

Factors Associated with Perinatal HIV Transmission among Infants Born 1997-2001 in New York City

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**Accepted for Poster Presentation at the XVth International AIDS Conference,
Bangkok, Thailand 2004**

Perinatal HIV Infection in the United States

- The perinatal HIV epidemic began in 1977
- In the early 1990's, between 1,000-2,000 HIV-infected infants were born each year
- In 2000, the estimated number of HIV-infected infants dropped to 280-370
- Each year, there are between 6,000-7,000 births to HIV-infected women
- Approximately 10% of births to HIV-infected women in the United States are reported from New York City

(CDC estimates: JAMA 1999;282:531-8; MMWR 2001; 50 (RR-19): 1-110)

Background

- Reductions in perinatal HIV transmission were shown:
 - **in 1994: ACTG 076 study: prenatal, intrapartum, and neonatal zidovudine** (*NEJM* 1994;331:1173-80)
 - **in 1999: short-course zidovudine or nevirapine** (*Lancet* 1999; 353: 773-80, 781-85, 786-92; 354:795-802)
 - **in 1999: European collaborative study of elective Cesarean-section deliveries** (*Lancet* 1999;353:1035-39) and **meta-analysis of Cesarean-section** (*NEJM*; 340:977-98)
 - **In 2002: prenatal regimens containing zidovudine in combination with other antiretrovirals** (*JAIDS* 2002;29:484-94)
- Recent recommendations for HIV-infected pregnant women were issued:
 - **in 2003: by US Public Health Service to use antiretroviral agents and interventions including Cesarean-section delivery for women with HIV-1 RNA levels above 1,000 copies/ml** (www.AIDSinfo.nih.gov)

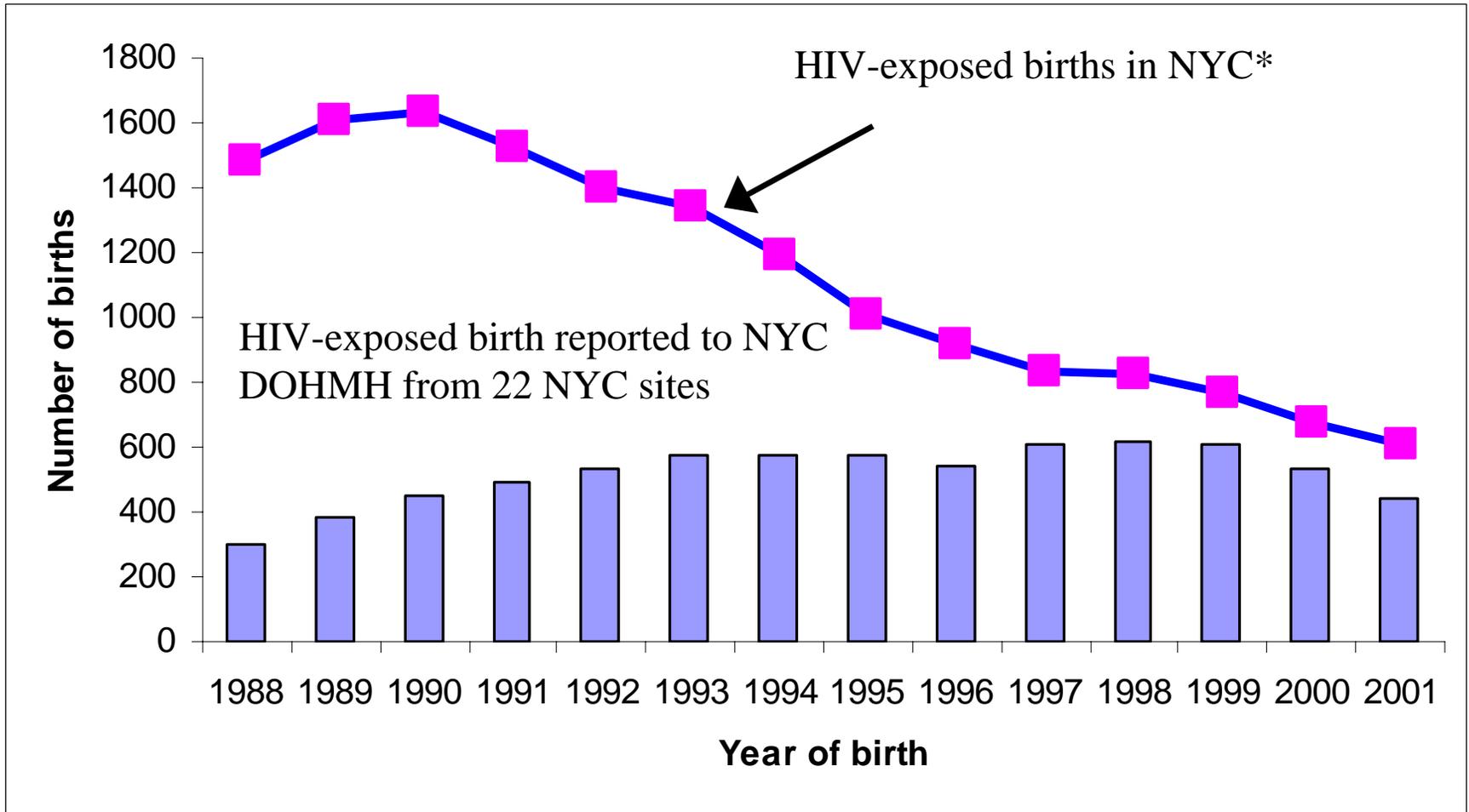
Objectives

- To describe trends in perinatal HIV prevention measures in New York City
- To describe missed opportunities for perinatal HIV prevention
- To describe failures of perinatal HIV prevention
- To describe factors associated with perinatal HIV transmission

Methods

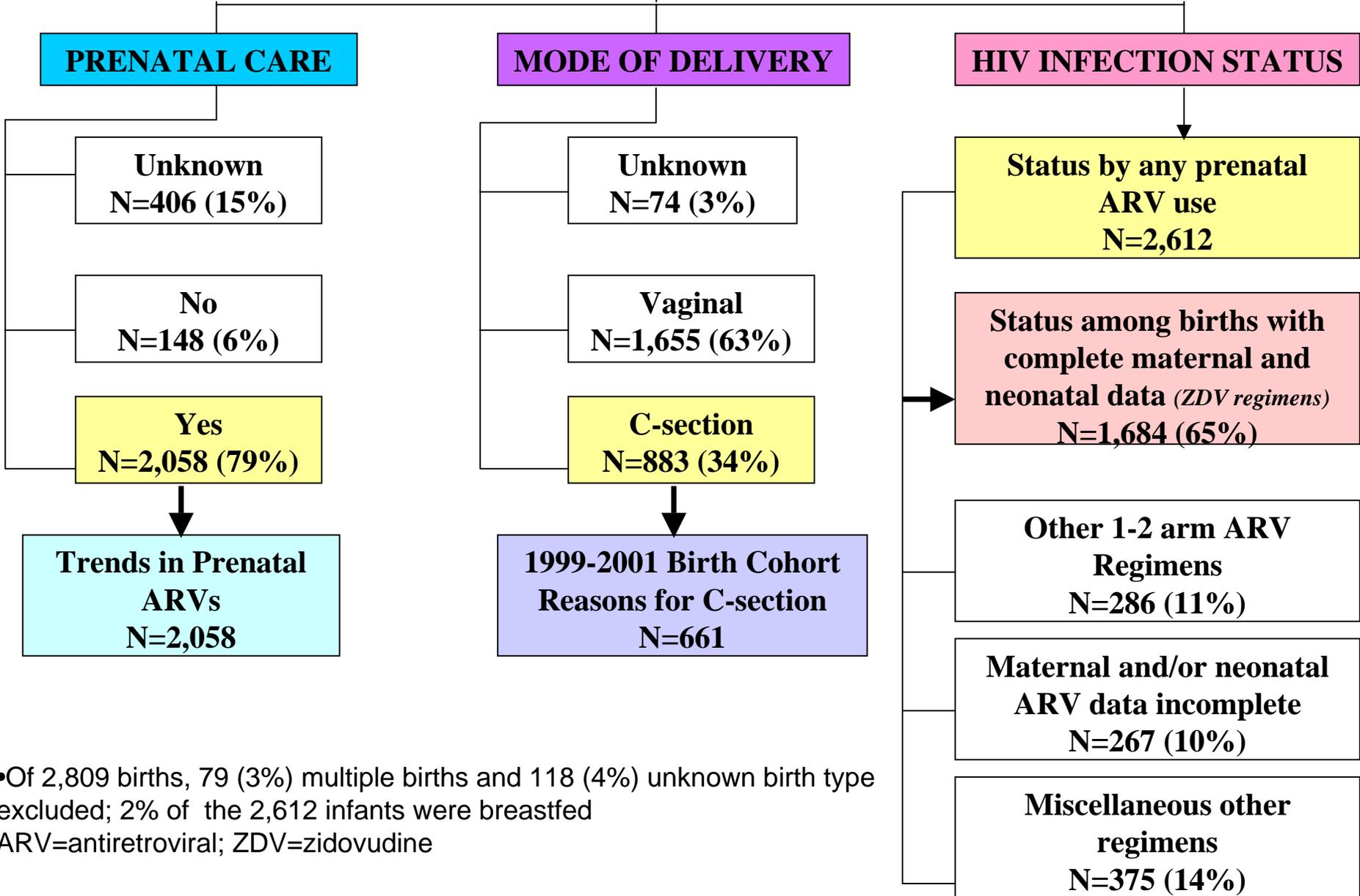
- HIV-exposed singleton infants born 1997-2001 in care at 22 NYC sites (10 sites participate in the national CDC-funded Pediatric Spectrum of HIV Disease Project)
- Retrospective abstraction of infant medical records with IRB approval
- Inclusion criteria for analytic cohort includes documentation of:
 - prenatal care
 - mode of delivery
 - prenatal, intrapartum, and neonatal antiretroviral use (*data on maternal adherence is NOT collected*)
- Infant HIV infection status is defined by the CDC (*MMWR 1999;48;RR-13:1-36*) with a modification for presumed uninfected (*2 negative PCRs 1-3 months of age*)

HIV-Exposed Births, New York City, 1988-2001



*New York State Data available through the Comprehensive Newborn Screening Program

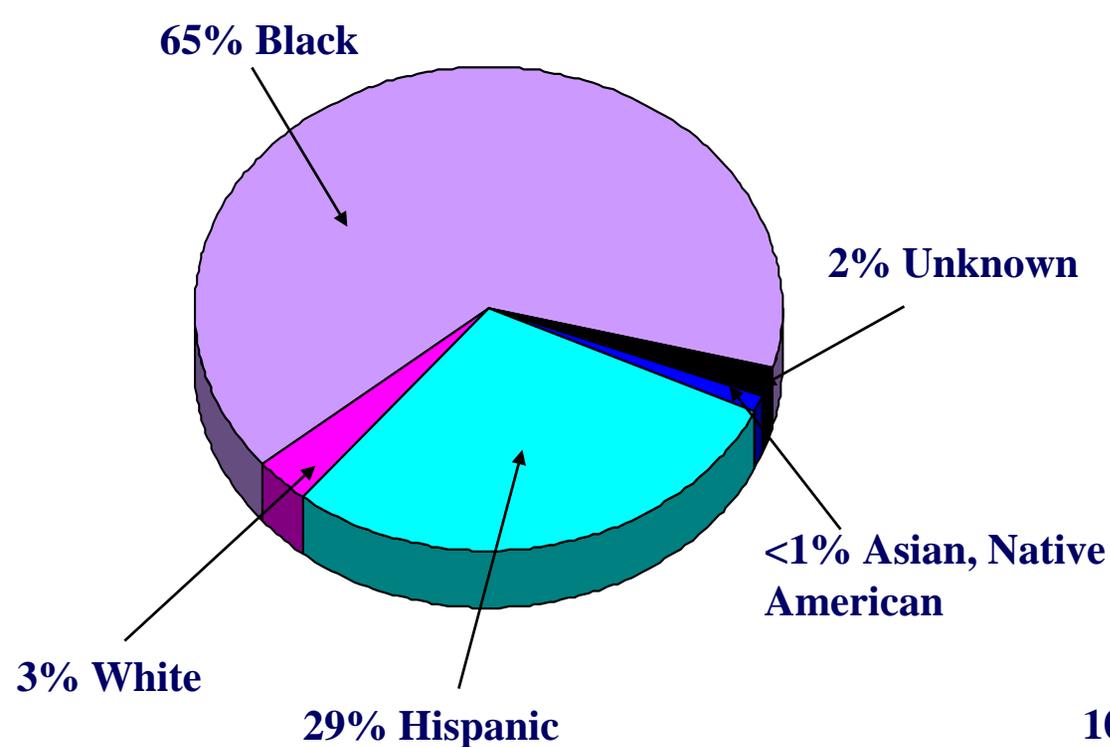
**HIV-exposed Singleton Births,
22 NYC Sites, 1997-2001*
N=2,612**



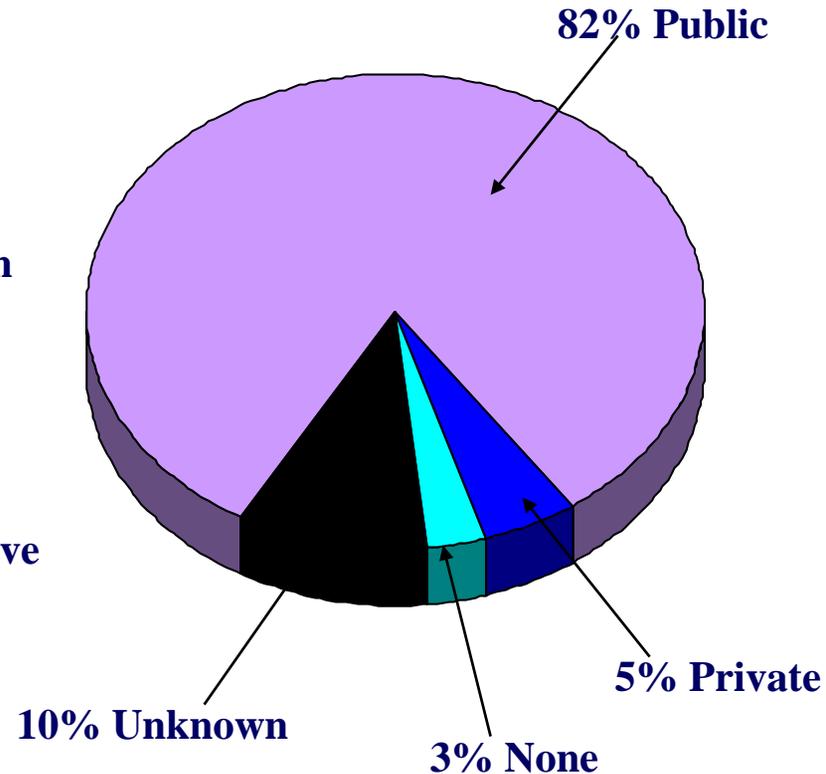
•Of 2,809 births, 79 (3%) multiple births and 118 (4%) unknown birth type excluded; 2% of the 2,612 infants were breastfed
ARV=antiretroviral; ZDV=zidovudine

Results-1: Characteristics of HIV-Exposed Singleton Deliveries (N= 2,612), 22 NYC Sites, 1997-2001

Maternal Race/Ethnicity

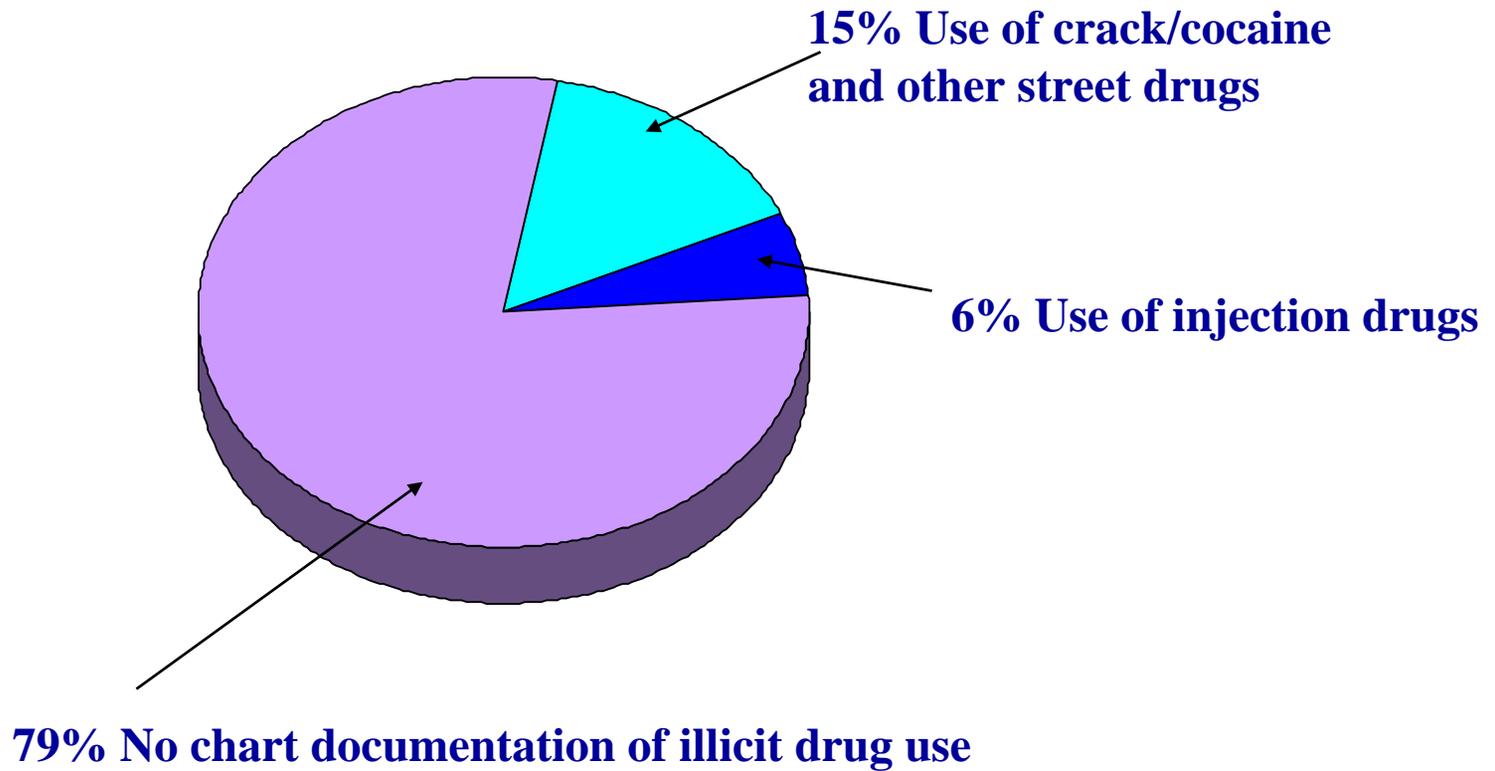


Source of Pediatric Medical Reimbursement



Results 1 continued

Maternal Illicit Drug Use



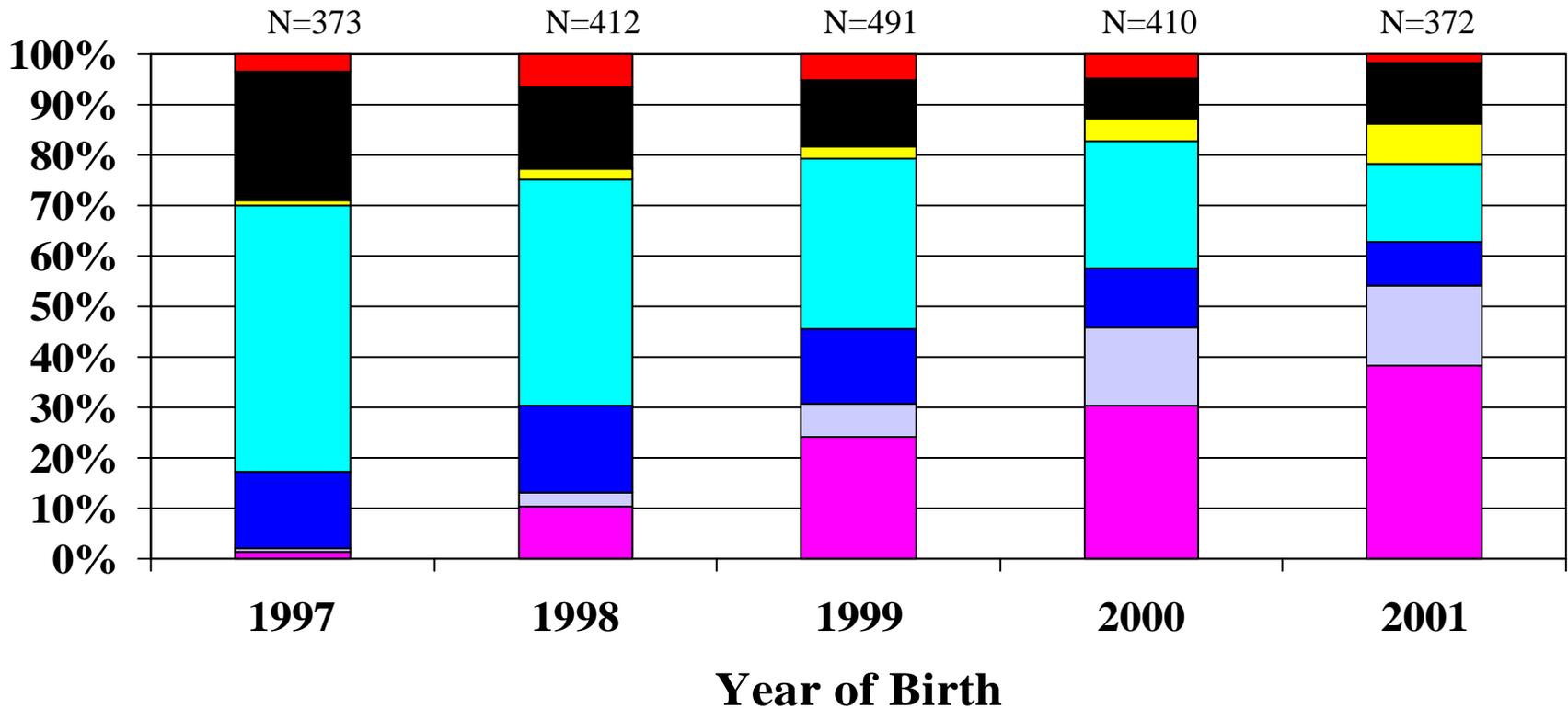
Results-2: Prenatal Care among HIV-Exposed Deliveries (N=2,612), 22 NYC sites, 1997-2001

Year of Birth	1997	1998	1999	2000	2001	Total
Number of deliveries	545	565	572	500	430	2,612
No. with prenatal care						
Yes*	373	412	491	410	372	2,058
No	45	40	26	20	17	148
Unknown	127	113	55	70	41	406
Deliveries with prenatal care data: % with prenatal care⁺	89%	91%	95%	95%	96%	93%

*Overall, 89% of women with prenatal care were diagnosed with HIV before delivery

+ Includes only Yes and No categories

Results-3: Prenatal Antiretroviral Therapies among HIV-Infected Women in Prenatal Care (N=2,058), 22 NYC Sites, 1997-2001



ZDV and a PI regimen*
 ZDV and NRTI/NNRTI
 ZDV and an NRTI

ZDV alone
 Other ARVs
 Unknown

*84%: 3-drug regimens

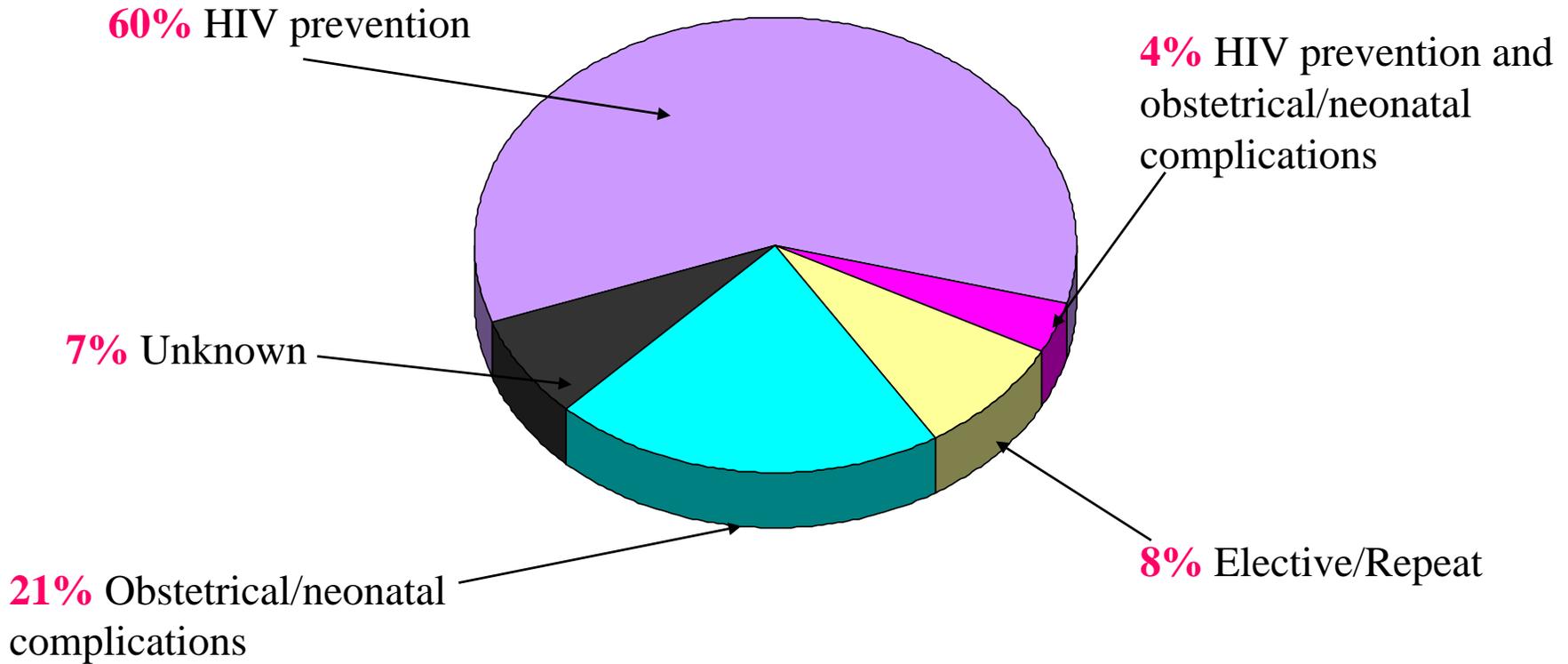
ZDV=zidovudine; PI=protease inhibitor; ARV=antiretroviral
 NRTI=nucleoside reverse transcriptase inhibitor
 NNRTI=non-nucleoside reverse transcriptase inhibitor

Results-4: Mode of Delivery in HIV-Exposed Deliveries, 22 NYC Sites (N=2,612), 1997-2001

	1997	1998	1999	2000	2001
Number of deliveries	545	565	572	500	430
Vaginal	77%	75%	59%	50%	51%
C-section*	20%	21%	39%	47%	47%
Unknown	3%	4%	2%	3%	2%

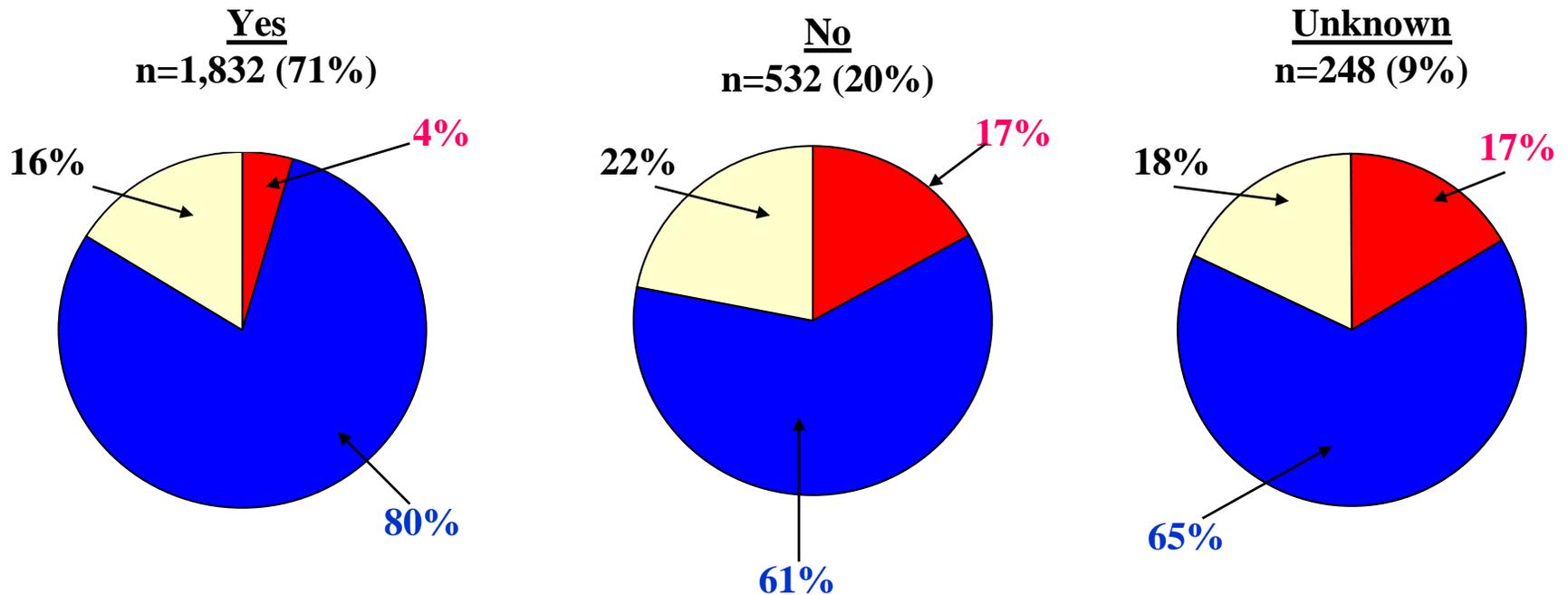
*All C-section deliveries regardless of indication; beginning in 1999, indications collected

Results 5: Indications for C-Section Deliveries in HIV-Exposed Births (N=661), 22 NYC Sites, 1999-2001



Results-6: Infant HIV Infection Status (N=2,612), by Prenatal Antiretroviral Use, 22 NYC Sites, 1997-2001

Mother Prescribed Any Prenatal Antiretroviral Therapy*



*Any prenatal antiretroviral (ARV): zidovudine (ZDV) alone or in combination with other antiretrovirals (ARVs) (80 ARV regimens did not include ZDV) *regardless* of intrapartum and neonatal ARVs

Results-7: Infant HIV Infection Status (N=1,684), by Antiretroviral Use, 22 NYC Sites, 1997-2001

Timing of ARV Use	N	% INF	% UNF	% IND	OR (95% CI)*
Prenatal ZDV with other ARVs plus intrapartum and neonatal ZDV	675	2	84	14	0.07 (0.04-0.15)
Prenatal, intrapartum and neonatal ZDV	644	5	77	18	0.21 (0.12-0.35)
Intrapartum and neonatal ZDV only	63	11	67	22	0.54 (0.21-1.37)
Neonatal ZDV only⁺	84	8	69	23	0.36 (0.14-0.91)
None (no ARVs)*	218	20	60	20	Referent

INF=infected, UNF=uninfected, IND=indeterminate; OR=Odds Ratio, CI=Confidence Interval

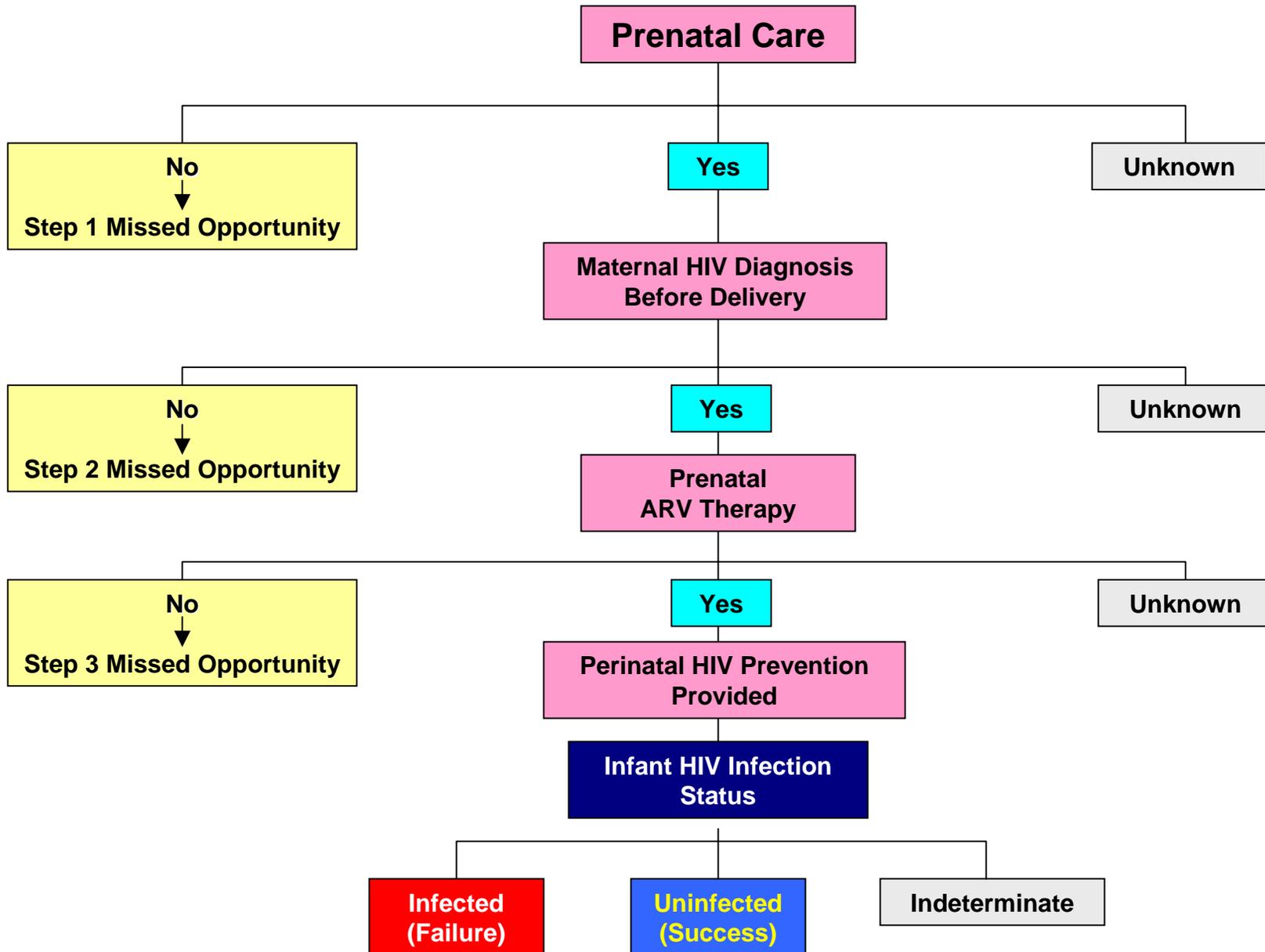
ZDV=zidovudine; PI=protease inhibitor; ARV=antiretroviral

*Based on the comparison of infected and uninfected infants

⁺Initiation of neonatal ZDV within 24 hours of birth

[#]Infants first evaluated for HIV exposure within 2 months of age

Evaluation of Perinatal HIV Prevention Methods



Results-8: Infant HIV Infection Status (N=1,951) by Methods for Perinatal HIV Prevention, 22 NYC Sites, 1997-2001*

	Infected N=134	Uninfected N=1,476	Indeterminate N=341	Total N=1,951
	N (%) ⁺	N (%) ⁺	N (%) ⁺	N (%) ⁺
Missed Opportunities for Perinatal HIV Prevention				
No prenatal care (<i>Step 1</i>)	25 (18.7)	85 (5.8)	38 (11.0)	148 (7.6)
Prenatal care but no prenatal HIV diagnosis (<i>Step 2</i>)	31 (23.1)	88 (6.0)	31 (9.1)	150 (7.7)
Prenatal care, prenatal HIV diagnosis but no ARVs (<i>Step 3</i>)	6 (4.5)	15 (1.0)	6 (1.8)	27 (1.4)
<i>Any Missed Opportunity</i> [#]	62 (46.3)	188 (12.8)	75 (21.9)	325 (16.7)
Incomplete ARV Regimens for Perinatal HIV Prevention				
Prenatal care, prenatal HIV diagnosis, 1-2 arm ARVs	22 (16.4)	191 (12.9)	58 (17)	271 (13.9)
Perinatal HIV Prevention Provided				
Prenatal care, prenatal HIV diagnosis, 3-arm ARVs	50 (37.3) [@]	1,097 (74.3) [@]	208 (60.1)	1,355 (69.4)

ARV=antiretroviral

*661 (25%) of 2,612 infants born in the same period have incomplete data

+Column percents shown

#Any Missed Opportunity among Infected vs.Uninfected: Unadjusted odds ratio 5.90 (4.00-8.71)

@Failures of perinatal HIV prevention, N=50; @Successes of prevention, N=1,097

Results-9: Factors Associated with Failures of Perinatal HIV Transmission in a Logistic Regression (N=1,039), 22 NYC sites, 1997-2001

Adjusted for race/ethnicity, type of medical insurance, type of delivery, gestational age, and year of birth

Maternal illicit drug use vs. none:

OR: 2.5 (95% CI 1.3-5.0) p=0.007

3-arm ZDV vs. 3-arm with prenatal ZDV with other ARVs:

OR: 2.6 (95% CI 1.3-5.0) p=0.006

Results-10: Factors Associated with Perinatal HIV Transmission in a Logistic Regression (N=1,532)*, 22 NYC sites, 1997-2001

	OR	95%C.I.
Year of Infant Birth		
1997	1.6	0.8-3.3
1998	1.3	0.7-2.7
1999	1.2	0.6-2.4
2000	1.1	0.5-2.3
2001		Referent
Race/Ethnicity		
Black		Referent
White	2.7	1.0-7.1
Hispanic	1.2	0.8-1.8
Pediatric Medical Insurance		
Public		Referent
Private	0.8	0.3-2.0
None	0.5	0.1-2.3

Results 10 continued

Prenatal Interventions

No Prenatal HIV testing, no ARVs		Referent
Prenatal HIV testing, no ARVs	0.8	0.3-2.2
Prenatal HIV testing, 1-2 arm regimens	0.2⁺	0.1-0.4
Prenatal HIV testing, 3-arm zidovudine	0.1⁺	0.08-0.3
Prenatal HIV testing, 3-arm combination zidovudine	0.06⁺	0.03-0.1

Delivery Type

Vaginal		Referent
Caesarian	1.1	0.7-1.7

Maternal Illicit Drug Use

No/Unknown		Referent
Yes	2.1⁺⁺	1.3-3.3

*Only deliveries with prenatal care included; breastfeeding not included in the model because data on duration of breastfeeding not collected among the 6 infected and 20 uninfected infants who were breastfed

**Prenatal zidovudine with other antiretrovirals

⁺p<0.001; ⁺⁺p=0.002

Summary

- Among the HIV-exposed infants born 1997-2001, the majority of their mothers received prenatal care, were diagnosed with HIV before delivery and were prescribed prenatal antiretroviral therapy
- HIV transmission rates are lowest among infants born to mothers who received prenatal combination therapies
- Despite successes, 46% of the HIV-infected infants in our hierarchy model were born to mothers with missed opportunities for perinatal HIV prevention

- Failure to diagnose HIV prenatally is the most common missed opportunity for perinatal HIV prevention among women in prenatal care
- Perinatal HIV transmission was associated with lack of prenatal HIV testing, incomplete antiretroviral regimens, and maternal illicit drug use
- Epidemiological data provide critical information to help guide HIV perinatal prevention programs and to monitor the population-wide success of the programs

Participating Institutions and Pediatricians NYC Special Study Sites

- **Albert Einstein Hospital (Arye Rubinstein)**
- **Beth Israel Hospital (Joanna Dobroszycki)**
- **Bronx Lebanon Hospital (Saroj Bakshi)**
- **Brookdale Hospital (Mahmoud Hassanein)**
- **Columbia-Presbyterian (Marc Foca)**
- **University Hospital of Brooklyn (Edward Handelsman)**
- **Harlem Hospital (Elaine Abrams)**
- **Incarnation Children's Center (Cathy Painter)**
- **Jacobi Hospital (Andrew Wiznia)**
- **Kings County Medical Center (Ninad Desai)**
- **Lincoln Hospital (Hermann Mendez)**
- **Long Island College (John Belko)**
- **Long Island Jewish Medical Center (Vincent Bonagura)**
- **Metropolitan Hospital (Marukh Bamji)**
- **Montefiore Hospital (Nathan Litman)**
- **Mount Sinai Medical Center (Roberto Posada)**
- **New York Hospital (Joseph Stavola)**
- **North Central Bronx (Jacob Abadi)**
- **Queens General Hospital (Paul Zam)**
- **St Lukes-Roosevelt Hospital (Stephen Arpadi)**
- **St. Vincents Hospital (Mona Rigaud)**
- **Woodhull Hospital (Lubin Augustin)**

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