were excluded); (3) 2 pharmacy charges for at least 1 ART separated by ≥30 days; or (4) 1 inpatient stay with HIV diagnosis code. We defined HIV-infected women as ART users if they filled at least 1 prescription for ART (drug names listed in Appendix) during the 6 years of the cohort.

Our primary outcome of interest was female sterilization or reversible prescription contraceptive use during the index year. This was identified from inpatient, outpatient, and pharmaceutical databases using *ICD-9-CM* diagnosis and procedure codes, Healthcare Common Procedure Coding System supply codes, *Current Procedural Terminology* codes,

and the US Food and Drug Administration National Drug Codes. We considered prescriptions to be a proxy measure for actual use. Contraceptive methods examined included female sterilization and reversible prescription methods such as IUDs, implants, injectables, pills, patches, and rings. A woman was identified as sterilized if a sterilization code was present in the inpatient or outpatient databases in the 6 years of the cohort. A woman was considered to be an IUD user during the index year if the method was placed based on a procedure code or supply code from the inpatient or outpatient databases during that index year or within the 5 years prior without a removal code noted. A woman was considered to be an implant user during the index year if the method was placed based on a procedure code or supply code from the inpatient or outpatient databases during that index year or within 3 years prior without a removal code noted. We searched for codes in the index year indicating injectable, pill, patch, or ring use. These methods needed to be identified at least once during the index year to be considered as use during that year. Injectable use was identified from inpatient and outpatient claims if there was a depot medroxyprogesterone acetate supply code or a family planning encounter diagnosis code coupled with a generic injection procedure code. Use of oral contraceptive pills (including combined and progestin-only pills), combination hormonal patches, or combination vaginal rings was identified by National Drug Codes in the pharmaceutical databases. If there were no sterilization or contraceptive codes identified, the individual was classified as using no method. Individuals classified as using no method may have been using nonprescription methods such as condoms. We used a method of hierarchal classification to determine the most effective method of contraceptive used similar to one previously described.[7] We collapsed the methods into 4 categories to evaluate trends in method use: (1) female sterilization; (2) LARC method (IUDs and implants); (3) short-acting hormonal contraception (SAHC), including shorter-acting prescription methods (injectable, pills, patch, or ring); and (4) no prescription method.

For covariates, we included age (3 categories: 15–24, 25–35, 36–44 years), region in the United States (defined as the following 5 categories by Truven Health: Northeast, North Central, South, West, unknown), chronic medical condition, and pregnancy. We identified women as having a chronic medical condition if they had 1 of the following conditions that were identified by the US MEC as: (1) conditions with increased health risks from an intended pregnancy; or (2) conditions for which certain contraceptives are considered unsafe or the risks outweigh the benefits. [6] The 22 chronic conditions included: diabetes, hypertension, epilepsy, breast cancer, endometrial cancer, ovarian cancer, tuberculosis, sickle cell disease, systemic lupus erythematosus, cirrhosis, thrombogenic mutations, schistosomiasis with fibrosis of liver, liver cancer, gestational trophoblastic disease, ischemic, heart disease, valvular heart disease, stroke, transplant, peripartum cardiomyopathy, bariatric surgery, and migraines (without or without aura).We used *ICD-9-CM* diagnosis and procedural codes to identify these conditions. Utilizing a methodology similar to one previously published,[7–9] we classified women as having a medical condition during the index year if related codes were present during 5 years prior to that year. To improve specificity and avoid overdiagnosis, we considered an individual as having the condition if there were 2 outpatient codes present at least 30 days apart (with the exception of migraines for which only 1 outpatient code was needed) or 1 inpatient code. Pregnancies

(either current pregnancy or recent pregnancy with a pregnancy outcome) were identified if they had a diagnosis or procedure code for 1 of the following outcomes during the index year: any pregnancy, delivery, ectopic, molar pregnancy, or abortion (spontaneous or induced).

All statistical analyses were performed with SAS (Version 9.3; SAS Institute Inc, Cary, NC) or SUDAAN (Version 11.0.0, RTI International, Research Triange Park, NC). We generated descriptive statistics for contraceptive use and covariates with corresponding numbers and percentages. In cases where cell counts were <5, the numbers and corresponding percentages were not reported to protect individual-level data. If it was possible to calculate one of the suppressed cells with counts<5 from the other cells of that variable, a second cell was also not reported. In all statistical analyses, a random effect (identifying individual women) was used to account for women in both the 2008 and 2014 cohorts. Bivariate analyses were performed with Fisher exact test or χ^2 test with a P value ≤.001 considered statistically significant based on the Holm-Bonferroni method for multiple comparisons. We performed multivariable polytomous logistic regression to generate unadjusted and adjusted odds ratios (aOR) with 95% confidence intervals (CIs) for sterilization, LARC, and SAHC compared to no prescription method use among all women and a separate multivariable polytomous logistic regression restricted to HIV-infected women to examine ART use. Covariates significant at the .05 level were maintained in the multivariable polytomous logistic regression models. Contraceptive use was examined separately for each cohort (2008 or 2014). For the multivariable polymtomous logistic regression, we included both the 2008 and 2014 cohorts and included year in the model as a covariate. Estimates for cohort year are presented from the model including HIV status.

Results

In 2008, 499,197 women were included, with 268 (0.05%) meeting our criteria for being HIV-infected. In 2014, 1,083,864 women were included with 917 (0.08%) meeting our criteria for being HIV-infected (Table 1). There were 90,916 women represented in both cohorts. In both 2008 and 2014, the HIV-infected women were older and had more chronic medical conditions than noninfected women with 39.2% and 42.5% of the HIV-infected women having a chronic medical condition in 2008 and 2014, respectively. Among HIV-infected women, there was no significant increase in the percent of pregnancies from 2008 (5.6%) through 2014 (7.5%) There were also no significant differences in the percent of pregnancies between HIV-infected and noninfected women in either year.

Overall, the majority of women did not use female sterilization or a prescription contraceptive (Table 2). However, significantly more HIV-infected women in our cohort were not using sterilization or a prescription method in 2008 (82.5%) and 2014 (71.1%) compared to noninfected women (71.2% in 2008 and 60.2% in 2014). LARC method use did not significantly differ between infected and noninfected women, and both groups experienced a significant increase from 2008 through 2014. SAHC use was significantly lower among HIV-infected women in both 2008 (10.4%) and 2014 (16.2%) compared to noninfected women (22.0% in 2008 and 28.6% in 2014).

Among the HIV-infected women, 170 (73.4%) and 508 (67.2%) were ART users in 2008 and 2014, respectively. ART use significantly varied by region in both 2008 and 2014, with increased proportion of HIV-infected women in the South using ART (data not shown). In 2008, among HIV-infected women, there were no significant differences in contraceptive method use by ART use (Table 3). In 2014 there was significantly lower proportion of women using a prescription method among HIV-infected women on ART compared to HIV-infected women not on ART (23.2% vs 35.9%), with a lower proportion of women on ART using SAHC methods compared to women not on ART (11.0% vs 22.7% for ART and nonART, respectively). There was increased LARC use among ART users from 2008 through 2014. In both the ART and no ART groups, there were more women using prescription method in 2014 compared to 2008, although this difference was not statistically significant.

Results of the multivariable polyto-mous regression models evaluating contraceptive use are reported in Table 4. There were lower odds of LARC method (aOR, 0.67; 95% CI, 0.52–0.86 vs no prescription method) and SAHC method use (aOR, 0.59; 95% CI, 50–0.70 vs no prescription method) among HIV-infected women compared to noninfected women when controlling for covariates and cohort year. Although among HIV-infected women, the adjusted odds of LARC use and sterilization did not significantly differ by ART status, there were significantly lower adjusted odds of SAHC method use among ART users compared to non-ART users. Overall, there was an increase in sterilization, LARC, and SAHC method compared to no method use from 2008 through 2014.

Comment

Our study evaluating a large national database of privately insured women highlights the persistent discrepancy in contraceptive use for HIV-infected women compared to noninfected women in the United States. While prior studies demonstrated an encouraging increase in the use of more effective LARC contraceptives[10] among noninfected women, our report also suggests this trend maybe occurring among HIV-infected women, a finding that differs from prior reports.[2] Despite this improvement in overall effective contraceptive use, our results show that reliance on no prescription method or female sterilization is more common among women with HIV compared with uninfected women. Prior research similarly found that HIV-infected women often rely on nonprescription contraceptive methods, such as condoms.[11] As the pregnancy rates with typical condom usage are as high as 15% in the first year of use,[12] current recommendations emphasize the need for dual protection, simultaneous use of a second more effective method of contraception (sterilization, LARC, or SAHC) in addition to condoms for sexually transmitted infection and HIV prevention. Our data indicate that the reliance on lower efficacy nonprescription contraceptive methods or no method persists despite these current dual-method recommendations. Given the high rates of unintended pregnancy in the United States, which are associated with negative health consequences, along with risks associated with pregnancy among HIV-infected women, efforts should be directed at increasing use of effective contraception beyond condoms alone among HIV-infected women as well.[13] Further, since those in our study with HIV are older with more chronic medical conditions, contraceptive use to reduce the risks associated with unintended pregnancy should be

emphasized. A recent study demonstrates that despite decreasing rates of induced abortion nationally, such rates among HIV-infected women have remained stable,[13] suggesting that prevention of unintended pregnancy has not improved overall reproductive outcomes for women with HIV.

Our data highlight that those with HIV are about 40% less likely to use SAHC compared to noninfected women. Lower use ofthese contraceptives among women with HIV may be related to providers' concerns about the safety of certain methods for women with HIV. However, evidence has not demonstrated that hormonal contraceptives are associated with HIV disease progression or HIV transmission to uninfected male partners.[14]

Our findings also highlight that among women with HIV, those using ART have about 50% lower odds ofusing SAHC than those not using ART. This may be related to ongoing concerns regarding the safety of combining certain hormonal contraceptive methods with antiretroviral drugs given concerns for drug-drug interactions reducing the effectiveness of either the birth control or ART. However, HIV-infected women should be reassured that studies have found few interactions between hormonal contraceptives and antiretroviral drugs that limit their use. Even in cases where a drug interaction may exist, studies suggested the impact could lead to a reduction in contraceptive but not antiretroviral effectiveness.[15–17] In these situations, such as the case of efavirenz-based regimens used with an etonogestrel or levonorgestrel contraceptive implant, the implant effectiveness is often still superior to nonprescription contraceptive alternatives.[18] Further, in cases where a provider may be concerned or unfamiliar with the potential drug-drug interactions, alternative forms of effective contraception, such as the nonhormonal IUD, can be considered. Health care providers should counsel women about the overall safety of contraceptives used in conjunction with ART, present a broad spectrum of contraceptive options available to avoid potential drug interactions, and not be hesitant to provide hormonal contraception, especially LARC, to women on ART.

We did not find a difference in the rates of sterilization among women with HIV compared to noninfected women. This is contrary to reports from earlier in the HIV epidemic when women reportedly felt pressure to undergo sterilization, and, even in cases when sterilization was not coerced, many experienced subsequent regret.[19] Our findings support an encouraging change toward increased reproductive choice for HIV-infected women.

As ART use increases and health status improves, recent data suggest that HIV-infected women have desires for children and pregnancy rates similar to noninfected women.[20] ART users should receive regular clinical care, thus offering numerous opportunities to address their contraceptive needs. Unfortunately, family planning is often absent from the current HIV clinical care paradigm. This integration of services is essential if we hope to adequately address the robust reproductive health needs of women living with HIV. Efforts must focus on understanding reproductive health needs of this cohort and providing targeted family planning options within an integrated care framework. Our study has several strengths as well as some limitations. With use of this large claims data set, we are able to evaluate a nationwide sample of privately insured women living with HIV compared to noninfected women as well as evaluate the change in patterns over time. Further, by controlling for other

medical conditions that may influence contraceptive prescription patterns, we are able to more specifically determine the impact of HIV on contraceptive use. While our data are representative of a nationwide privately insured population, they may not be generalizable to Medicaid or uninsured populations. As a significant proportion of women with HIV rely on Medicaid or are uninsured, we may not be able to extrapolate these findings to all HIV-infected women. However, it is notable that women continuously enrolled in these health care plans should have similar access to contraceptives and thus any differences detected likely reflect true practice pattern differences within the cohort of women who are insured. While we demonstrate an overall improvement in contraceptive use over time, the impact of the Affordable Care Act, passed in 2010, on access to contraception may account for some of these observed patterns. The small number of HIV-infected women, particularly ART users, may have reduced our power to detect differences between groups. As with any administrative database, there are inherent risks of misclassification. We aimed to reduce misclassification by using more conservative definitions for defining diagnoses, including 2 outpatient visits, rather than 1. Further, while we aimed to capture contraceptive and surgical procedures for individuals over a continuous time frame of 6 years for each cohort, we may have not captured sterilization procedures or IUD insertions performed outside of the study interval. Additionally, prescriptions may not reflect actual use of the contraceptive. This is particularly important for user-dependent methods such as combined hormonal contraceptive pills, where individuals may incorrectly, infrequently, or never use the method prescribed. Women classified as non-users may have included those with IUD insertion, sterilizations, or hysterectomy before 2004; women relying on male sterilization or using nonprescription methods (barrier methods or fertility awareness-based methods); or women who were pregnant, trying to become pregnant, not sexually active, or otherwise not at risk for unintended pregnancy. Lastly, we captured only prescription and surgical contraceptive methods and cannot specifically comment on the use of nonprescription methods, such as condoms. This underscores that certain women may be relying on no method or condom use alone, rather than a more effective prescription methods of birth control. Providers need to counsel patients on the use of more highly effective prescription contraceptive methods, beyond condom use. For HIV-infected individuals specifically, providers must go beyond condom promotion to emphasize dual-method use with combining condoms, for HIV and sexually transmitted infection prevention, along with prescription contraceptive use, for pregnancy prevention.

In conclusion, our data highlight a persistent gap in effective contraceptive use among women with HIV in the United States compared to HIV-uninfected women. We should aim to better understand the reasons for lower use of LARC and SAHC methods and further promote effective contraceptives. Future efforts should focus on increasing dual-method contraceptive use while educating patients and providers regarding potential misconceptions that could limit contraceptive use. Our findings emphasize the importance of understanding the reproductive health needs of women living with HIV and providing targeted family planning options as part of routine HIV care.

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Appendix

List of conditions and procedures by *International Classification of Diseases, Ninth Revision, Clinical Modification* diagnostic and procedure; *Current Procedural Terminology*; Healthcare Common Procedure Coding System; and diagnosis-related group codes

Condition/procedures	*ICD-9-CM* diagnostic and procedure codes	CPT, HCPC codes	DRG codes
HIV	042.X, 043.X, 044.X, V08.X, 079.53, 279.10, 279.19, 795.71, 795.8		
Hysterectomy	68.3, 68.4, 68.5, 68.6, 68.7, 68.8, 68.9	45126, 51597, 51925, 58150, 58152, 58180, 58200, 58210, 58240, 58260, 58262, 58263, 58267, 58270, 58275, 58280, 58285, 58290, 58291, 58292, 58293, 58294, 58541, 58542, 58543, 58544, 58548, 58550, 58552, 58553, 58554, 58570, 58571, 58572, 58573, 58951, 58953, 58954, 58956, 59100, 59135, 59525	
Pregnancy (current pregnancy or recent pregnancy with pregnancy outcome)	63X.X, 64X.X, 65X.X, 651.X, 66X.X, 67X.X, 69.X, 72.X, 73.22, 73.59, 73.6, 74.X, 75.X, V27.X, V91.X	59409, 59514, 59612, 59620, 59840, 59841, 59850, 59851, 59852, 59855, 59856, 59857	Before 2007: 370–375, 378, 380, 381 ≥2007: 765, 766, 767, 768, 774, 775, 770, 777, 779
Medical conditions: diabetes, hypertension, epilepsy, breast cancer, endometrial cancer, ovarian cancer, tuberculosis, sickle cell disease, systemic lupus erythematosus, cirrhosis, thrombogenic mutations, schistosomiasis with fibrosis of liver, liver cancer, gestational trophoblastic disease, ischemic heart disease, valvular heart disease, stroke, transplantation, peripartum cardiomyopathy, bariatric surgery, migraines with aura and without aura	010.X, 011.X, 012.X, 013.X, 014.X, 015.X, 016.X, 017.X, 018.X, 120.X, 155.X, 174.X, 182.X, 183.X, 197.7, 198.6, 198.81, 199.2, 230.8, 233.0,233.2, 235.3, 236.2, 238.3, 238.77,239.3, 250.X, 282.6X, 289.81, 345.0, 345.1, 345.2, 345.3, 345.4, 345.5, 345.7, 345.8, 345.9, 346.0X, 346.1X, 346.2X, 346.3X, 346.4X, 346.5X, 346.6X, 346.7X, 346.8X, 346.9X, 394.X, 395.X, 396.X, 401.X, 402.X, 403.X, 404.X, 405.X, 410.X, 411.X, 412.X, 413.X, 414.X, 430.X, 431.X, 432.X, 433.X, 434.X, 435.X, 436.X, 437.X, 571.2, 571.5, 571.6, 630.X, 674.5X, 710.0, 996.8X, E87.80, V42.X, V45.86, V58.44	43644, 43645, 43770, 43771, 43773, 43842, 43843, 43845, 43846, 43847, 43848, 43886, 43887, 43888	
Sterilization	V25.2, 66.2, 66.3	58565, 58579, 58600, 58605, 58611, 58615, 58670, 58671, A4264	
IUD	Insertion: V25.11, V25.13, 69.7 Removal: V25.12, 97.71	Insertion: 58300, J7300, J7302 Removal: 58301	
Implant	Insertion: V25.5		Insertion: 11975, 11977, J7307, J7306, S0180:

Condition/procedures	*ICD-9-CM* diagnostic and procedure codes	CPT, HCPC codes	DRG codes
			Removal: 11976
Injectable contraception	V25.02, V25.03, V25.04, V25.09, V25.40, V25.49, V25.8, V25.9	J1051, J1055, J1056, 96372 (≥2009), 90772 (before 2009)	

CPT, Current Procedural Terminology; *DRG*, diagnosis-related group; *HCPC*, Healthcare Common Procedure Coding System; *ICD-9-CM*, *International Classification of Diseases, Ninth Revision, Clinical Modification*; *IUD*, intrauterine device.

List of medications

Medications	Generic product identification	National Drug Code	Drug names
Contraceptive ring	123340		
Contraceptive patch	119146, 128775, 131135		
Contraceptive pills	101027, 101489, 101490, 102153, 102759, 102760, 102761, 102762, 102765, 102768, 102769, 102772, 102775, 102776, 108159, 108160, 108835, 109055, 109514, 109630, 109788, 109879, 110119, 112742, 113364, 113365, 113426, 113486, 114219, 114407, 114634, 115052, 122790, 122792, 122793, 122794, 122795, 122796, 122799, 122800, 122801, 122802, 122803, 122804, 122806, 122807, 122809, 122810, 122812, 122870, 122908, 123025, 123044, 123058, 123545, 123546, 123548, 123638, 123644, 123771, 123773, 123779, 124134, 124392, 124749, 125060, 125086, 125218, 125234, 125375, 125376, 125561, 125789, 125887, 125947, 126318, 127463, 128230, 128236, 128255, 128449, 128593, 128656, 128732, 128748, 128839, 128856, 129061, 129213, 129929, 130110, 130644, 130698, 130775, 131061, 131315	00008005603, 00008007802, 00008007803, 00014005106, 00014008158, 00014008184, 00014015142, 00014015160, 00014016156, 00014016184, 00014040107, 00014040108, 00014040113, 00014040124, 00014040160, 00014040163, 00014042109, 00014042114, 00014042115, 00025005131, 00025007113, 00025008114, 00025010150, 00025015113, 00025016114, 00025031103, 00025032103, 00025033106, 00025034106, 00046089410, 00062135108, 00062139015, 00062139115, 00062176022, 00062176122, 00062177022, 00062177122, 00071090111, 00071090146, 00071090335, 00071090336, 00071090411, 00071090446, 00071090535, 00071090536, 00071090735, 00071090736, 00071091336, 00071091546, 00071091646, 00071091736, 00251341010,	

Medications	Generic product identification	National Drug Code	Drug names
		00251361010, 00251381010, 00304205621, 00304205628, 00304205721, 00304205728, 00304210428, 00536405544, 00536405644, 00536405744, 17236038528, 17236046012, 17236046028, 42987010213, 42987010214, 42987010223, 42987010224, 42987010227, 42987010228, 42987010312, 42987010320, 47202290921, 47202291028, 54765003521, 54765003528, 99999100026, 99999100063, 99999100068, 99999100084, 99999200026, 99999200063, 99999200068, 99999200084, 99999777603, 99999777604, 99999777606, 99999777607	
Antiretroviral drugs	104056, 104057, 104058, 104059, 104060, 104209, 104210, 104211, 104212, 108940, 109377, 109378, 109407, 109408, 110254, 110888, 111835, 111837, 112183, 112244, 113370, 113371, 113372, 113435, 113554, 113555, 113816, 113847, 113848, 113873, 114636, 114940, 114941, 116190, 119066, 123003, 123233, 123234, 123235, 123517, 123885, 124326, 124601, 124730, 124854, 125221, 125492, 125992, 126048, 126049, 126223, 126322, 126431, 126624, 126643, 126644, 126696, 126996, 127176, 127215, 127432, 128047, 128681, 128833, 128988, 129147, 129495, 129496, 129510, 129954, 130130, 130236, 130480, 130752, 130934, 130985, 131196, 131352, 131413, 131557, 131632		Abacavir sulfate, abacavir sulfate/ lamivudine, abacavir sulfate/ lamivudine/ zidovudine, abacavir/ dolutegravir/ lamivudine, amprenavir, atazanavir sulfate, atazanavir/ cobicistat, cobicistat/ darunavir, cobicistat/ elvitegravir/ emtricitabine/ tenofovir disoproxil fumarate, darunavir ethanolate, dolutegravir sodium, efavirenz, efavirenz/ emtricitabine/ tenofovir disoproxil fumarate, elvitegravir, emtricitabine/ rilpivirine hydrochloride/ tenofovir, enfuvirtide,

Medications	Generic product identification	National Drug Code	Drug names
			etravirine, fosamprenavir calcium, indinavir sulfate, lamivudine/ zidovudine, lopinavir/ritonavir, maraviroc, nelfinavir mesylate, nevirapine, raltegravir potassium, rilpivirine hydrochloride, ritonavir, saquinavir, saquinavir mesylate, stavudine, tipranavir, zalcitabine, zidovudine

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TABLE 1

Characteristics of girls and women ages 15–44 years by HIV serostatus among commercially insured from MarketScan databases, 2008 and 2014

	2008			2014				
	HIV-infected N = 268 n (%)	**Noninfected N = 498,929 n (%)**	***P* value**	**HIV-infected N = 917 n (%)**	**Noninfected N = 1,082,947 n (%)**	***P* value**	***P* value HIV-infected 2008 vs 2014**	***P* value Noninfected 2008 vs 2014**
Age, y			<.0001			<.0001	.383	<.0001
15–24	27 (10.1)	179,998(36.1)		112(12.2)	468,310(43.3)			
25–35	63 (23.5)	103,117(20.7)		186 (20.3)	215,957 (19.9)			
36–44	178(66.4)	215,814(43.2)		619(67.5)	398,680 (36.8)			
Region			.009			<.0001	<.0001	<.0001
Northeast	NR	45,484(9.1)		205 (22.3)	157,889 (14.6)			
North Central	68 (25.4)	137,255 (27.5)		154 (16.8)	278,228 (25.7)			
South	115 (42.9)	183,769 (36.8)		473 (51.6)	473,820 (43.7)			
West	52 (19.4)	130,660 (26.2)		78 (8.5)	168,629 (15.6)			
Unknown	NR	1761 (0.4)		7 (0.8)	4381 (0.4)			
Chronic medical conditions[a]	105 (39.2)	94,396 (18.9)	<.0001	390 (42.5)	223,939 (20.7)	<.0001	.315	<.0001
Pregnancy[b]	15 (5.6)	27,060 (5.4)	.892	69 (7.5)	62,663 (5.8)	.028	.247	<.0001

Holm-Bonferroni adjustment: *P* values ≤001 are statistically significant.

NR, not reported because of small numbers (<5).

[a]Diabetes, hypertension, epilepsy, breast cancer, endometrial cancer, ovarian cancer, tuberculosis, sickle cell disease, systemic lupus erythematosus, cirrhosis, thrombogenic mutations, schistosomiasis with fibrosis of liver, liver cancer, gestational trophoblastic disease, ischemic, heart disease, valvular heart disease, stroke, transplant, perlpartum cardiomyopathy, bariatric surgery, and migraines (without or without aura);

[b]Any current pregnancy code or outcome code for delivery, ectopic, molar, spontaneous, and Induced abortion during index year.

TABLE 2

Prevalence of prescription contraceptive methods in 2008 and 2014 by HIV serostatus

	2008			2014				
	HIV-infected N = 268 n (%)	**Noninfected N = 498,929 n (%)**	***P* value**	**HIV-infected N = 917 n (%)**	**Noninfected N = 1,082,947 n (%)**	***P* value**	***P* value HIV-infected 2008 vs 2014**	***P* value Noninfected 2008 vs 2014**
SAHC	28 (10.4)	109,528 (22.0)	<.0001	149 (16.2)	309,731 (28.6)	<.0001	.009	<.0001
LARC	NR	13,575 (2.7)	.262	62 (6.8)	79,379 (7.3)	.568	<.0001	<.0001
Female sterilization	NR	20,352 (4.1)	.214	54 (5.9)	41,716(3.9)	.003	.845	<.0001
No prescription method[a]	221 (82.5)	355,474 (71.2)	<.0001	652 (71.1)	652,121 (60.2)	<.0001	<.0001	<.0001

Holm-Bonferroni adjustment: *P* values ≤.001 are statistically significant

LARC, long-acting reversible contraception including intrauterine devices and implants; *NR*, not reported because of small numbers (<5); *SAHC*, short-acting hormonal contraception includes contraceptive pills, patches, rings, and injectable methods.

[a]Women with no contraceptive or female sterilization codes–these may have included women using nonprescription methods, such as condoms.

TABLE 3

Prevalence of prescription contraceptive methods in 2008 and 2014 among HIV-infected women, by antiretroviral therapy use

	2008			2014				
	No ART N = 98 n (%)	**On ART N = 170 n (%)**	***P* value**	**No ART N = 409 n (%)**	**On ART N = 508 n (%)**	***P* value**	***P* value No ART 2008 vs 2014**	***P* value On ART 2008 vs 2014**
SAHC	15 (15.3)	13(7.7)	.062	93 (22.7)	56 (11.0)	<.0001	.075	.173
LARC	NR	NR	.14	30 (7.3)	32 (6.3)	.597	.051	<.0001
Female sterilization	NR	NR	.269	24 (5.9)	30 (5.9)	1.0	.160	.571
No prescription method[a]	77 (78.6)	144(84.7)	.243	262 (64.1)	390 (76.8)	<.0001	.003	.016

Holm-Bonferroni adjustment: *P* values ≤001 are statistically significant.

ART, antiretroviral therapy; *LARC,* long-acting reversible contraception including intrauterine devices and implants; *NR,* not reported because of small numbers (<5); *SAHC,* short-acting hormonal contraception includes contraceptive pills, patches, rings, and injectable methods.

[a]Women with no contraceptive or female sterilization codes-these may have included women using nonprescription methods, such as condoms.

TABLE 4

Multivariable polytomous regression models of prescription contraceptive prevalence among women by cohort year, HIV infection status, and antiretroviral therapy use

	Female sterilization		LARC		SAHC	
	OR (95% CI)	**aOR (95% CI)**	**OR (95% CI)**	**aOR (95% CI)**	**OR (95% CI)**	**aOR (95% CI)**
HIV infected vs noninfected[a,b]	1.28 (0.99–1.67)	0.83 (0.64–1.08)	0.82 (0.64–1.05)	0.67 (0.52–0.86)	0.49 (0.41–0.57)	0.59 (0.50–0.70)
ART use vs nonuse[c]	0.99 (0.58–1.68)	0.95 (0.56–1.61)	0.63 (0.38–1.05)	0.68 (0.41–1.13)	0.41 (0.29–0.56)	0.45 (0.32–0.63)
2014 vs 2008[b]	1.12 (1.10–1.14)	1.21 (1.19–1.23)	3.19 (3.13–3.25)	3.35 (3.29–3.42)	1.54 (1.53–1.55)	1.44 (1.43–1.45)

Polytomous model 4 contraceptive groups where referent group is no prescription method use. No prescription method includes women with no contraceptive codes; these may have included women using nonprescription methods, such as condoms.

aOR, adjusted odds ratio; *ART*, antiretroviral therapy; *CI*, confidence interval; *LARC*, long-acting reversible contraception including intrauterine devices and implants; *OR*, odds ratio; *SAHC*, short-acting hormonal contraception includes contraceptive pills, patches, rings, and injectable methods.

[a] ART, considered only for those who are HIV infected;

[b] Adjusted for year, any chronic medical condition, age category, region, pregnancy;

[c] Adjusted for year, age category.

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