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The Prevalence and Trends of Antiviral Medication Use during Pregnancy in the U.S. A population-based study of 664,297 deliveries in 2001-2007

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Abstract

Objectives—To evaluate the prevalence, trends, timing and duration of exposure to antiviral medications during pregnancy within a US cohort of pregnant women and to evaluate the proportion of deliveries with a viral infection diagnosis among women given antiviral medication during pregnancy.

Methods—Live-born deliveries between 2001 and 2007, to women aged 15 to 45 years, were included from the Medication Exposure in Pregnancy Risk Evaluation Program (MEPREP), a

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collaborative research program between the U.S. Food and Drug Administration and eleven health plans. They were evaluated for prevalence, timing, duration, and temporal trends of exposure to antiviral medications during pregnancy. We also calculated the proportion of deliveries with a viral infection diagnosis among those exposed to antiviral medications.

Results—Among 664,297 live births, the overall prevalence of antiviral exposure during pregnancy was 4% (n=25,155). Between 2001 and 2007, antiviral medication exposure during pregnancy doubled from 2.5% to 5%. The most commonly used antiviral medication was acyclovir, with 3% of the deliveries being exposed and most of the exposure occurring after the 1st trimester. Most deliveries exposed to antiviral medications were exposed for less than 30 days (2% of all live births). Forty percent of the women delivering an infant exposed to antiviral medications had a herpes diagnosis.

Conclusions—Our findings highlight the increased prevalence of women delivering an infant exposed to antiviral medications over time. These findings support the need for large, well-designed studies to assess the safety and effectiveness of these medications during pregnancy.

Introduction

Antiviral medications are used to treat or prevent viral infections such as herpes simplex virus (HSV), influenza A and B, hepatitis B (HBV) and C (HCV), and antiretrovirals are used to treat HIV. The presence of these infections during pregnancy can have adverse effects on the developing fetus resulting in outcomes such as preterm delivery, low birth weight, fetal anomalies and fetal/infant deaths(1-3). Research suggests early treatment of viral infections with antiviral agents can reduce pregnancy complications and improve outcomes. During the H1N1 epidemic in 2009, studies showed that early initiation of treatment was associated with reduced duration of symptoms, co-morbidities and mortality(4-6). Appropriate antiviral therapy, such as treatment for HBV-infected mothers is critical for preventing HBV mother-to-child vertical transmission (7). In addition, prophylaxis for herpes, generally with acyclovir, is often given to infected pregnant women in late pregnancy to prevent the outbreak of herpes at time of delivery thereby decreasing risk of transmission of herpes to the neonate at the time of delivery.(8) This practice in turn allows a woman to have a vaginal delivery.

Despite research demonstrating the benefits of antiviral medications to the mother and fetus, little is known about their unintended consequences. A crucial step toward understanding the potential teratogenic effects of antiviral medication exposure on the fetus is to quantify the use of these medications during pregnancy. The timing and duration of exposure to antiviral medication are also important factors to take into consideration.

We are aware of only one study(9) that evaluated the prevalence of exposure to antiviral medications, specifically antiherpetic medications. In the current study, a large cohort of pregnant women was established through the FDA-funded multi-center Medication Exposure in Pregnancy Risk Evaluation Program (MEPREP)(10) to determine the prevalence of exposure to antiviral medication among deliveries from 2001 to 2007 in a large, geographically diverse sample in the United States.

Methods

The methods for MEPREP have been described elsewhere(10). Briefly, the three contracted sites within MEPREP are: the HMO Research Network Center for Education and Research in Therapeutics (HMORN CERT), Kaiser Permanente of California, and Vanderbilt University School of Medicine/Tennessee State Medicaid. These research institutions have access to health plan data of approximately 12 million current enrollees within nine states,

covering geographically and ethnically diverse populations with a broad age range and a wide array of medical care delivery models.

To support multi-site studies, each research institution extracted information on maternal and infant enrollment, demographics, outpatient pharmacy dispensing, and outpatient and inpatient health care encounters from their administrative and claims databases. Health plan data were linked to birth certificate data obtained from the state departments of public health, which include information on sociodemographic, medical, and reproductive factors, such as gestational age, race/ethnicity, and parity. All data have been transformed into standardized datasets. The study was approved by the Institutional Review Board of each participating organization, and the state departments of public health, where applicable.

Study population and inclusion/exclusion criteria

Deliveries of live-born infants to women between January 1, 2001 and December 31, 2007 were included in the study. To be eligible, women had to be between 15 and 45 years of age at the time of delivery. Additionally, women had to be continuously enrolled in one of the participating health plans with drug coverage from at least 30 days prior to pregnancy through delivery.

Antiviral medications of interest and exposure periods

Dispensed prescriptions for any FDA-approved antiviral medications during the time period beginning 30 days before and throughout pregnancy were included in the investigation (Appendix 1). In this study we use the term antiviral to refer to all medications used to treat viral infections (e.g., antiretrovirals, and oral and topical medications). Antiviral medication exposure was determined using dispensing dates and days supply information. A 14-day grace period was incorporated, after the expected exhaustion of the days supplied for each dispensing and women were considered exposed during that period. Generic medication names and National Drug Codes (NDC) corresponding to the medication names were used to identify the antiviral medications.

The *timing of use* (during the 30 days before pregnancy, 1st trimester only, only after 1st trimester, 1st trimester and at some point after 1st trimester, or anytime during pregnancy) was calculated based on gestational age at delivery (see below) (Figure 1). The *duration of use* was calculated for each of the previously mentioned categories (1-30 days, 31-60 days, 61-90 days, 90+ days) and included the 14-day grace period as described above.

Definition and identification of trimesters of pregnancy

A multi-stage algorithm was developed to identify the trimesters of pregnancy. For deliveries for which the last menstrual period (LMP) was available in the birth certificate file (94% of the study population), the first day of the LMP was used as the beginning of the first trimester ("day zero"). The first trimester was defined as days 0-89, the second trimester as days 90-179, and the third trimester as day 180 through delivery. If the LMP was missing or had an improbable value (e.g., gestational age based on LMP < 17 weeks), day zero was defined as the delivery date minus the clinical or obstetric estimate-based gestational age. This method of using LMP to determine gestational age is consistent with the approach used by CDC's National Center for Health Statistics(11). Using the birth certificate data to calculate the LMP has been validated previously by one of the participating health plans, which found a concordance of +/- 2 weeks in the LMP between the birth certificate and the medical records in 94% of the records reviewed(12). In addition, another recent validation study(13) found that LMP-based gestational age and obstetric estimate-based gestational age were identical in more than half of all deliveries and within ± 1 week in approximately 85% of all deliveries; the difference in means was 1 day.

For deliveries for which gestational age information was missing from the birth certificate, the trimesters were estimated using the delivery date and specific International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes recorded in the health plan claims data. The algorithm assumed day zero of pregnancy according to whether a code for preterm birth was associated with delivery. Specifically day zero of pregnancy was assigned as 1) the date of delivery minus 270 days if there was no ICD-9-CM code for preterm birth; 2) the date of delivery minus 245 days if there was a code for preterm birth of unspecified gestational age; and 3) the date of delivery minus the upper limit of the gestational age range if there was a code for preterm birth with a specified range, e.g., the date of delivery minus 224 days for deliveries with an ICD-9-CM code 765.26 (“31 to 32 weeks of gestation”). A previous study that used birth registry data at one of the participating health plans found the mean gestational age was 273 days, whereas the median gestational age was 275 days(14). The 270-day algorithm has been found to be valid for non-preterm deliveries(15).

Identification of maternal demographic and clinical characteristics

Information on maternal age at delivery and calendar year of delivery was obtained from the health plan clinical or administrative data. Information on maternal race/ethnicity, education level, and marital status was obtained from the birth certificate data.

Viral infection diagnoses during pregnancy were obtained using ICD-9-CM codes (Appendix 2). Data regarding viral infection diagnoses and antiviral medication dispensing during pregnancy were ascertained concomitantly from administrative and pharmacy claims records. Specifically, the diagnosis did not necessarily precede the medication dispense date. Of the deliveries exposed to antiviral medications, 50% did not have a specific viral infection diagnosis recorded during pregnancy and were labeled “no diagnosis during pregnancy”. It was assumed these women had a viral infection that was diagnosed prior to their pregnancy and it was not recorded during the current pregnancy.

Statistical Analysis

The prevalence of antiviral medication exposure was calculated among the entire cohort where the denominator was the total number of deliveries of live-born infants. Prevalence estimates were calculated in two ways: 1) deliveries exposed to antiviral medication(s) any time between 30 days prior to pregnancy through delivery and 2) deliveries exposed to antiviral medication(s) during specific time periods of pregnancy (1st trimester only, only after 1st trimester, and during 1st trimester and at some point after 1st trimester). Prevalence estimates (with 95% confidence intervals) for antiviral medication exposure were calculated overall and stratified by characteristics including maternal age, race/ethnicity and education level. For overall sample characteristics the calculations were based on the total number of deliveries exposed to antiviral medications any time during the 30 days prior to pregnancy through delivery. The prevalence of deliveries exposed to antiviral medications was calculated for each year with the numerator reflecting the total number of deliveries exposed to antiviral medications in a given year and the denominator consisting of the total number of deliveries in the same year. The prevalence of exposure to each antiviral medication any time during pregnancy was calculated overall and for the three specific time periods of pregnancy (1st trimester only, during 1st trimester and at some point after 1st trimester).

Additionally, the prevalence for the duration of any antiviral medication exposure was calculated for the same time periods described above. In this case, the numerator is the number of deliveries exposed to antiviral medications for a given duration during a given time period while the denominator is the total number of deliveries exposed to antiviral medication(s) during that time period of pregnancy.

Finally, the percent of coded viral infection diagnoses identified by ICD-9-CM code among antiviral medication users was calculated. In these estimates, the numerator was the number of deliveries with a given viral diagnosis and the denominator was the total number of deliveries exposed to at least one antiviral medication.

Results

The Cohort

The study cohort was comprised of 664,297 deliveries with an overall prevalence of antiviral medication exposure from 2001 - 2007 of approximately 4% (n= 25,155) including the period beginning 30 days prior to pregnancy and 4% (n=24,720) for deliveries exposed at any time during the pregnancy. Table 1 shows a description of the maternal characteristics of the overall sample and by antiviral medication exposure. More than half of the deliveries (53%) were to women between the ages of 25-34 at the time of delivery and nearly half of the women were White (46%), followed by 22% Hispanic, 15% Black, and 10% Asian. Most of the deliveries were to women who had above a high school education (52%).

Prevalence of antiviral medication exposure

The characteristics of the deliveries exposed to antiviral medications anytime in the 30 days prior to pregnancy through delivery can also be found in Table 1. Deliveries of women aged 35-45 years were more likely to be exposed to any antiviral medications during pregnancy compared to deliveries of women under 18 years of age (4.6% (95% CI: 3.9 – 6.1) vs. 2.7% (1.3-3.2), respectively). Deliveries among Black women were the most likely to be exposed to antiviral medications and deliveries among Asian Americans were the least likely (5.0% (95% CI: 4.1 – 6.0) vs. 1.4% (95% CI: 1.2 – 1.9), respectively). The prevalence of using antiviral medications was similar across categories of maternal education. Figure 2 shows the prevalence of antiviral medication use during pregnancy, which includes any time during the 30 days prior to pregnancy through delivery, over the seven years of the study period. The prevalence of antiviral medication use increased from 2.5% in 2001 to nearly 5% in 2007.

Table 2 lists the prevalence of exposure to the ten most commonly used antiviral medications among all deliveries (n=664,297). In the 30 days prior to pregnancy, acyclovir was the most commonly antiviral medication used (0.33%) as well as among all deliveries with approximately 3% of the deliveries being exposed and accounting for 68% of all exposures to antiviral medication. Most of the exposure to acyclovir occurred after the 1st trimester (2% of all women delivering an infant). None of the other antivirals were used in more than 1% of deliveries.

The duration of exposure to antiviral medications during pregnancy was 30 days or less in 2% of deliveries and 31-60 days in 1% of deliveries (Table 3). Of the deliveries exposed to antiviral medications during the first trimester of pregnancy only, 78% were exposed for 30 days or less and less than 20% were exposed for 31 to 60 days. Similarly, approximately 60% of the deliveries exposed only after the 1st trimester were exposed for 30 days or less, 31% were exposed for 31-60 days, 6% were exposed for 61-90 days, and approximately 3% for more than 90 days. Deliveries to women who took antiviral medications across all three trimesters were exposed to them for more than 90 days (36%), as expected.

A diagnosis of a viral infection was coded in only 50% of the deliveries treated with one or more antiviral medications (Table 4). The most common viral infection diagnosis was herpes (including herpes simplex virus or herpes zoster virus), accounting for 40% of the women delivering an infant exposed to an antiviral medication.

Conclusions

In this retrospective population-based study the prevalence of deliveries exposed to antiviral medications increased, nearly doubling, over the seven year study timeframe of 2001 to 2007 in a large geographically and racially/ethnic diverse cohort of pregnant women(10) in the United States. Despite the increasing prevalence of use of antiviral medications, little research has been conducted on the safety and risk-benefit profiles for most of these medications during pregnancy.

Antiviral medications used to treat herpes simplex virus (HSV) (acyclovir, valacyclovir, and famciclovir) have garnered much of the research attention. The reason is likely the prevalence of HSV (seroprevalence of 23% of women for HSV 2)(16), the increased availability of new medications over recent years and treatment recommendations aimed at preventing vertical transmission. However, the research assessing the safety of these three medications has been somewhat inconclusive(17). The epidemiologic research has not found a significant risk of any major birth defects associated with acyclovir(9, 18), valacyclovir, and famciclovir(9). However, an increased risk of multiple defects at high doses of acyclovir exposure during pregnancy has been documented in animal models(19, 20).

The only other study that we are aware of that has reported the prevalence of antiviral medications use was conducted by Pasternak and Hviid(9) in Denmark. In their study, the overall prevalence of exposure to any of the three antiviral medications used to treat herpes (acyclovir, valacyclovir and famciclovir) together was less than 1%, which was less than the overall prevalence of 3% of acyclovir alone observed in our population. This discrepancy could be partially due to the time frame of the studies. The Denmark study covered births from 1996 through 2008, compared to our study which included pregnancies from 2001 through 2007. The authors do not describe trends in the use of antiviral medications in their study, but our data indicate that the prevalence of antiviral medication use nearly doubled in just six years. Regardless of whether the trends were similar between the two studies for the overlapping time periods, if the prevalence of exposure to antiviral medications in the Danish study for the five years prior to our study was low, the overall exposure in that study population would be expected to be lower. Another possibility is that there may be differences in prescribing patterns between the two countries. Our results were similar to the Denmark study with regard to the trimester(s) in which most pregnancies were exposed to antiviral medications, that is, after the first trimester. These similarities are not surprising given that American Congress of Obstetricians and Gynecologist (ACOG) recommends acyclovir or valacyclovir for women with active herpes starting at 36 weeks gestation until delivery to prevent recurrence at delivery and vertical transmission(21).

This study is not without limitations. Similar to other studies that rely on electronic pharmacy dispensing records to identify drug use, it was not possible to ascertain whether or when antiviral medications dispensed were actually taken by the women. Given that the study population only included live births, it was not possible to evaluate the use of antiviral medications in women with either a spontaneous abortion or early termination of pregnancy. We acknowledge also that the quality of birth certificate data can sometimes be limited. While our requirement for continuous health care and drug coverage resulted in more complete ascertainment of antiviral medication exposure, we recognize that our findings may overestimate exposure as women without coverage may be less likely to be prescribed medications including antiviral medications.

While our requirement for continuous health care and drug coverage resulted in more complete ascertainment of antiviral medication exposure, we recognize that our findings may be an overestimate of exposure as women without coverage may be unlikely to take

prescription medications. Finally, although the diagnoses recorded during the prenatal period among mothers who used antiviral medications were identified, it was not possible to determine whether the medications were used for those indications, and for 50% of the population, no specific viral diagnosis was recorded.

Since the pharmacy data systems were established in 1995, the increase is not likely due to any systematic changes within the health plans such as recordings of prescriptions. The increase in the prevalence of exposure to antiviral medications in our study population was largely due to acyclovir, given to treat herpes. This increase emerged gradually over the study time period and is likely due to the implementation of 2000 ACOG committee guidelines for treating pregnant women with a history of herpes starting in gestational week 36 to prevent vertical transmission (21). The frequency of acyclovir use among pregnant women almost tripled during the study period.

This study has several strengths. First, this study is a multi-center study with a large geographically and racially/ethnically diverse population. Ascertaining medication use based on pharmacy records has the advantage of avoiding recall bias. Data on comorbidities was also ascertained. Additionally, the data captures a wide array of health care delivery systems. Birth certificate data was linked to the health care data to obtain more accurate gestational age information and additional maternal characteristics. Finally, these data provide a cohort which can be followed longitudinally for future investigations of infant/child outcomes.

In conclusion, this study is one of the largest and most comprehensive studies to date to address the prevalence of deliveries exposed to antiviral medications in a large, geographically diverse sample of deliveries in the United States over time. The findings demonstrate the increasing frequency of use of antiviral medications by pregnant women. The increase is largely accounted for by acyclovir dispensing, commonly used to treat herpes infections. Given these findings, together with the limited research on the safety and risk benefit profiles of exposure to many of these medications during pregnancy, future research is needed to assess the safety and risk-benefit profiles of antiviral medication use during pregnancy.

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Appendix 1: Dispensed Prescriptions for FDA-approved Antiviral Medications during the Study Period and their FDA Pregnancy Category

Antiviral Medication	FDA Pregnancy Category	Antiviral Medication	FDA Pregnancy Category
Abacavir	C	Lopinavir	C
Acyclovir	B	Maraviroc	B
Adefovir	C	Nelfinavir	B
Amantadine	C	Nevirapine	B
Amprenavir	C	Oseltamivir	C
Atazanavir	B	Palivizumab	C
Cidofovir	C	Peginterferon Alfa-2a	C

Darunavir	C	Penciclovir	B
Delavirdine	C	Podofilox (topical)	C
Didanosine	B	Podophyllum (topical)	X
Docosanol	B	Raltegravir	C
Efavirenz	D	Ribavirin	X
Emtricitabine	B	Rimantadine	C
Enfuvirtide	B	Ritonavir	B
Entecavir	C	Saquinavir	B
Etravirine	B	Sinecatechins	C
Famciclovir	B	Stavudine	C
Fomivirsen	C	Telbivudine	B
Fosamprenavir	C	Tenofovir	B
Foscarnet	C	Tipranavir	B
Ganciclovir	C	Trifluridine	C
Idoxuridine	C	Valacyclovir	B
Imiquimod (topical)	C	Valganciclovir	C
Imunovir	C	Vidarabine	C
Indinavir	C	Zalcitabine	C
Interferon	C	Zanamivir	C
Lamivudine	C	Zidovudine	C

Appendix 2: List of Viral Infections Included in the Study and ICD-9 codes

ICD-9 code	Disease Name
042	Human Immunodeficiency Virus (HIV)
053,054	Herpes simplex/Herpes zoster virus
070.4,	
070.44, 070.5,	Hepatitis B or Hepatitis C
070.54	
48, 488	Influenza
079.4	Human papillomavirus (HPV)
	Other viral Infections
045	acute poliomyelitis
046	slow virus infections and prior diseases of central nerve system
047	meningitis due to enterovirus
048	other enterovirus diseases of central nerve system
049	other non-arthropod-borne virus disease of central nerve system
050	smallpox
051	cowpox and paravaccinia
052	chickenpox
055	measles
056	rubella
057	other viral exanthemata
058	other human herpes virus
059	other poxvirus infection
060	yellow fever

061	dengue
062	Mosquito-borne viral encephalitis
063	tick-borne viral encephalitis
064	viral encephalitis transmitted by other and unspecific arthropods
065	arthropod-borne hemorrhagic fever
066	other arthropod-borne viral diseases
071	rabies
072	mumps
073	ornithosis
074	specific diseases due to coxsackies
075	infectious mononucleosis
076	trachoma
077	other diseases of conjunctiva due to viruses and chlamydiae
078	other diseases due to viruses and chlamydiae vial and chlamydial infection in conditions classified elsewhere and of unspecific
079	site

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Figure 1. Exposure Periods of Interest

Figure 2. Prevalences of Use of Antiviral Medications by Calendar Year of Delivery of Live-born Infant*

Table 1
Maternal Characteristics for the Full Sample and Among Deliveries of Live-born Infants Exposed to Antiviral Medications^a

	Full Sample (n=664,297)		Antiviral Medication Exposure (n=25,155)	
	n	(%) ^b	n	% ^c 95% CI
Maternal Age (years)				
<18	21316	(3.2)	579	2.7 [1.33, 3.20]
18-24	172773	(26)	6620	3.8 [2.60, 3.88]
25-34	351471	(52.9)	12526	3.6 [2.99, 4.60]
35-45	118737	(17.9)	5430	4.6 [3.94, 6.01]
Maternal Race/Ethnicity				
White	302381	(45.5)	14093	4.7 [3.71, 5.22]
Black/African American	99720	(15)	4943	5.0 [4.14, 6.00]
Hispanic	144977	(21.8)	3096	2.1 [2.26, 3.81]
Native American	1741	(0.3)	84	4.8 [2.76, 6.45]
Asian American	64790	(9.8)	911	1.4 [1.23, 1.93]
Other	23918	(3.6)	1075	4.5 [2.48, 7.36]
Unknown	26770	(4)	953	3.6 [3.01, 4.44]
Maternal Education Level				
12 th grade	279506	(42.1)	9814	3.5 [2.68, 3.96]
>12 th grade	347352	(52.3)	13941	4.0 [3.39, 5.35]
Unknown	37439	(5.6)	1400	3.7 [2.87, 4.80]

^a exposure to antiviral medications includes 30 days prior to pregnancy through delivery

^b column percent was calculated to describe the cohort,

^c row percent was calculated to compare the characteristics of the deliveries exposed to antiviral medications by maternal characteristics

Table 2
Prevalence of Type of Antiviral Medication Exposure Among Deliveries Exposed to Antiviral Medications

	30 days prior to pregnancy		Anytime during pregnancy		First trimester only		During 1 st trimester and at some point after 1 st trimester		Only after 1 st trimester	
	n	(%) ^a	n	(%) ^a	n	(%) ^a	n	(%) ^a	n	(%) ^a
Acyclovir	2220	(0.33)	18193	(2.74)	2633	(0)	2742	(0.41)	12818	(1.93)
Valacyclovir	512	(0.08)	3837	(0.58)	512	(0.08)	691	(0.1)	2634	(0.4)
Imiquimod (topical)	115	(0.02)	1052	(0.16)	205	(0.03)	163	(0.02)	684	(0.1)
Lamivudine	86	(0.01)	493	(0.07)	25	(0)	149	(0.02)	319	(0.05)
Oseltamivir	112	(0.02)	453	(0.07)	224	(0.03)	30	(0)	199	(0.03)
Penciclovir	62	(0.01)	446	(0.07)	131	(0.02)	71	(0.01)	244	(0.04)
Amantadine	160	(0.02)	374	(0.06)	268	(0.04)	20	(0)	86	(0.01)
Famciclovir	107	(0.02)	416	(0.06)	165	(0.02)	57	(0.01)	194	(0.03)
Palivizumab	51	(0.01)	65	(0.01)	34	(0.01)	28	(0)	5	(0)
Podofilox (topical)	65	(0.01)	260	(0.04)	118	(0.02)	33	(0)	109	(0.02)
Others	279	(0.04)	1232	(0.19)	149	(0.02)	399	(0.06)	684	(0.1)

^a Denominator is all deliveries (n=664,297)

Table 3
Duration of Antiviral Medication Exposure by Trimester of Pregnancy

	Any time during pregnancy ^a		1st Trimester Only		Only after 1 st trimester		During 1 st trimester and at some point after 1 st trimester	
	n	(%) ^b	n	(%) ^c	n	(%) ^c	n	(%) ^c
1-30 days	13430	(2)	3111	(78.4)	9813	(59.4)	506	(12)
31-60 days	7227	(1.1)	739	(18.6)	5189	(31.4)	1299	(30.7)
61-90 days	2002	(0.3)	120	(3)	988	(6)	894	(21.1)
90+ days	2059	(0.3)	0		529 (3.2)	(0)	1530	(36.2)
Total	24,718		3970		16519		4229	

^a Data on duration of exposure was missing for two deliveries (n=24,718)

^{b*} Denominator is all deliveries (n=644,297)

^c Denominator is total number of exposed deliveries during given time period.

Table 4

The Frequency of Seven Types of Viral Infections Among Deliveries Exposed^a to Antiviral Medication(s) (n=24,720).

	n	(%)
Human Immunodeficiency Virus (HIV)	414	(1.7)
Herpes Simplex/Herpes Zoster	9799	(39.6)
Hepatitis B and C	102	(0.4)
Influenza	461	(1.9)
Human Papillomavirus (HPV)	305	(1.2)
Other	2516	(10.2)
No Diagnosis During Pregnancy	12453	(50.4)

^aExposure any time during pregnancy and does not include 30 days prior to pregnancy