HIV Infection in Houston

AN EPIDEMIOLOGIC PROFILE 2010 - 2014

HIV INFECTION

The Human Immunodeficiency Virus (HIV) is a retrovirus passed from person to person through sexual contact, sharing needles or syringes, or blood, or from mother to child during pregnancy, or delivery, or breastfeeding. As the disease progresses, the infected person's immune system is weakened and they may develop other opportunistic infections or diseases.

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This profile is a summary of epidemiologic data from 2010-2014, regarding human immunodeficiency virus (HIV) infection in the Houston and Harris County jurisdictions (Houston/Harris County). Data sources include Texas enhanced HIV and Acquired Immune Deficiency Syndrome Reporting System (eHARS), National HIV Behavioral System (NHBS), Houston Medical Monitoring Program (HMMP), Houston Electronic Surveillance System (MAVEN), Sexually Transmitted Disease Management Information System (STD*MIS), American Community Survey (ACS)1-year estimates, US Census 2010, and the Texas Demographer.

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EXECUTIVE SUMMARY

Introduction

The Houston Health Department (HHD) received funding through a cooperative agreement with the Centers for Disease Control and Prevention under Program Announcement 13-1302, the National HIV Surveillance System (NHSS). HHD provides support to the existing epidemic surveillance infrastructure across the jurisdictions of the City of Houston and Harris County, Texas.

The Houston HIV/STD Surveillance Program (Program) is part of the Bureau of Epidemiology within the Division of the Office of Surveillance and Public Health Preparedness. Stephen Williams, M.Ed., MPA is the Director of HHD; Raouf R. Arafat, MD, MPH is the Director of the Division and Overall Responsible Party; Kirstin Short, MPH is the Chief of the Bureau of Epidemiology; and Salma Khuwaja, MD, MPH, DrPH is the Manager of the Program and Surveillance Coordinator. The current HIV surveillance projects include case surveillance, incidence surveillance, and the optional activities of molecular HIV surveillance, geocoding and data linkage, and perinatal HIV exposure surveillance.

The Texas Health and Safety Code, Title 2, Subtitle D, Chapters 81 and 85 and the Texas Administrative Code, Title 25, Part 1, Chapter 97 regulates the reporting of communicable diseases including HIV infection to the health authority, the investigation of these reports, and the subsequent dissemination of epidemiologic data. The first documented case of AIDS in Houston was reported in 1981, and AIDS has been a reportable disease in Texas since 1983. Named HIV reporting became mandatory in 1999. Most recently, changes to the law which became effective January 1, 2010, require the reporting of all CD4 counts or percentages and all HIV viral load tests regardless of the result, both positive and negative HIV-DNA or HIV-RNA virologic tests for children under three years of age, and all HIV genotype resistance results.

Demographics of Surveillance Area

Harris County, which comprises the majority of the Houston and Harris County HIV surveillance area, is the third-most populous county in the United States. It is an ethnically-diverse region, with African Americans and Hispanics accounting for 60% of the population as compared to the national average of 30%. The population is younger than national and state averages.

The Houston/Harris County region ranks below state and national averages in adults over 25 years with a high school diploma or its equivalent. More people in this region live below the Federal Poverty Level: Harris County (17.4%) vs. the national average (15.5%). Access to healthcare is strikingly different among race/ethnicity groups. The percentage of African Americans who are uninsured is twice that of Whites, and Hispanics are uninsured at a rates 4 times that of Whites.

HIV Case Surveillance

Overall, the estimated number of HIV new diagnoses in Houston/Harris County remained relatively stable from 2007 to 2013, with the average HIV incidence rate at 28.2 per 100,000 population per year. New HIV diagnoses data in Houston/Harris County in 2014 revealed several important findings:

- African American males had higher rates of new HIV diagnoses than White and Hispanic males (4.6 times that of White males).
- African American women were newly diagnosed with HIV at a rate 21 times that of White and 5.8 times that of Hispanic women.
- African Americans had new HIV diagnoses rates 7.6 times that of Whites in both age groups 15-24 years and 55 years and over.
- Men who have sex with men (MSM) was the largest risk category for all male cases (85.8%).

In 2011, there were approximately 1.2 million people in the United States living with HIV infection, which included undiagnosed HIV-infected individuals[1]. Since the data were generated from HIV surveillance data, only people living with HIV diagnoses (PLWH) were reported in this profile. At the end of 2013, there were 22,551 PLWH in Houston/Harris County, at a rate of 520 per 100,000 population. One out of 200 residents in Houston/Harris County was reported as having an HIV diagnoses. By risk, 54.1% of the living cases were attributed to MSM exposure, 30% due to heterosexual exposure, and 10% due to injection drug user (IDU) exposure. The steady increase in the number of PLWH from 1999 to 2013 was a result of a consistent rate of new infections each year and increased survival of those already infected with HIV. This resulted in a growing number of people at risk for transmitting HIV and requiring HIV treatment.

Acquired immune Deficiency Syndrome (AIDS) was classified as HIV stage 3 beginning in 2014[2]. In 2014, the rates of new AIDS diagnoses in African Americans were higher than that in Whites (4.8 times in males and 10.1 times in females). Among males, MSM was the largest risk category, accounting for 83% of AIDS diagnoses in Whites and Hispanics and about 60% in African Americans. By age, the highest rate of new AIDS diagnoses was in the age group 35-44 years for Whites and African Americans, and 25-34 years for Hispanics. African Americans aged 25-34 had an AIDS diagnoses rate 6.3 times that of Whites.

Among persons newly diagnosed with HIV in Houston/Harris County in 2013, 26.2% progressed to AIDS within a year. Hispanics had the highest percentage of late HIV diagnoses (34.4%) among all race/ethnicity groups. Half of the newly diagnosed people over the age of 55 were diagnosed as AIDS within a year after HIV diagnoses.

Comorbidities:

PLWH are more likely to be co-infected with other sexually-transmitted diseases (STDs) as well as hepatitis B and C than people without HIV infection. The most common STDs among HIV patients are syphilis, gonorrhea and chlamydia. In 2012 and 2013, a total of 117 HIV positive people living in Houston/Harris County were diagnosed with acute hepatitis B or hepatitis C (current or previous infection), which is about 0.5% of PLWH. PLWH co-infected with hepatitis B or C were more likely to be male, African American, and individuals aged 45 years and older. MSM was the most common reported transmission risk followed by IDU and was reported in one quarter of the HIV and hepatitis co-infected cases. In 2013, 22 PLWH were diagnosed with tuberculosis.

Preventing Secondary Transmissions through Care:

The Houston Health Department (HHD) has Service Linkage Workers (SLWs) who travel throughout the city to meet with out-of-care persons and assess their willingness to return to care and the barriers that prevent them from seeking care. SLWs, who have been utilized in the Houston area since 2008, are non-medical case managers who locate HIV-infected persons not receiving medical care, facilitate their entry into care, and work to keep them in care once they have engaged with the medical care system.

Special Projects:

Houston Medical Monitoring Project (HMMP)

The purpose of the HMMP is to produce population-based estimates of characteristics of PLWH who are also receiving medical care in Houston/Harris County. The HMMP provides information on risk behaviors, clinical outcomes, use of prevention services, and identifies met and unmet needs for HIV care and prevention services.

National HIV Behavioral Surveillance in Houston (NHBS)

The National HIV Behavioral Surveillance program (NHBS) was established to monitor behaviors associated with risks for HIV infection. NHBS consists of a repeated, cross-sectional survey of MSM, IDU, and heterosexual exposure at risk for HIV infection.

INTRODUCTION
SECTION I

HIV Infection in Houston: An Epidemiologic Profile 2010-2014 is the HIV Epidemiologic Profile produced by the HHD HIV Surveillance Program. The profile describes HIV trends in Houston/Harris County, providing a thorough description of HIV Epidemiology, HIV comorbidity, and special projects such as the HMMP, the NHBS and the HIV Linkage to Care. It can be used for making decisions about service priorities, funding allocations and quality assessments, and can assist in designing jurisdictional needs assessments and developing comprehensive HIV plans. The profile describes cases of HIV infection diagnosed through December 31, 2014, and reported to the HHD by June 30, 2015, except where noted.

The *Epidemiologic Profile* is divided into seven sections, beginning with Section I, the Introduction. Section II presents a description of the geographic and socio-demographic characteristics of Houston and Harris County. Section III provides information on epidemiological trends in HIV infection, including incidence, prevalence, and mortality. This section also describes the geographic distribution of HIV in the area. Section IV provides information about the population with comorbid infections (HIV diagnosis with at least one additional diagnosis of a sexually transmitted infection, hepatitis, or tuberculosis). Section V highlights re-linkage to care of PLWH in Houston/Harris County. Section VI describes HIV special projects such as HMMP and NHBS. The final section includes a glossary of terms used in the profile, references, and an overview of data sources.

HIV surveillance is the continuous and systematic epidemiological practice of collecting, analyzing, interpreting, and disseminating population-based data related to HIV infections. Texas law requires health care providers and laboratories submit reports of HIV infection to the local health authority upon completion of a positive confidential HIV test or when making a diagnosis of HIV infection. Complete and accurate HIV/AIDS and STD reporting by healthcare providers and laboratories is critical to monitor disease in Texas. The HIV Surveillance Program strives to provide the most complete picture of the HIV epidemic in Houston/Harris County using surveillance and epidemiologic research data and analysis.

Maintaining confidentiality and security is required for federal funding and is a priority of the HIV Surveillance Program. Information about infected individuals is strictly confidential and maintained according to federal, state, and local policies and procedures. Additionally, strict guidelines govern the release of reports to ensure that no data presented could be used to identify any individual with HIV. Anonymous test results are not reported to the health department.

The HIV Surveillance Program provides HIV information to assist community-based organizations, academic researchers and policy-makers for planning, implementation, and evaluation of programs and policies affecting HIV care, as well as HIV prevention, education, and research in the area. The epidemiologic profile complements information provided through the program's quarterly reports, data requests, reports and presentations at professional meetings, community-based organizations, and regional or national conferences.

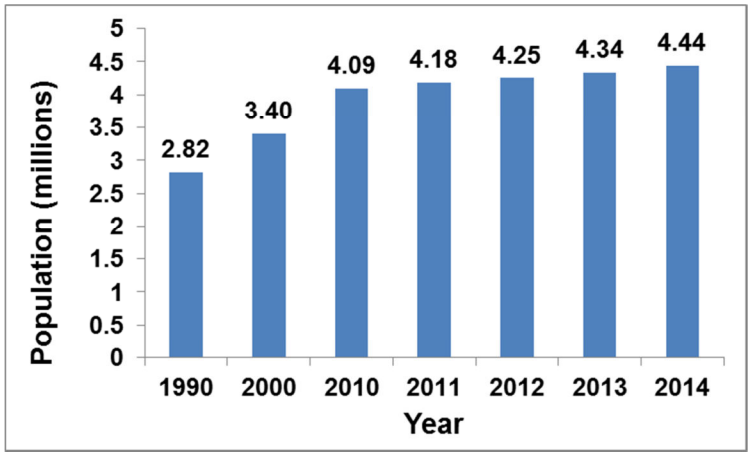
Geography and Population Size:

Harris County is located in southeast Texas and encompasses 1,777 square miles. It is the third most populous county in the United States, with an estimated 4.44 million residents. Most residents live within the county's 34 municipalities with over two million residents living within the City of Houston, the fourth largest city in the U.S. While most of the City of Houston lies within Harris County, Houston also extends slightly into Fort Bend County to the southwest and Montgomery County to the north.

Population Growth:

The population of Harris County continues to grow rapidly, having increased by 57.5% since 1990 and with a 30.6% increase from 2000 to 2014 (Figure 1). Table 1 shows the comparison of population characteristics in Harris County, Texas and the U.S. Furthermore, the Texas Demographer projects that Harris County's population will reach 4.5 million by the end of 2015 and 6.8 million by 2040.

***Figure 1*: Population Growth in Harris County, 1990-2014**



Source: a) 1990, 2000, and 2010: U.S. Census Bureau, 1990, 2000 or 2010; b) 2011-2014: U.S. Census Bureau, American Community Survey (ACS) 1-year estimates for each year.

Racial/Ethnic Distribution:

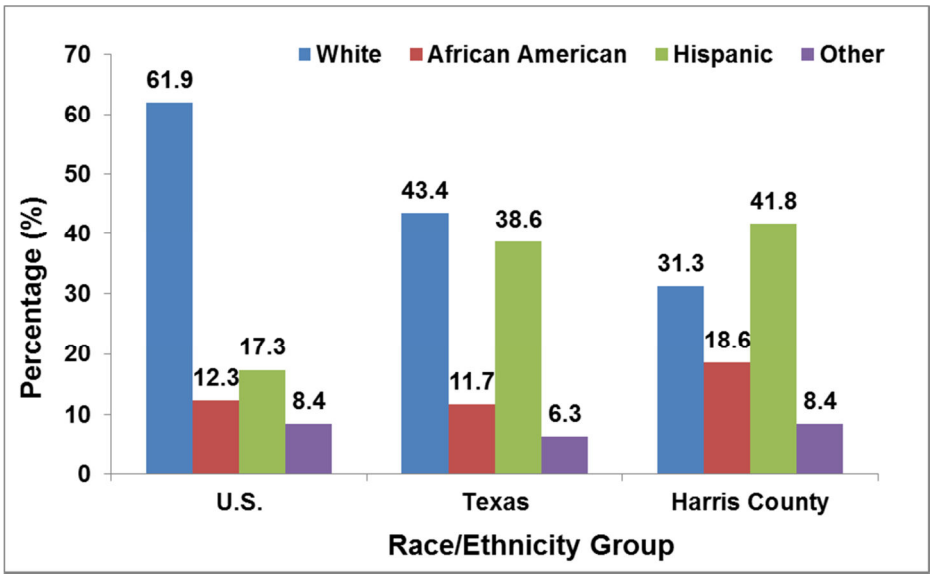
Harris County is racially and ethnically diverse. Figure 2 shows the racial and ethnic composition of Harris County. Since 1982, the White population has been declining while Asian, Hispanic, and African American populations have shown an increase. Hispanics are the largest single population group in the area today, while the African American population has remained relatively constant. In 2014, Hispanics, African Americans and other minority race/ethnicity groups combined accounted for 68.7% of the total population. Whites make up 31.3% in Harris County, which was lower than the percentage of Whites in Texas (43.4%) and in the U.S. (61.9%) (Table1).

Table 1: **Comparison of Population Characteristics in Harris County, Texas and U.S., 2014**

	Harris County	Texas	U.S.
Total population	4,441,370	26,956,958	318,857,056
Race/Ethnicity			
White	31.3%	43.4%	61.9%
African American	18.6%	11.7%	12.3%
American Indian and Alaska Native	0.2%	0.2%	0.7%
Asian	6.6%	4.3%	5.2%
Native Hawaiian and Other Pacific Islander	0.1%	0.1%	0.2%
Some other races alone	0.2%	0.1%	0.2%
Two or more races	1.3%	1.6%	2.2%
Hispanic/Latino (includes all races)	41.8%	38.6%	17.3%
Sex and Age			
Median Age (years)	33.0	34.3	37.7
Persons under 5 years	7.7%	7.2%	6.2%
Persons under 18 years	27.1%	26.4%	23.1%
Persons 65 years and over	9.2%	11.5%	14.5%
Female	50.2%	50.3%	50.8%
Male	49.8%	49.7%	49.2%
Place of Birth and Language Spoken At Home			
Foreign Born Persons	26.0%	16.8%	13.3%
Language other than English, age 5 years and over	44.1%	35.5%	21.1%
Education Attainment among Population 25 years and Over			
Less than 9th grade	11.2%	9.0%	5.6%
9th to 12th grade (no diploma)	9.0%	8.8%	7.5%
High school graduate (includes equivalency)	22.8%	25.2%	27.7%
Some college, no degree	21.2%	22.5%	21.0%
Associate's degree	6.0%	6.7%	8.2%
Bachelor's degree	18.9%	18.2%	18.7%
Graduate or professional degree	10.8%	9.6%	11.4%
Percent high school graduate or higher	79.8%	82.2%	86.9%
Percent bachelor's degree or higher	29.7%	27.8%	30.1%
Household Size, Income and Poverty Rates			
Household	1,538,072	9,277,197	117,259,427
Persons per household	2.65	2.84	2.65
Per capita money income	$29,421	$27,125	$28,889
Median household income	$54,178	$53,035	$53,657
Persons below poverty level (all age groups)	17.4%	17.2%	15.5%
Persons below poverty level (children under 18 years)	21.7%	24.6%	25.7%
Family received --			
Social Security income	19.6%	25.1%	30.3%
Retirement income	10.2%	14.3%	18.1%
Cash public assistance	1.4%	1.5%	2.7%
Food stamps	12.7%	13.1%	13.2%

Sources: U.S. Census Bureau, 2014 ACS 1-Year Estimates.

Figure 2: **Race/Ethnicity in Harris County, Texas, and U.S, 2014.**

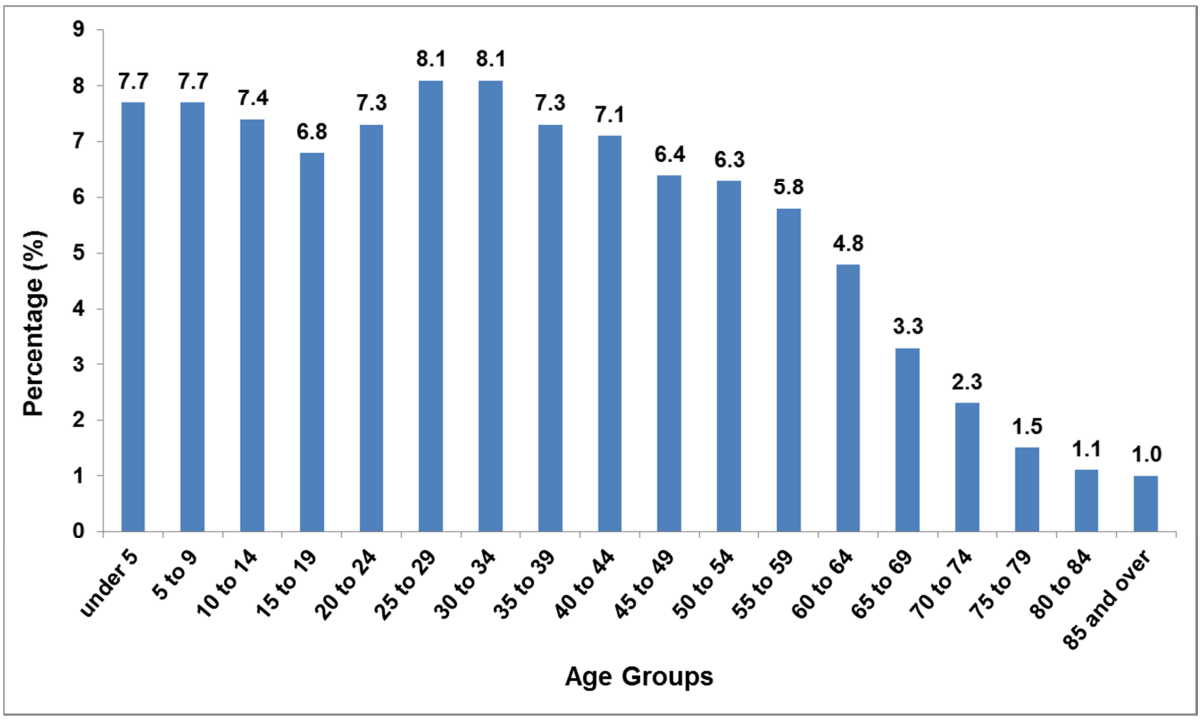


Source: U.S. Census Bureau, 2014 ACS 1-Year Estimates.

Age and Sex Distribution:

In 2014, the Harris County population consisted of 49.8% males and 50.2% females. Similarly, the U.S. and Texas population were fairly evenly distributed between males and females. The median age of the Harris County population (33 years of age) was younger than that of the Texas (34.3) and U.S. population (37.7) (Table 1). In Harris County, 43.3% of the population was between the ages of 25 to 54 years (Figure 3).

Figure 3: **Age Groups in Harris County, 2014**



Source: U.S. Census Bureau, 2014 ACS 1-Year Estimates.

Socioeconomic Status:

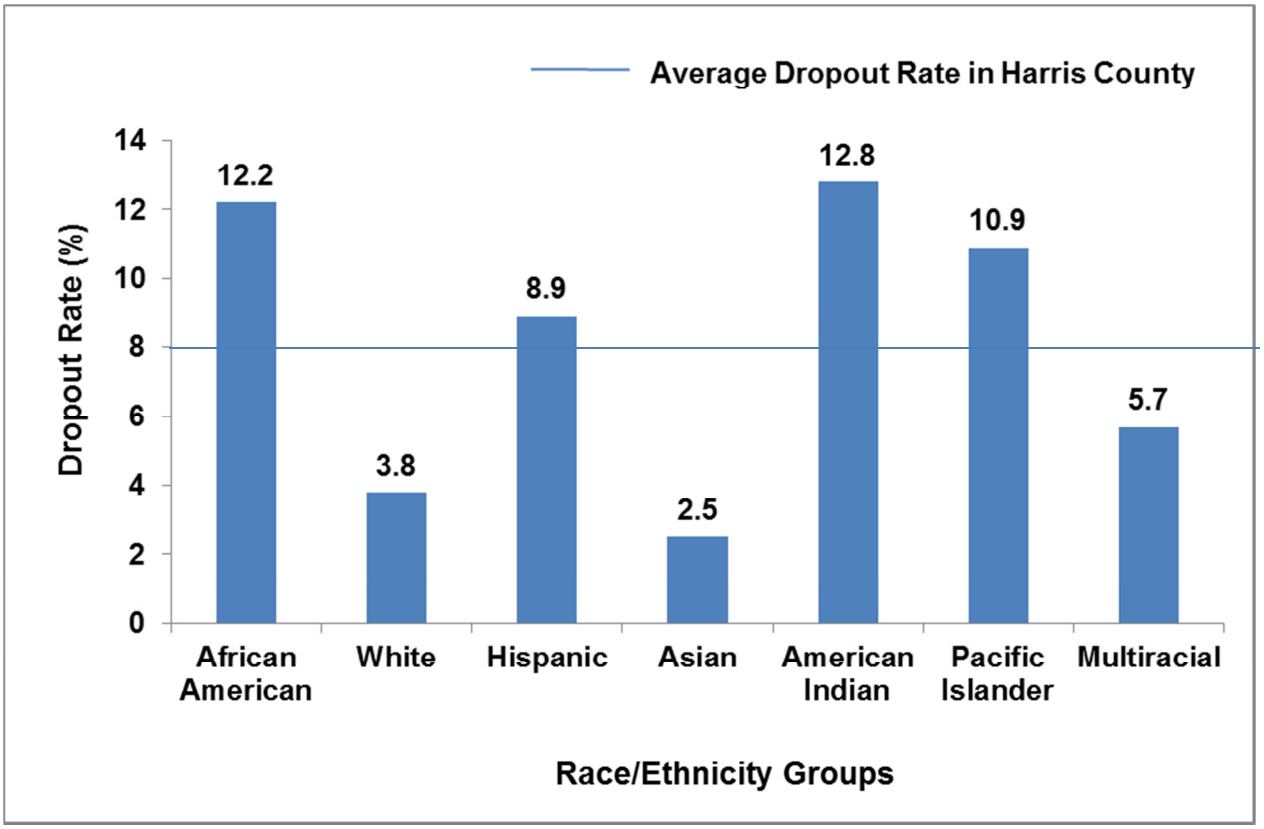
Education

There is a well-established relationship between education and health[3]. Individuals with lower education levels are at increased risk of experiencing morbidity and mortality from different diseases, unhealthy behaviors, and reduced access to health care.

Compared to the U.S. and Texas, fewer Harris County residents aged 25 and older had a high school diploma or its equivalent. In 2014, 79.8% of Harris County residents age 25 and older were high school graduates, compared to 82.2% in Texas and 86.9% in the U.S. However, the percentage of residents with a bachelor's degree or higher education was 29.7% in Harris County, which is similar to 30.1% in the U.S. and slightly higher than 27.8% in Texas (Table 1).

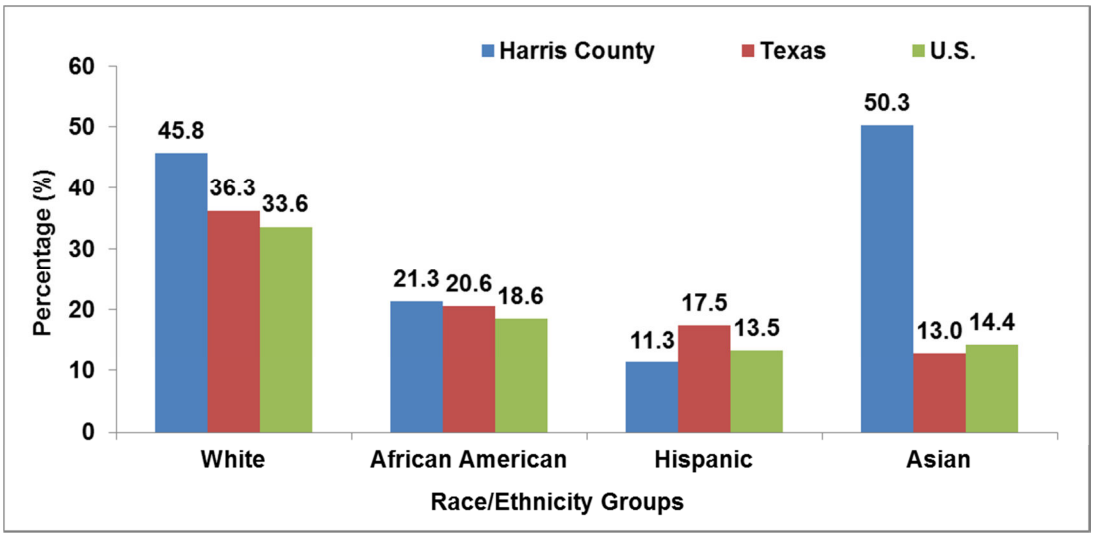
There are apparent differences in educational attainment among racial/ethnic groups in Harris County. According to the Texas Education Agency, the annual dropout rate of African Americans, Hispanics, American Indians, and Pacific Islanders was above the average rate in Harris County, which was 8%. Moreover, the dropout rate among African American and American Indian students was about 3 times the rate of Whites (Figure 4). According to the 2014 ACS 1-year estimates, the rates of attainment of higher education in White residents aged 25 years and older were 2 times the rates of African American and 4 times the rate of Hispanic individuals (Figure 5).

***Figure 4*: Annual Dropout Rates (%) in Public Schools in Harris County, 2013-2014**



Source: Texas Education Agency, Secondary School Completion and Dropouts in Texas Public Schools, 2013-14. A dropout is a student who is enrolled in public school in Grades 7-12, does not return to public school the following fall, is not expelled, and does not: graduate, receive a General Educational Development (GED) certificate, continue school outside the public school system, begin college, or die.

Figure 5: **Percentage of Adults (≥25 Years) with a Bachelor's Degree in Harris County, Texas and U.S., 2014**



Source: U.S. Census Bureau, 2014 ACS 1-Year Estimates.

Household Income and Poverty:

In 2014, there were 1,538,072 households in the county with an average of 2.65 persons per household and median household income averaged $54,178, higher than $53,035 in Texas and $53,657 in the U.S. The per capita income in Harris County was $29,421 compared to $27,125 in Texas and $28,889 in the U.S. (Table 1).

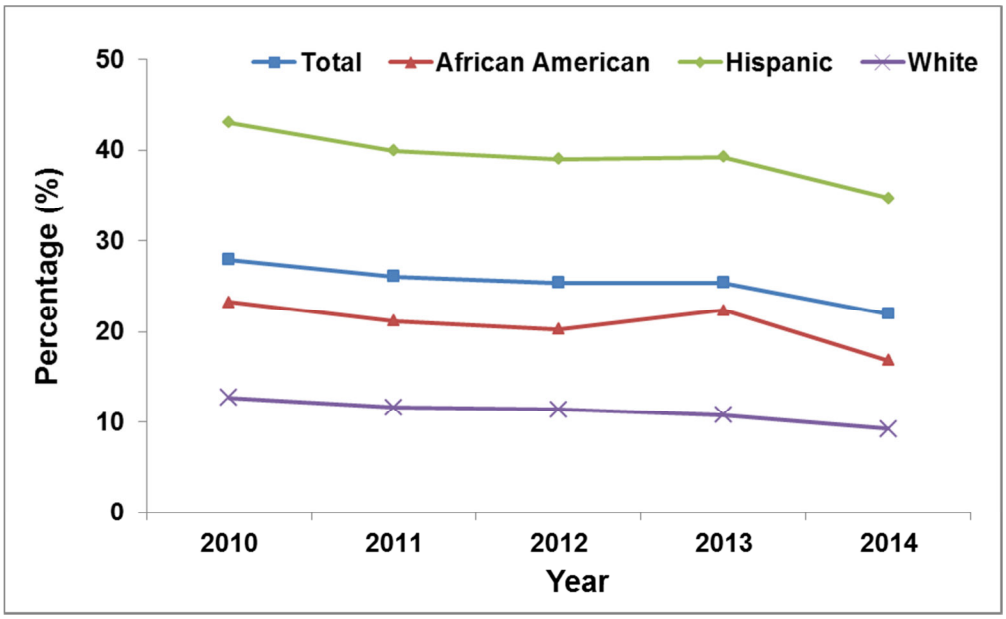
In 2014, an estimated 17.4% of persons living in Harris County were living below the Federal Poverty Level compared to 17.2% in Texas and 15.5% nationally (Table 1).

Children living in low-income families have a higher risk of dropping out of school, poor adolescent and adult health, poor employment outcomes, and greater likelihood of experiencing poverty as adults[4]. In 2014, 25.7% of children aged less than 18 years in Harris County lived below the federal poverty line compared to 24.6% in Texas and 21.7% nationally (Table 1).

Access to Care:

Health insurance status influences a person's ability to prevent major illness and to access health care before health problems become serious[2]. People without insurance or without adequate coverage often delay care and are more likely to be hospitalized for conditions which could be treated in a primary care setting. Texas continues to have the highest rate of uninsured persons in the nation. According to the 2014 ACS 1-year estimates, 22.0% of people in Harris County did not have health insurance coverage compared to 11.7% nationally. In Harris County, the percentage of uninsured residents decreased 6% in total population from 2010 to 2014. Notable differences continue to exist among the different race and ethnic groups. In 2014, the uninsured rate among Whites was around 9%. The uninsured rate in African Americans was 1.8 times as that of Whites. The uninsured rate among Hispanics was 3.8 times that of Whites (Figure 6).

Figure 6: **Lack of Health Insurance by Race in Harris County, 2014**



Source: U.S. Census Bureau, 2014 ACS 1-Year Estimates.

Person Living with HIV Diagnoses (PLWH)

The number of PLWH is determined by adding new HIV diagnoses to the number of PLWH and subtracting those who died. The most recent prevalence data were available through the end of 2013, which allows time for deaths to be reported and for these persons to be removed from calculation of persons living with diagnosed HIV infection.

Table 2 shows the number, percentage, and rate of reported cases of PLWH in Houston/Harris County at the end of 2013, by sub-populations. This serves only as an estimate of the prevalence rate of HIV since it was computed from reported cases and does not include people infected but undiagnosed or unreported. The CDC estimated that 17.8% of persons living with HIV infection in Texas were undiagnosed in 2012 and the percentage of undiagnosed HIV has dropped modestly from 2008 to 2012[5]. As of the end of 2013, there were 22,551 PLWH in Houston/Harris County. The rate of PLWH in Houston/Harris County was 520 per 100,000 population, which was higher than the rate in Texas (299)[6].

In Houston/Harris County, the number of male PLWH was three times that of female PLWH. The rates of PLWH (per 100,000 population) were 780 and 261 in males and females, respectively. Both rates were higher than the rates in Texas[6]. Half of PLWH were African Americans in Houston/Harris County, although only 18.6% of the total population in Harris County was African American. The rate of African Americans living with HIV, 1,400 per 100,000 population, was approximately four times that of Whites or Hispanics. Rates of HIV in Whites, African Americans and Hispanics in Houston/Harris County were higher than those in Texas[6]. At the end of 2013, 49.2% of the PLWH were aged 45 years or older, and 45% were 25-44 years old. The highest rate of PLWH by age was in the 40-44 age group (996 per 100,000 population). By transmission risk, 54.1% of the living cases were attributed to MSM exposure, 30% due to heterosexual exposure, 10% due to IDU exposure, and 6% due to other exposures including perinatal, MSM/IDU or other risks.

Figure 7 shows the steady increase in the number of PLWH, a growing number of people at risk for transmitting HIV and requiring HIV treatment. The number of deaths each year was much lower than the number of new diagnoses of HIV, resulting in a continuous increase in the number of PLWH.

Figure 8 shows the burden of HIV disease by neighborhood. HIV cases were not evenly distributed across Houston/Harris County, TX. In 2013, the top 20% of ZIP codes with higher rates of PLWH were located in central, south, and southwest Houston/Harris County.

Table 2: **PLWH in Houston/Harris County at the end of 2013, by Key Sub-populations**

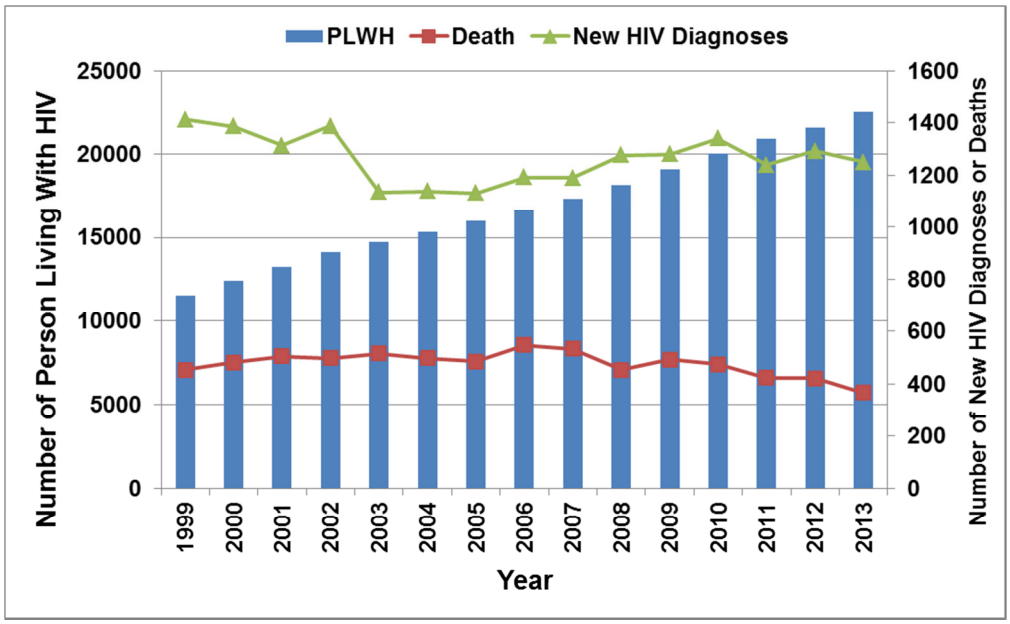
	Houston/Harris County				Texas			
	Cases	**%**	**Rate***	**Relative Rate***	**Cases**	**%**	**Rate***	**Relative Rate***
Total	22,551	100%	520.0	-	76,621	100%	298.8	-
Sex								
Female	5,682	25.2%	261.3	1.0	16,699	21.8%	129.3	1.0
Male	16,869	74.8%	780.3	3.0	59,922	78.2%	471	3.6
Race/Ethnicity								
White	4,643	20.6%	337.3	1.0	21,838	28.5%	186.7	1.0
African American	11,179	49.6%	1399.7	4.2	28,682	37.4%	944	5.1
Hispanic	5,901	26.2%	327.2	1.0	23,018	30.0%	236.5	1.3
Other	828	3.7%	231.3	0.7	3,083	4.0%	-	-
Age (as of 12/31/13)								
0 - 9 yrs	41	0.2%	6.0	0.0	129	0.2%	3.3	0.0
10 - 14 yrs	48	0.2%	15.2	0.0	180	0.2%	8.3	0.0
15 - 19 yrs	178	0.8%	59.3	0.2	526	0.7%	28	0.2
20 - 24 yrs	1,051	4.7%	330.9	1.0	3,356	4.4%	178.9	1.0
25 - 29 yrs	1,862	8.3%	530.9	1.6	6,198	8.1%	330.2	1.8
30 - 34 yrs	2,386	10.6%	684.5	2.1	7,803	10.2%	429.4	2.4
35 - 39 yrs	2,775	12.3%	903.0	2.7	8,936	11.7%	511.1	2.9
40 - 44 yrs	3,120	13.8%	996.6	3.0	10,755	14.0%	615.7	3.4
45 yrs and over	11,090	49.2%	793.3	2.4	38,758	50.6%	435.9	2.4
Mode of Exposure**								
MSM	12,193.6	54.1%						
IDU	2,246.6	10.0%						
MSM/IDU	1,055.1	4.7%						
Heterosexual	6,763.7	30.0%						
Perinatal	237.0	1.1%						
Other	55.0	0.2%						

Source: Houston/Harris County data were from the Texas eHARS, 2015; Texas data were from 2013 Texas STD and HIV Epidemiologic Profile[6]

**: Rate was the number of cases per 100,000 population in each subgroup. Population data were from the 2013 ACS 1-year estimates. Relative rate was the ratio of rates using assigned groups in each key sub-population, ie. female, White and 20-24 years group, as reference groups .*

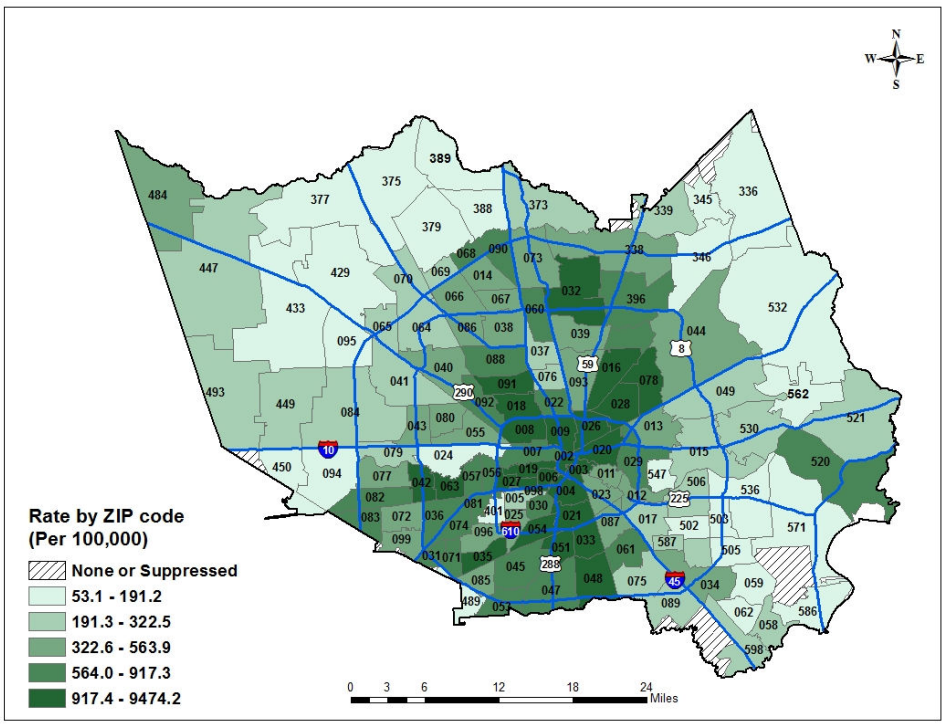
***: Mode of Exposure: Patients with no risk reported were re-categorized into standard categories using CDC's multiple imputation program*[7]*. "Other" was the group with modes of exposure excluding MSM, IDU, MSM/IDU, heterosexual and perinatal risks.*

Figure 7: **PLWH, New HIV Diagnoses, and Deaths among PLWH in Houston/Harris County, 1999 - 2013**



Source: Texas eHARS, 2015.

Figure 8: **PLWH by ZIP Code in Houston/Harris County, 2013**



Source: Texas eHARS, 2015. The number of PLWH includes all cases diagnosed earlier than 12/31/2013 with address at 12/31/2013 residing in Houston/Harris County and reported to Texas eHARS through 7/26/2015. The population data was based on 2010 US Census. The rates by ZIP code were grouped by quintiles and shown in the map. ZIP codes were labeled using the last three digits only (e.g. 77002 was labeled as "002"). ZIP codes with less than five cases were suppressed to protect patients' confidentiality.

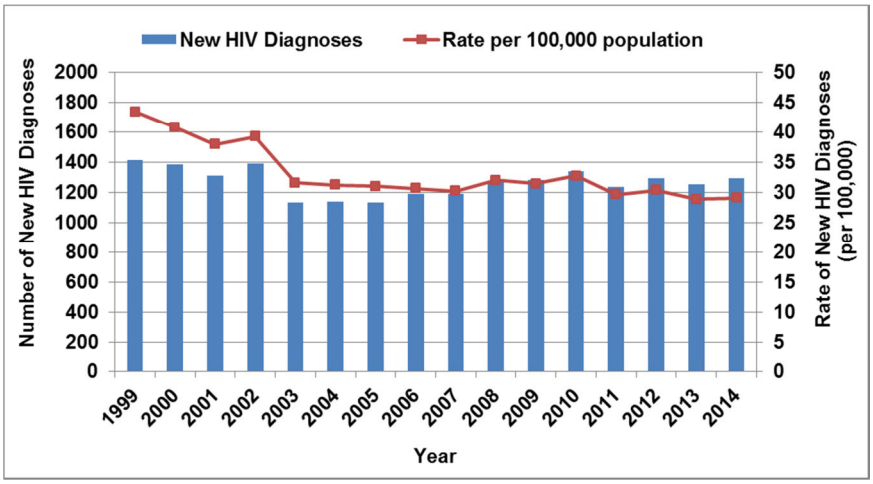
New HIV Diagnoses

In 2013, the most recent year with the state and national new HIV diagnoses data available, the number of new HIV diagnoses in Houston/Harris County was 1,251. There were 984 diagnoses of HIV in adult and adolescent males (78.7%) and 259 in adult and adolescent females (20.7%). There were eight diagnoses of HIV infection among children 13 years or less at diagnosis (0.6%). In 2013, Texas had the 10th highest rate (22.3 per 100,000 population) of new HIV diagnoses in the United States (16.1 per 100,000)[6,8]. The new HIV diagnosis rate in Houston/Harris County is 28.8 per 100, 000 populations, which is higher than the reported rate in Texas[4].

Trend of New Diagnoses from 1999 to 2014

HIV became reportable by name in Texas in 1999. The number of new HIV diagnoses decreased from 1999 to 2003 and gradually increased from 2003 to 2010 in Houston/Harris County. Case counts increased by 13.9% from 2003 to 2014. New HIV diagnoses ranged from 1200-1300 per year from 2008 to 2014 (Figure 9). The rate of new HIV diagnoses decreased from 1999 to 2003 and remained relatively stable thereafter. The rate of new HIV diagnoses in Houston/Harris County was 29.1 per 100,000 population in 2014.

***Figure 9*: Numbers and Rates of New HIV Diagnoses in Houston/Harris County, 1999-2014**



Source: Texas eHARS, 2015. Population data were from the 2014 ACS 1-year estimates.

New Diagnoses in 2014 by Key Sub-populations

Table 3 summarizes new HIV diagnoses, regardless of AIDS status, in 2014 by key sub-populations. Those included were all persons residing in Houston/Harris County at the time of their diagnosis in 2014. The Risk categories "Both MSM and IDU (MSM/IDU)", "Perinatal", and "Other" were combined.

In 2014, there were 1,293 new HIV diagnoses in Houston/Harris County. Approximately 4 out of 5 new HIV diagnoses were among males and 43% of the newly reported male cases were African American. The rate of new HIV diagnoses in African American men was 4.6 times the rate of White men and 2.8 times that of Hispanic men. African American women were newly diagnosed with HIV at a rate 21.1 times that of White women and 5.8 times that of Hispanic women. Within males, MSM was by far the largest risk category with 90% of total new HIV diagnoses cases in Whites and Hispanics and at about 80% in African Americans. The two age groups with the highest rate of new HIV diagnoses were the age groups 15-24 and 25-34. African Americans 15-24 years old had an HIV diagnosis rate 7.6 times that of Whites. Similarly, the rate in African Americans of 55 years or older was 7.8 times that of their White counterparts.

Table 3: New HIV Diagnoses in Houston/Harris County by Race/Ethnicity, 2014

	White				African American				Hispanic				Total		
	Number**	%	Rate*	Relative Rate*	Number**	%	Rate*	Relative Rate*	Number**	%	Rate*	Relative Rate*	Number**	%	Rate*
Total	180	100.0%	13	1.0	624	100.0%	74	5.7	438	100.0%	24	1.8	1288	100.0%	29
Sex															
Male	166	92.2%	24	1.0	435	69.6%	110	4.6	375	85.0%	40	1.6	1012	78.3%	46
Female	14	7.8%	2	1.0	189	30.4%	42	21.0	63	15.0%	7	3.6	276	21.7%	13
Age Group															
0-14 yrs	**				**				**				**		
15-24 yrs	26	14.4%	18	1.0	180	28.8%	135	7.6	113	25.8%	37	2.1	331	25.7%	53
25-34 yrs	58	32.2%	28	1.0	199	31.9%	145	5.1	152	34.7%	49	1.7	426	33.1%	59
35-44 yrs	50	27.8%	28	1.0	121	19.4%	103	3.7	103	23.5%	36	1.3	284	22.0%	45
45-54 yrs	32	17.8%	16	1.0	84	13.5%	80	5.1	54	12.3%	26	1.6	175	13.6%	31
55 yrs and over	14	7.8%	3	1.0	40	6.4%	25	7.7	16	3.7%	8	2.3	72	5.6%	8
Mode of Exposure* **															
MSM	147.9	82.2%			352.5	56.5%			337.7	76.6%			868.9	67.2%	
IDU	6.6	3.7%			40.6	6.5%			13.8	3.1%			62.5	4.8%	
Heterosexual	15.9	8.8%			217.0	34.8%			81.4	18.5%			327.0	25.3%	
Other	9.6	5.3%			13.9	2.2%			5.1	1.8%			29.6	2.7%	
%MSM in Male***		89.1%				80.8%				90.1%				85.8%	

Source: Houston/Harris County data were from Texas eHARS, 2015.

**: Rate was shown the number of cases per 100,000 population in each subgroup. Rates in Total or gender groups were calculated based on population at all age groups. Population data were from 2014 ACS 1-year estimates. Relative Rate is the ratio of rates using White group in each key sub-population as reference groups.*

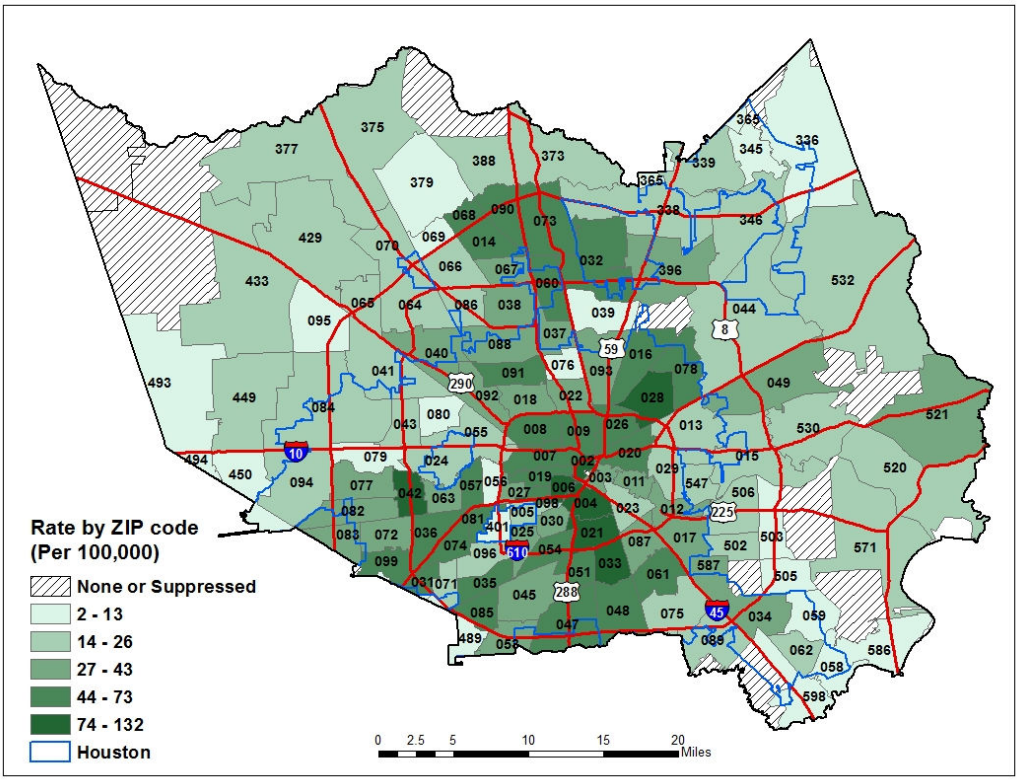
***: The numbers in the group "0-14 years" were suppressed to protect confidentiality of patients. All numbers in rows of "Total", "Sex" and "Mode of Exposure" did not include the suppressed values from the age groups. Data from other race/ethnicity groups, including Asian, Pacific Islander, American Indian, multiracial and others, were not shown. All values in columns of "Total" were data from all race/ethnicity groups.*

****: Patient with no risk reported were re-categorized into standard categories using CDC's multiple imputation program[7]. Percentage of MSM within males was shown. "Other" was the group with mode of exposure excluding MSM, IDU, and heterosexual risks.*

Geographic Distribution of New HIV Diagnoses

The burden of HIV disease by neighborhood is mapped in Figure 10, which shows rates of new HIV diagnoses by ZIP code in Houston/Harris County for 2014. The ZIP codes with the highest rates of new HIV diagnoses were mostly located in central and northern Houston/Harris County.

***Figure 10*: Rates of New HIV Diagnoses by ZIP Code in Houston/Harris County, 2014**

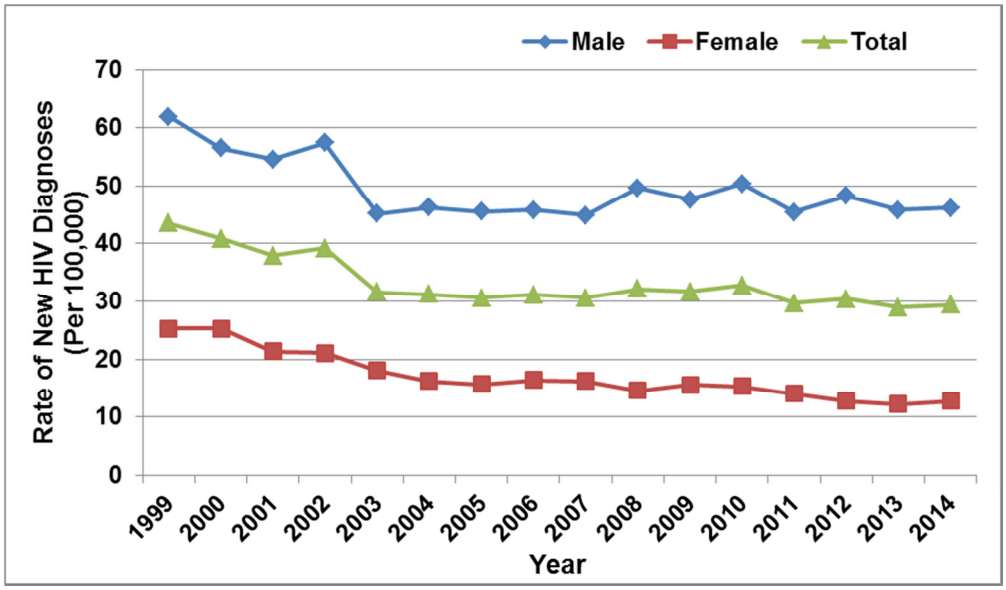


Source: Texas eHARS, 2015. The number of new HIV diagnoses included all cases diagnosed in 2014 with address at HIV diagnosis within Houston/Harris County and reported to eHARS by 7/26/2015. The population data was based on 2010 US Census. The rates by ZIP code were grouped by quintiles and shown in the map. ZIP codes were labeled using the last three digits only (e.g. 77002 was labeled as "002"). ZIP codes with less than five cases were suppressed to protect patients' confidentiality.

Trends of New HIV Diagnoses by Key Sub-populations

The rates of new HIV diagnoses both in females and males decreased 25% from 1999 to 2003 in males and females, and kept relatively constant after 2004 in Houston/Harris County, which was consistent with trends in the U.S.[8](Figure 11).

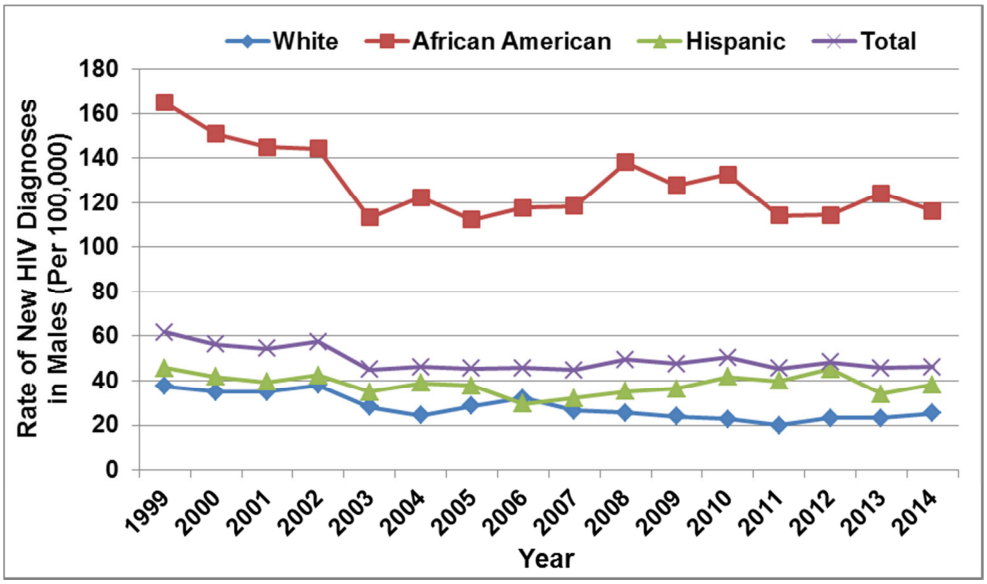
Figure 11: **Rates of New HIV Diagnoses by Sex at Birth in Houston/Harris County, 1999-2014**



Source: Texas eHARS, 2015.

The rate of new HIV diagnoses in African American males decreased approximately 28% from 1999 to 2003 and remained relatively constant after that. However, African American males had the highest rate of new HIV diagnoses each year. In White, Hispanic and all males, the rate of new diagnoses remained stable from 1999 to 2014 (Figure 12).

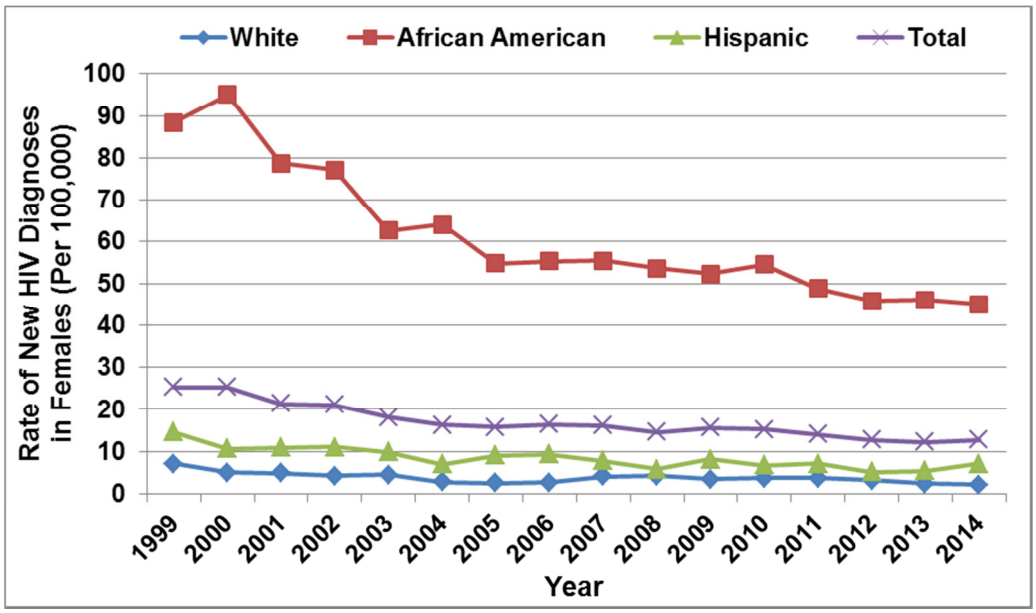
Figure 12: **Rates of New HIV Diagnoses by Race/Ethnicity in Males, Houston/Harris County, 1999-2014**



Source: Texas eHARS, 2015.

The rate of new HIV diagnoses in females slightly decreased from 1999 through 2012 (Figure 11). This was driven mostly by a decreasing trend in African American females, particularly from a 38% decrease from 2000 to 2005. The rates in Hispanic and White females were relatively constant (Figure 13).

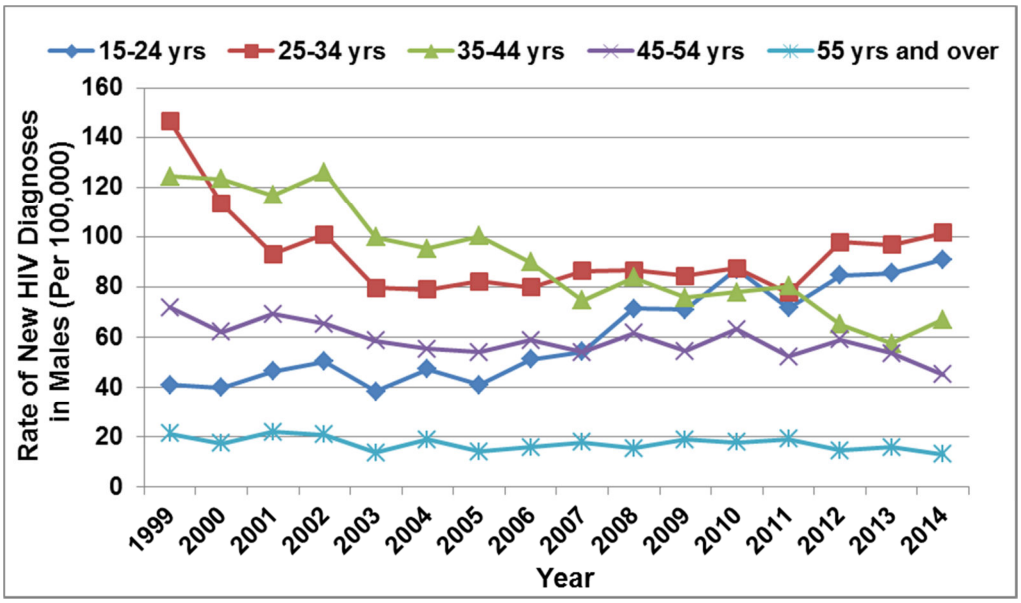
Figure 13: **Rates of New HIV Diagnoses by Race/Ethnicity in Females, Houston/Harris County, 1999-2014**



Source: Texas eHARS, 2015.

The rate of new HIV diagnoses among young males 15-24 years doubled from 1999 through 2014 (Figure 14). The rate in the age group 25-34 decreased from 1999 to 2003 by about 45% and slightly increased from 2004 to 2014. The age group 35-44 had decreasing rates from 1999 to 2014, while the rate in groups 45 or older remained relatively stable over the years.

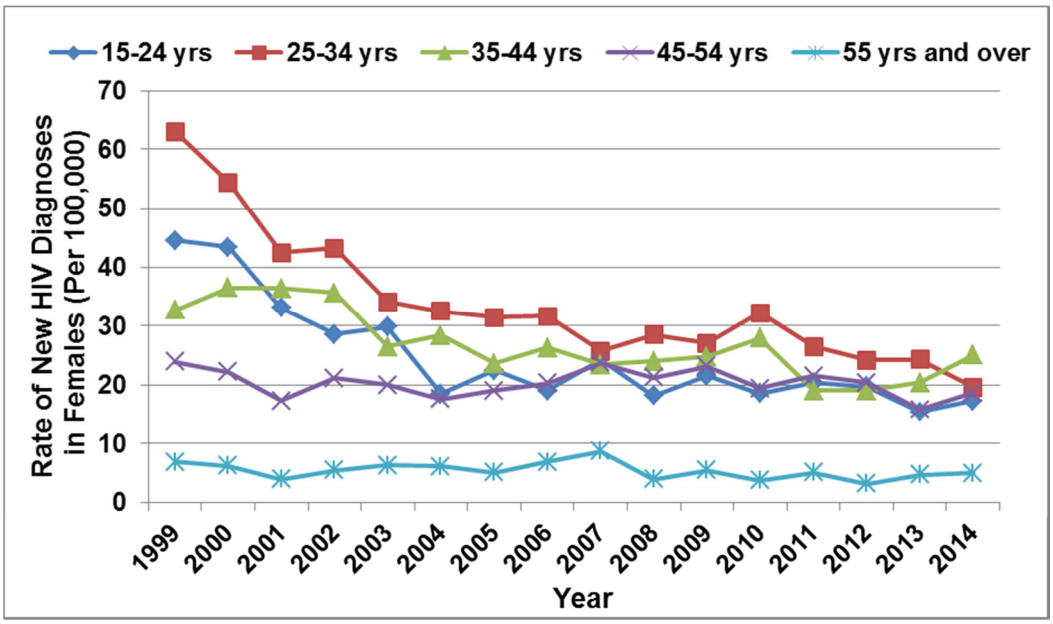
Figure 14: **Rates of New HIV Diagnoses by Age Groups in Males, Houston/Harris County, 1999-2014**



Source: Texas eHARS, 2015.

From 1999 to 2014, the rates of new HIV diagnoses in 15-44 year-old females were decreasing, with more than 50% decrease from 1999 to 2008 in the age group 15-24 years and 25-34. Age groups of 45 years or older showed a stable trend over the years.

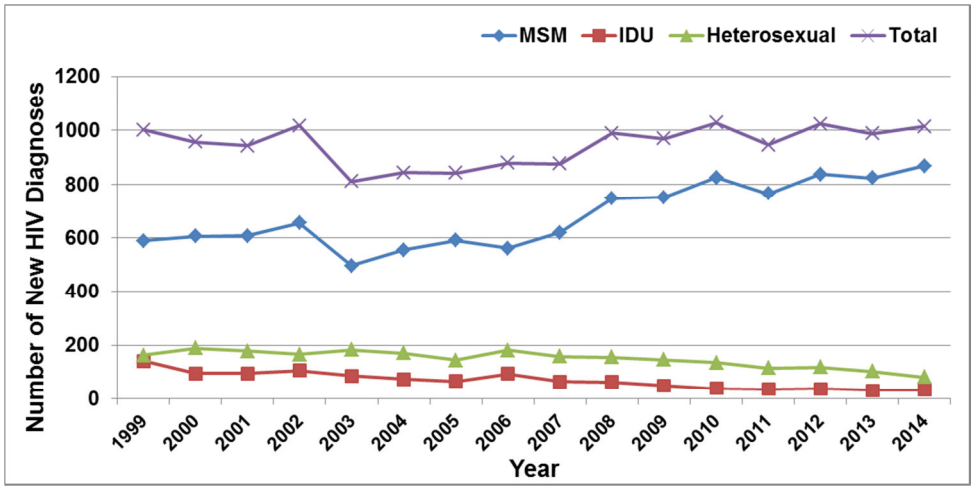
***Figure 15*: Rates of New HIV Diagnoses by Age Groups in Females, Houston/Harris County, 1999-2014**



Source: Texas eHARS, 2015.

In males, the number of new HIV diagnoses among MSM increased 75% from 2003 to 2014 in Houston/Harris County, while new diagnoses among IDU and heterosexuals slightly decreased starting in 2006 (Figure 16).

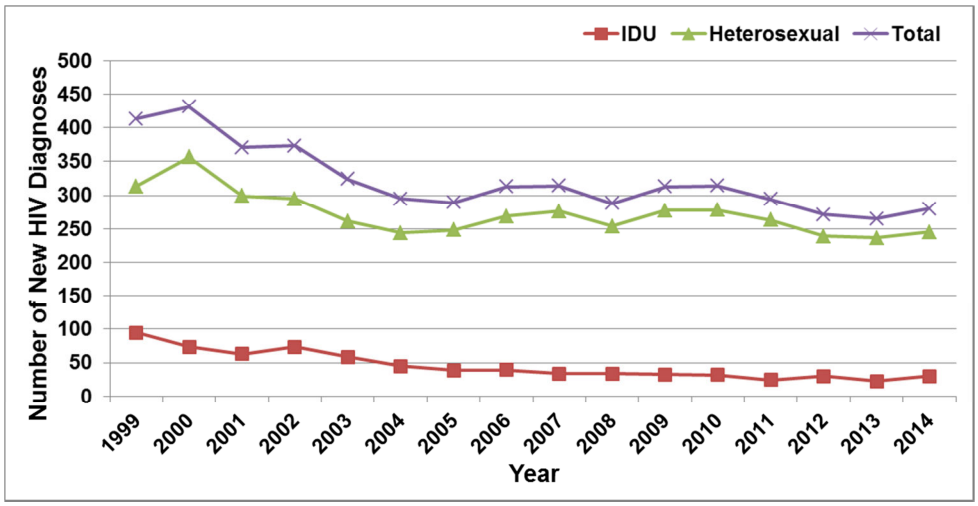
***Figure 16:* New HIV Diagnoses in Males by Transmission Risks in Houston/Harris County, 1999-2014**



Source: Texas eHARS, 2015. Patients with no risk reported were re-categorized by using CDC's multiple imputation or risk program[7].

Heterosexual contact was the main mode of transmission for women and it showed a decreasing trend (about 20% of decrease from 1999 to 2014) as did IDU (Figure 17).

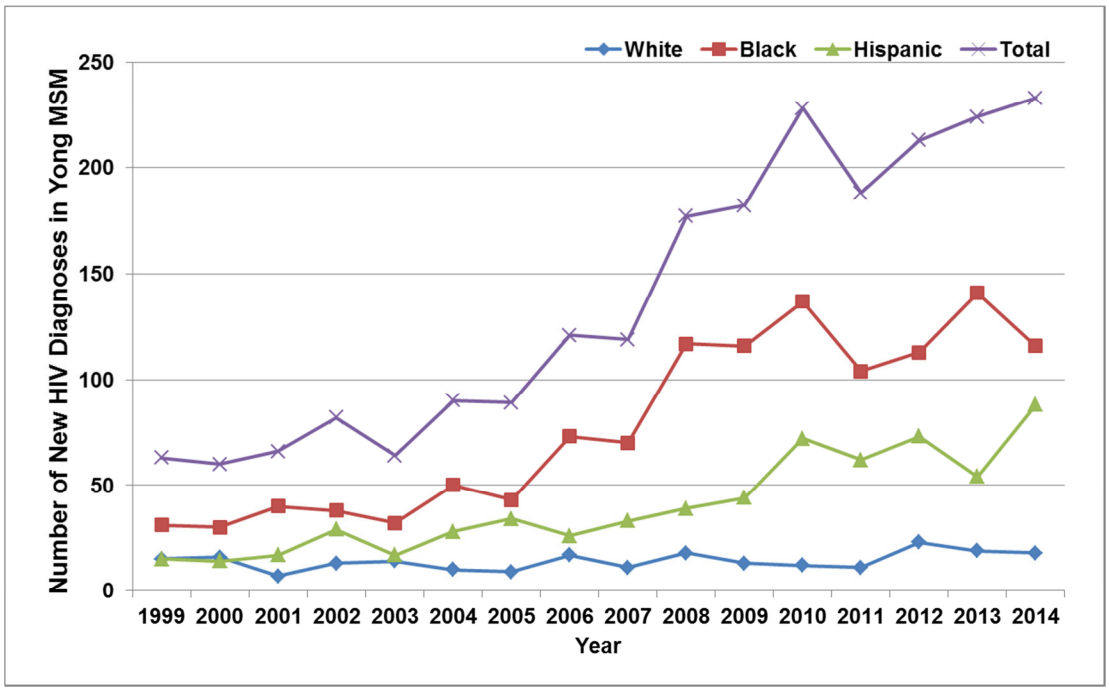
Figure 17: **New HIV Diagnoses in Females by Transmission Risks in Houston/Harris County, 1999-2014**



Source: Texas eHARS, 2015. Patients with no risk reported were re-categorized by using CDC's multiple imputation or risk program[7].

In young MSM (13-24 years old), the number of new HIV diagnoses doubled from 1999 to 2014 in African Americans and Hispanics. In Whites, the numbers increased slightly from 1999 to 2014. Overall, the number of new HIV diagnoses in young MSM increased from 2003 to 2014 in Houston/Harris County (Figure 18).

Figure 18: **New HIV Diagnoses in Young (13-24 Years) Men Who Have Sex with Men by Race in Houston/Harris County, 1999-2014**



Source: Texas eHARS, 2015. Patients with no risk reported were not re-categorized by using CDC's multiple imputation or risk program.

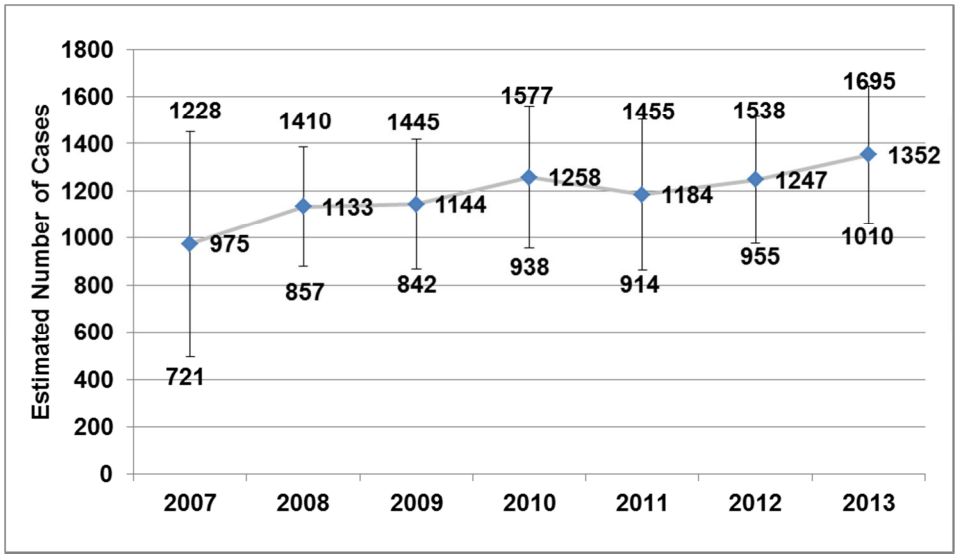
HIV Incidence Surveillance

The number of new HIV infections occurring each year in the community can provide a better understanding of how HIV trends impact the community. However, the number of new HIV diagnoses only tells how many people have been diagnosed with HIV within a year, regardless of when the infection occurred. HIV incidence is the estimated number of new HIV infections occurring in a population during a specific time period.

HIV incidence can be estimated by using a CDC-developed statistical model that utilizes a specific laboratory test and previous HIV testing and treatment history from a newly-diagnosed patient to determine whether it is a recent or long-term infection. HIV incidence data is critical to monitoring the HIV epidemic in the region, assessing the goals of the National HIV/AIDS Strategy, and evaluating the effectiveness of HIV prevention and treatment programs.

The overall estimated number of HIV cases slightly increased among populations of aged 13 years and over in Houston/Harris County from 2007 to 2013 (Figure 19). However, considering the growth of the Houston/Harris County population, the incidence rates were relatively stable within these years (Figure 20). The multi-year incidence estimates allow for a reliable examination of trends over time. On average, for those aged 13 and over, the overall HIV incidence is an estimated 1,184 new cases at a rate of 28.2 for every 100,000 people per year.

Figure 19: **Estimated Number of Incident HIV Cases (Age 13 Years or Older) in Houston/Harris County, 2007-2013.**

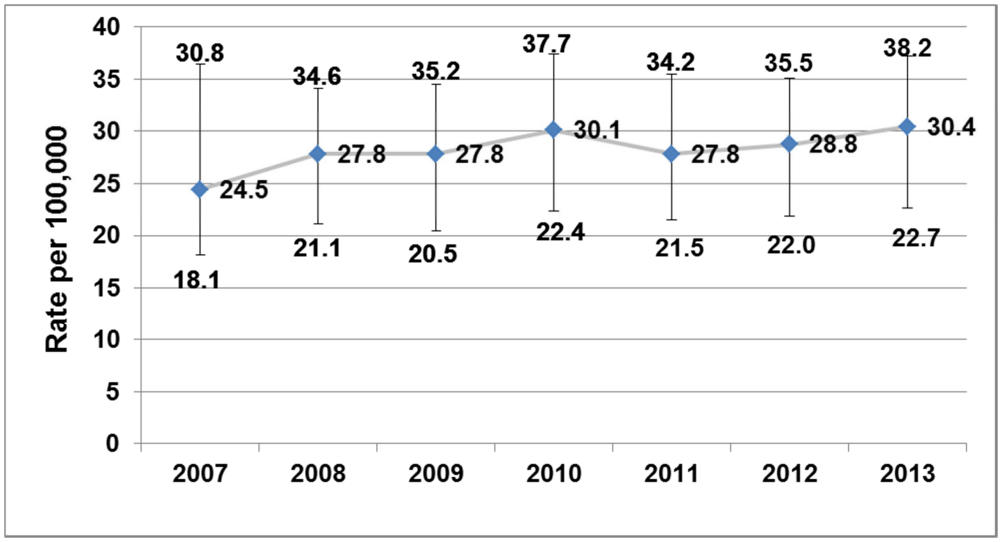


Source: Texas eHARS, 2015.Point estimates and 95% confidence intervals are presented for each year.

Table 4 summarizes the HIV incidence estimation in Houston/Harris County in 2013 by key sub-populations. There was no statistically significant change in HIV incidence for the seven-year period (Figure 20). Certain groups, including African Americans, younger age groups and men who have sex with men continued to be disproportionately affected by HIV.

Rates were calculated for all cases 13 years and older at diagnosis. Data are reported for sub-groups (risk, sex, race and age) where there are a minimum of 200 reported HIV cases, 40 incidence tests (or 20 percent completeness), and 10 recent incidence results. Some demographic groups must be combined to satisfy the minimum number of reported cases required to release estimates. Since reliable denominator data are not available for risk groups, rates cannot be calculated.

Figure 20: **Estimated HIV Incidence Rate in Houston/Harris County (Age 13 Years or Older), 2007-2013.**



Source: Texas eHARS, 2015. Z-test results showed that there was no significant difference between any two years (p>0.05).

In 2013, the estimated rate of new HIV infection in males was 3.7 times the rate in females. In 2013, the highest HIV incidence rates were among African Americans (94.3 per 100,000 persons) followed by Whites or other race group (15.2 per 100,000) and Hispanics (18.6 per 100,000 persons). The estimated HIV incidence rate among African Americans was 5 times more than Whites/Other or Hispanics. African Americans and Hispanics accounted for 80.5% of the new HIV infections in Houston/Harris County. Persons between 13-34 years of age were at the greatest risk of contracting HIV. In 2013, young adults between 13-34 years of age accounted for 68.3% of the newly infected HIV cases. Those 13-24 years old accounted for 32.6% and those 25 to 34 accounted for 35.7% of the estimated incident cases. MSM accounted for 63.8% of new HIV infections, while IDU accounted for 9%. Persons engaged in heterosexual sex and other transmission risk accounted for 27.2% of the estimated new HIV diagnoses.

Overall, the estimated HIV incidence in Houston/Harris County was relatively stable from 2007 to 2013. However, in young MSM, African American, HIV disease continues to be a major public health concern.

Table 4: **HIV Incidence Estimation in Population (Age 13 years or older) by Key Sub-populations, 2013.**

	Cases	%	Rate*	Relative Rate*
Total	1352	100%	31.2	
Sex				
Male	1061	78.5%	49.1	3.7
Female	291	21.5%	13.4	1.0
Race/Ethnicity				
White/Other	264	19.5%	15.2	0.8
African American	753	55.7%	94.3	5.1
Hispanic	335	24.8%	18.6	1.0
Age at Infection				
13 - 24 yrs	441	32.6%	59.7	3.8
25 - 34 yrs	483	35.7%	69.1	4.4
35 - 44 yrs	209	15.5%	33.7	2.1
45 yrs and over	220	16.3%	15.7	1.0
Mode of Exposure				
MSM	863	63.8%		
IDU	122	9.0%		
Other**	368	27.2%		

Source: Texas eHARS, 2015.

**: Rate was the number of cases per 100,000 population in each subgroup. Population data were from the 2013 ACS 1-year estimates. Relative rate was the ratio of rates using the group with the lowest rate within each key sub-population, ie. female, White or 20-24 years group, as reference groups .*

*** "Other" in mode of exposure was the group excluding MSM and IDU risks. Patients with no risk reported were re-categorized by using CDC's multiple imputation or risk program[7].*

Concurrent/Late Diagnoses, Progression to AIDS

Concurrent/late HIV diagnosis is defined as an AIDS diagnosis within 12 months of an HIV diagnosis. Studies show that late HIV diagnosis is associated with higher mortality and lower survival outcomes. If diagnosed early, HIV-positive individuals can seek treatment sooner and receive more health benefits from highly-active antiretroviral therapy (HAART) medication. Therefore, late HIV diagnosis can be used as an indicator for HIV prevention program planning and evaluation[9].

In 2014, 26.2% of newly diagnosed HIV-positive people in Houston/Harris County progressed to AIDS within a year (Table 5). Males had a slightly higher percentage (26.4%) of late diagnosis compared to females (25.7%). Hispanics had the highest percentage of late HIV diagnoses (34.4%) among all race/ethnicity groups. Compared to younger age groups, older age groups had a higher percentage of late HIV diagnoses. Half of the newly diagnosed people over 55 had a concurrent/late diagnoses. MSM had a relatively lower percentage of late HIV diagnoses (23.6%) compared to the heterosexual transmission group (30.5%). In summary, males, Hispanics, people over 55 years of age and heterosexual transmission risk had a higher percentage of late HIV diagnoses. HIV prevention programs in Houston/Harris County should target these populations at risk for late HIV diagnosis to encourage HIV testing.

***Table 5:* Concurrent/Late HIV Diagnoses in Houston/Harris County, 2013**

	HIV to AIDS ≤ 1 year (Late HIV Diagnosis)		HIV to AIDS > 1 year		Total
	Number	%	Number	%	
Total	328	26.2%	923	73.8%	1251
Sex					
Male	260	26.4%	726	73.6%	986
Female	68	25.7%	197	74.3%	265
Race/Ethnicity					
White	37	22.0%	131	78.0%	168
African American	151	23.2%	501	76.8%	652
Hispanic	128	34.4%	244	65.6%	372
Other/Unknown	12	20.3%	47	79.7%	59
Age at HIV diagnoses					
13-24 yrs	52	16.8%	258	83.2%	310
25-34 yrs	92	21.7%	332	78.3%	424
35-44 yrs	84	35.1%	155	64.9%	239
45-54 yrs	60	31.6%	130	68.4%	190
55 yrs and over	40	50.0%	40	50.0%	80
Mode of Exposure*					
MSM	152	23.6%	491	76.4%	643
Heterosexual	51	30.5%	116	69.5%	167
Other	125	28.3%	316	71.7%	441

Source: Texas eHARS, 2015.

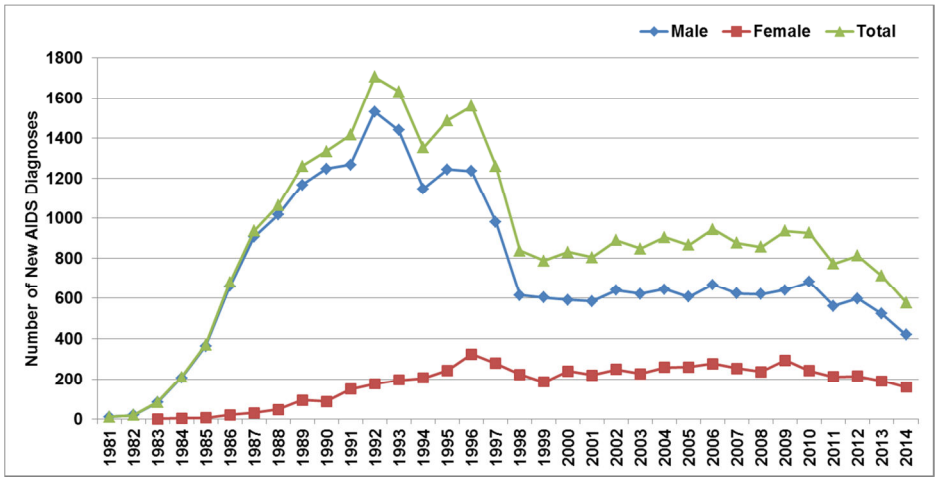
**: "Other" in mode of exposure was the group excluding MSM, heterosexual risks. Patients with no risk reported were not re-categorized by using CDC's multiple imputation or risk program.*

AIDS (HIV Stage 3):

According to the CDC revised case definition, AIDS is now classified as the third stage of HIV infection[2]. Table 6 summarizes new AIDS diagnoses among those residing in Houston/Harris County in 2014 by key sub-populations. In 2014, there were 577 new AIDS diagnoses in Houston/Harris County. Approximately half of these new AIDS cases were African Americans. In males, the rate of new AIDS diagnoses in African Americans was 4.8 times that of Whites and 3.6 times that of Hispanics. African American females were newly diagnosed with AIDS at a rate 10.1 times that of White females and 5.2 times that of Hispanic females. Within males, MSM was the largest risk category, comprising 83% of AIDS diagnoses in Whites and Hispanics and 60% in African Americans. By age, the highest rate of new AIDS diagnoses was in the age group 35-44 for Whites and African Americans, and the age group 25-34 for Hispanics. African Americans 25-34 had an AIDS diagnoses rate 6.3 times that of Whites.

Analysis of AIDS cases in Houston/Harris County showed a rapid increase from 1981 through 1992. With the introduction of highly active antiretroviral therapy (HAART) in 1996, the number of new AIDS cases precipitously dropped through 1999, and remained constant between 2000 and 2010. In the past 5 years, the number of new AIDS diagnoses showed a decreasing trend (Figure 21). The new combination therapy reduces the progression from HIV infection to AIDS in people diagnosed early in the HIV disease process. HIV prevention efforts also reduced the rate of AIDS cases by reducing the number of new HIV infections. Among females, the number of AIDS diagnoses steadily increased from 1985 to 1996, followed by steady decreases from 1997-1999. Since 2000, the number of AIDS cases among females remained relatively constant. In 2014, females accounted for 27% of new AIDS cases in Houston/Harris County, with a relative rate of males to females of 2.7 (Table 6).

Figure 21: **New AIDS Diagnoses by Sex at Birth in Houston/Harris County, 1981-2014**



Source: Texas eHARS, 2015.

Analysis of new AIDS diagnoses in males early in the epidemic, 1981-1992, shows that Whites made up the majority of cases, with the proportion of cases in African Americans and Hispanics rising. In 1997, cases among African American males surpassed that of White males and have remained higher than all other races since that time. From 1998 through 2012, AIDS cases have been increasing in Hispanic males, steady in African Americans and decreasing in Whites (Figure 22). From 2012 to 2014, AIDS cases in all races were decreasing. By 2014, African Americans made up 47.5% of the new AIDS cases in males, followed by Hispanics (32%) and Whites (17.4%). The rate of new AIDS cases in African Americans males was 4.8 times the rate of White males and 3.6 times the rate of Hispanic males (Table 6).

Table 6: New AIDS Diagnoses in Houston/Harris County by Race/Ethnicity, 2014

	White				African American				Hispanic				Total		
	Number **	%	Rate*	Relative Rate*	Number **	%	Rate*	Relative Rate*	Number **	%	Rate*	Relative Rate*	Number **	%	Rate*
Total	84	100.0%	6	1.0	296	100.0%	47	7.7	171	100.0%	11	1.8	571	100.0%	16
Sex															
Male	69	82.1%	11	1.0	199	67.2%	50	4.8	134	78.4%	14	1.3	415	72.7%	19
Female	15	17.9%	2	1.0	97	32.8%	22	10.1	37	21.6%	4	1.9	156	27.3%	7
Age Group															
0-14 yrs	**				**				**				**		
15-24 yrs	**		3	1.0	27	9.1%	20	7.5	19	11.1%	6	2.3	52	9.1%	9
25-34 yrs	20	23.8%	10	1.0	84	28.4%	61	6.3	59	34.5%	19	2.0	167	29.2%	23
35-44 yrs	28	33.3%	16	1.0	75	25.3%	64	4.1	43	25.1%	15	1.0	152	26.6%	24
45-54 yrs	21	25.0%	10	1.0	62	20.9%	59	5.7	31	18.1%	15	1.4	118	20.7%	21
55 yrs and over	15	17.9%	3	1.0	48	16.2%	30	8.6	19	11.1%	9	2.6	82	14.4%	9
Mode of Exposure* **															
MSM	58.0	65.9%			118.3	40.0%			109.9	64.3%			298.6	52.3%	
Heterosexual	9.5	10.8%			124.4	42.0%			50.0	29.2%			190.2	33.3%	
Other	16.5	18.8%			53.3	18.0%			11.1	6.5%			82.2	14.4%	
%MSM in Male***		84.1%				59.4%				82.0%				72.0%	

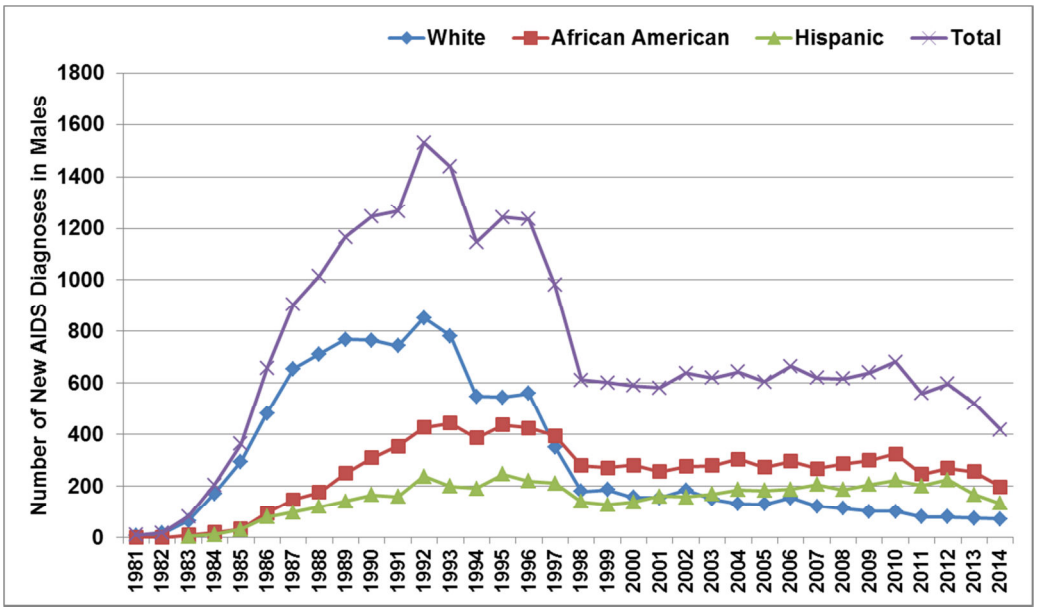
Source: Texas eHARS, 2015.

**: Rate was shown the number of cases per 100,000 population in each subgroup. Rates in total and gender groups were calculated based on population at all age groups. Population data were from 2014 ACS 1-year estimates. Relative Rate was the ratio of rates using White group in each key sub-population as reference groups.*

***:The numbers were suppressed in the group "0-14 years" and "15-24 years" in White to protect confidentiality of patients. All numbers in the row of "Total", "Sex" and "Mode of Exposure" did not include the suppressed value from the age groups. Data for other race/ethnicity group, including Asian, Pacific Islander, American Indian, multiracial and others, were not shown. All values in columns of "Total" were data from all race/ethnicity groups.*

****: Patient with no risk reported were re-categorized into standard categories using CDC's multiple imputation program[7]. Percentage of MSM within males was shown. "Other" was the group with mode of exposure excluding MSM, IDU, and heterosexual risks.*

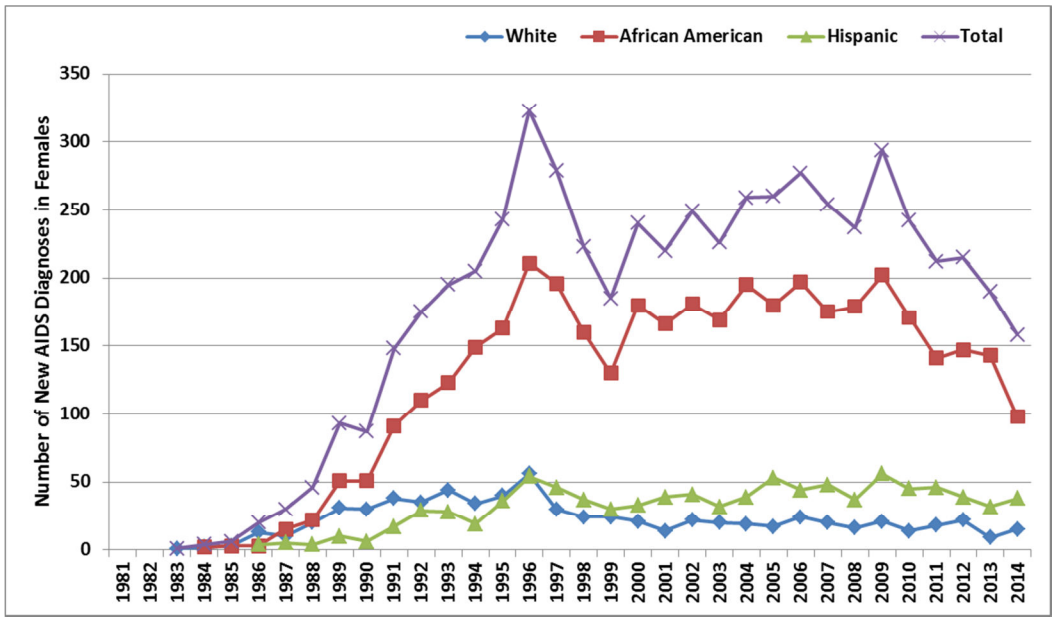
Figure 22: **New AIDS Diagnoses by Race in Males, Houston/Harris County**



Source: Texas eHARS, 2015.

Early in the epidemic, new AIDS cases in African American females rapidly increased with slower increases in Whites and Hispanics. From 1999 through 2010, the number of new cases in females gradually increased in African Americans and Hispanics and remained steady in Whites (Figure 23). By 2014, African Americans accounted for 62% of new female cases, Hispanics 24.1%, and Whites 9.5%. The rate of new cases in African American females was 10.1 times the rate in White females. The rate of new cases in Hispanic females was 1.9 times the rate in White females (Table 6).

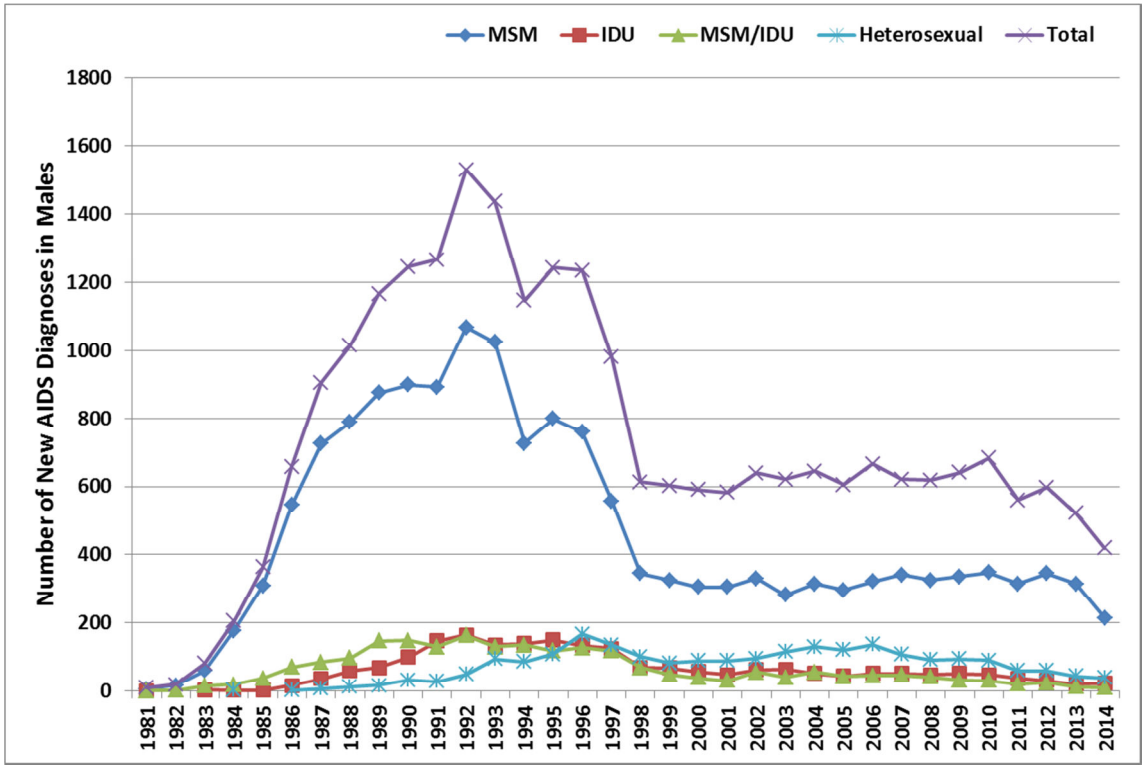
Figure 23: **New AIDS Diagnoses by Race in Females, Houston/Harris County**



Source: Texas eHARS, 2015.

Over the duration of the epidemic, MSM have been disproportionately impacted by both HIV and AIDS. Early in the epidemic, AIDS cases among MSM rapidly increased through 1992 (Figure 24). From 1998 through 2012, the number of new AIDS cases in MSM remained stable. Heterosexual contact as a risk factor increased early in the epidemic, remained stable from 1996-2005, and slightly decreased after 2006. IDU as a risk factor has decreased over the same time period. Note that a graph for AIDS cases due to blood transfusion or the use of clotting factor for hemophilia is not displayed. AIDS in this group peaked at 13 cases in 1988 and then rapidly decreased with the introduction of blood screening with the HIV antibody test in 1985. In 2014, AIDS cases in males attributed to MSM risk were 72.0% (Table 6).

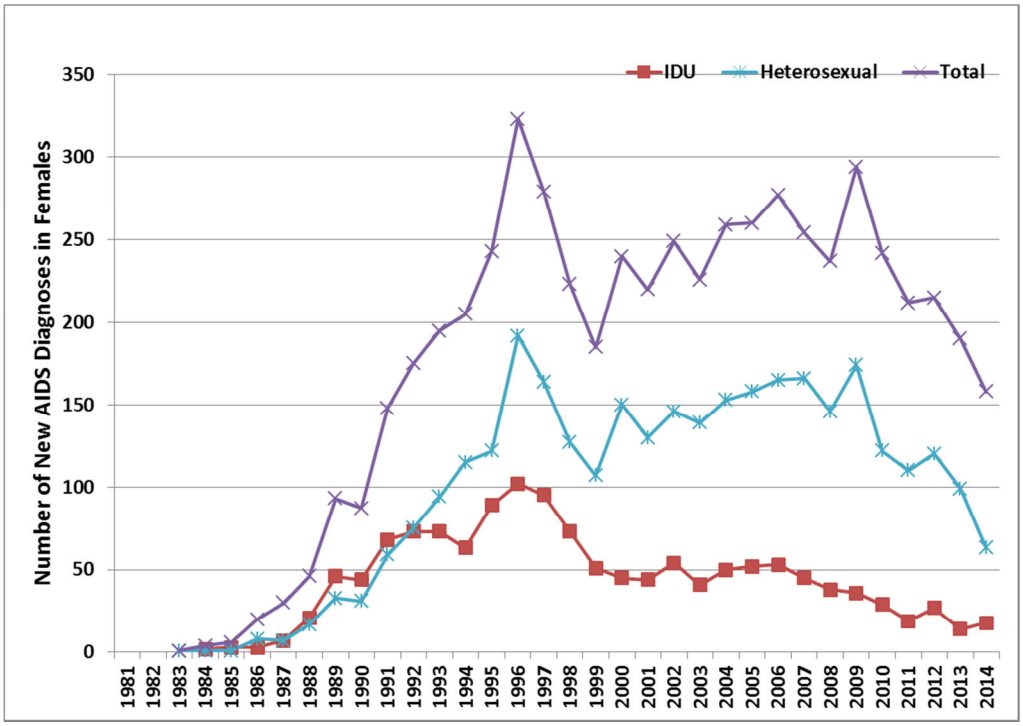
***Figure 24*: New AIDS Diagnoses by Transmission Risks in Males, Houston/Harris County, 1981-2014**



Source: Texas eHARS, 2015. Patients with no risk reported were not re-categorized into standard categories using CDC's multiple imputation program.

In females, both heterosexual and IDU risk increased from 1981 to1996. There was a decreasing trend of IDU risk after 1996, while there was an increase in heterosexual contact risk from 1998 to 2008 and then decreasing after 2009, which was attributed to the decreasing trend in AIDS females (Figure 25). Note that AIDS cases due to blood transfusion or the use of clotting factor for hemophilia are not displayed. AIDS in this group peaked at 6 cases in 1988 and then rapidly decreased with the introduction of blood screening with the HIV antibody test in 1985. In 2014, 39.9% of AIDS cases in females were due to heterosexual risk and 11.4 % due to IDU risk within those with identified or reported risk (Figure 25).

Figure 25: **New AIDS Diagnoses by Transmission Risks in Females, Houston/Harris County, 1981-2014**



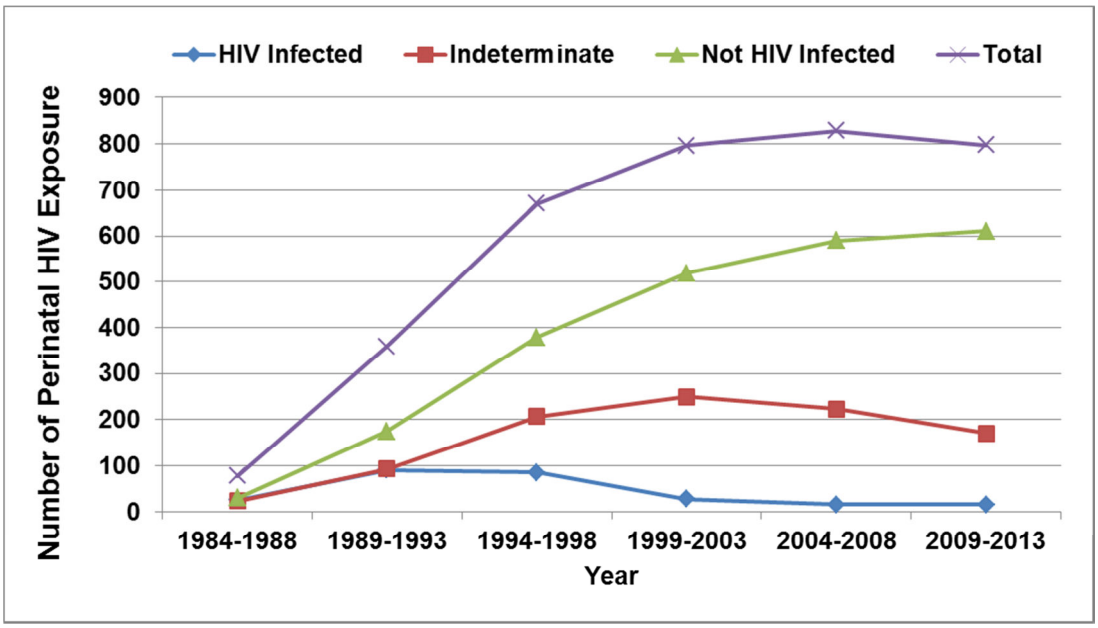
Source: Texas eHARS, 2015. Patients with no risk reported were not re-categorized into standard categories using CDC's multiple imputation program.

HIV in Children - Perinatal HIV Exposure in Infants

Figure 26 shows the number of infants born to HIV-infected mothers by the year of birth, stratified by the HIV infection status of the infants. Since perinatal cases sometimes have less than five cases per year, the years of birth were grouped into 5-year intervals to protect patients' confidentiality. The data are reported through 2013. Infants proven to be HIV infected are classified as "HIV Infected". Infants who have been proven not to be HIV infected are classified as "Not HIV Infected". Infants whose final infection status have not been determined or have not been reported to the Health Department are classified as "Indeterminate".

Figure 26 shows that the number of perinatal HIV-exposed infants increased from 1984 as the number of living HIV-infected women of childbearing age was increasing. It appeared to have reached a steady state of about 800 perinatal-exposed infants born every 5 years from 1999 through 2013. The number of HIV infected infants decreased from 1994 and reached a steady state of about 15 cases every 5 years from 2004 to 2013. During 2009-2013, the percentage of infants with HIV infection status of "HIV infected", "Indeterminate" and "Not HIV Infected" were 2%, 21% and 77%, respectively. The frequency of infants with perinatal HIV exposure has decreased over time due to early diagnoses of HIV infected pregnancy, early-in-pregnancy treatment of HIV infected women, cesarean section as needed, treatment of the exposed infants, and HIV positive mothers avoiding breast feeding.

Figure 26: **Perinatal HIV Exposure by HIV Infection Status in Houston/Harris County, 1984-2013**

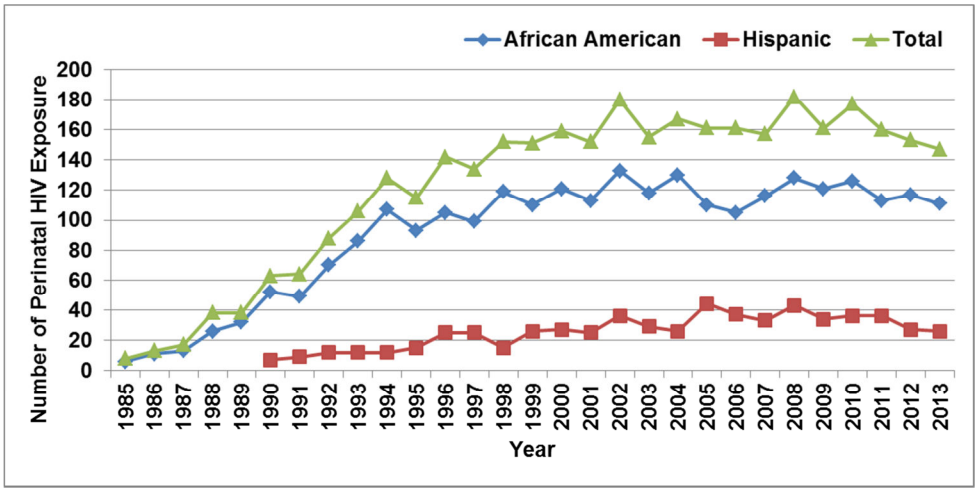


Source: Texas eHARS, 2015.

Figure 27 shows the number of infants born to HIV-infected mothers by the year of birth, stratified by race/ethnicity. In African Americans, the number of perinatal HIV exposures increased from 1985 to 2002 and has remained relatively stable. In Hispanics, the number of perinatal HIV exposures showed a slight increase from 1990 to 2008 followed by a decrease.

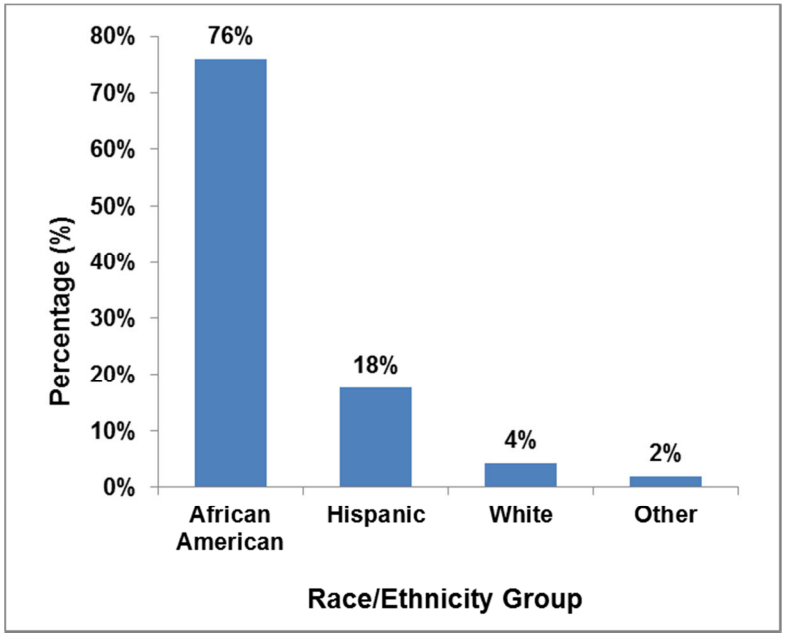
Averaging perinatal exposures for 2012 and 2013, 76% of the perinatal exposures were in African Americans, 18% in Hispanics, and 4% in Whites. This roughly reflected the race proportions of women of child bearing age living with HIV (Figure 28).

Figure 27: **Perinatal HIV Exposures by Race/Ethnicity in Houston/Harris County, 1985- 2013**



Source: Texas eHARS, 2015.

Figure 28: **Perinatal HIV Exposures by Race/Ethnicity in Houston/Harris County, 2013-2014**



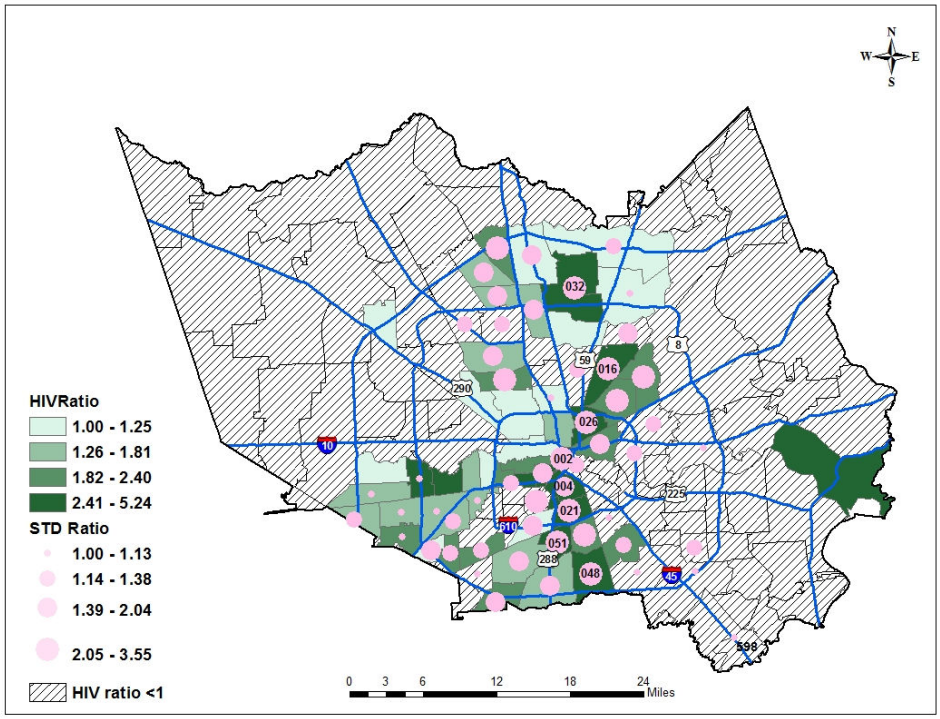
Source: Texas eHARS, 2015.

Introduction

People living with HIV are more likely to be co-infected with other sexually transmitted diseases as well as with hepatitis B, hepatitis C and tuberculosis. Common sexually transmitted diseases (STDs) occurring in HIV patients are syphilis, gonorrhea and chlamydia. Untreated STDs may cause long-term health consequences such as reproductive health issues, fetal and perinatal health problems, cancer, and even death[10]. STDs have been proven to facilitate the sexual transmission of HIV infection[11,12]. Improved treatment of STDs may reduce the HIV incidence rate[13].

Figure 29 shows both HIV and STD diagnosis rates by ZIP code. There were 8 zip codes labeled in the figure that have both the highest HIV and highest STD diagnosis rates within the region, which may suggest a higher possibility of having HIV and STD coinfection. Most of the 8 ZIP codes were in the central Houston area and a few in south and north Houston.

Figure 29: **HIV and STD Diagnoses in Houston/Harris County, 2014**



*Source: HIV data were from Texas eHARS, 2015. STD data were from STD*MIS. The HIV ratio was the ratio of HIV diagnosis rate by each ZIP code relative to the HIV background rate, which was the HIV diagnosis rate in Houston/Harris County in 2014 (29.1 per 100,000 population). The STD ratio was the ratio of STD diagnosis rate by each ZIP code relative to the STD background rate, which was the STD diagnosis rate in Houston/Harris County in 2014 (725.6 per 100,000 population). STD included primary and secondary syphilis, chlamydia, and gonorrhea. ZIP codes with less than 5 case counts or with rates less than the background rate were suppressed. ZIP codes with both the highest (top 25%) STD diagnosis rates and highest (top 25%) HIV diagnosis rates were labeled using the last three digits only (e.g. 77002 was labeled as "002").*

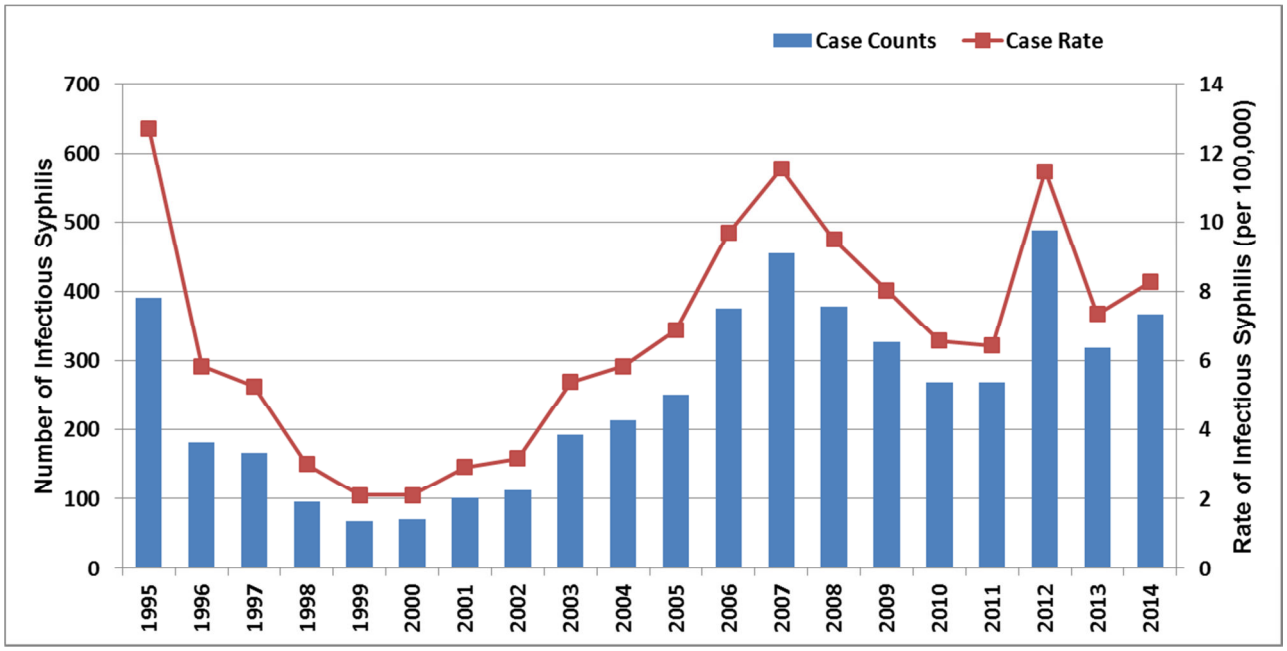
HIV and Infectious Syphilis Co-infection

Syphilis in Houston/Harris County

Syphilis progresses in four stages, advancing from stage to stage over time: (a) Primary, (b) Secondary, (c) Latent, and (d) Tertiary. Syphilis is most infectious or communicable to others at the Primary and Secondary stages. Therefore, these two stages are of most concern for the potential transmission to others and are also indicative of a recent infection. In this report, we refer to these two stages combined as "infectious syphilis". The consequences of HIV/syphilis co-infection on transmission of HIV and successful treatment of syphilis presents a significant health concern. Co-infection may increase the transmission of HIV to sex partners[11,12]. It has been reported in research that syphilis progresses much faster in HIV infected people, leading to an extended risk for neurological complications[14].

Figure 30 displays the twenty-year trend of primary and secondary syphilis in Houston/Harris County. The rates of infectious syphilis decreased from 1995 to 1999, increased from 2000 to 2008, then decreased from 2008 to 2011. In 2012, the number of primary and secondary syphilis cases increased from 2011. Following a decline from 2012 to 2013, there was a slight increase in rates from 2013 to 2014.

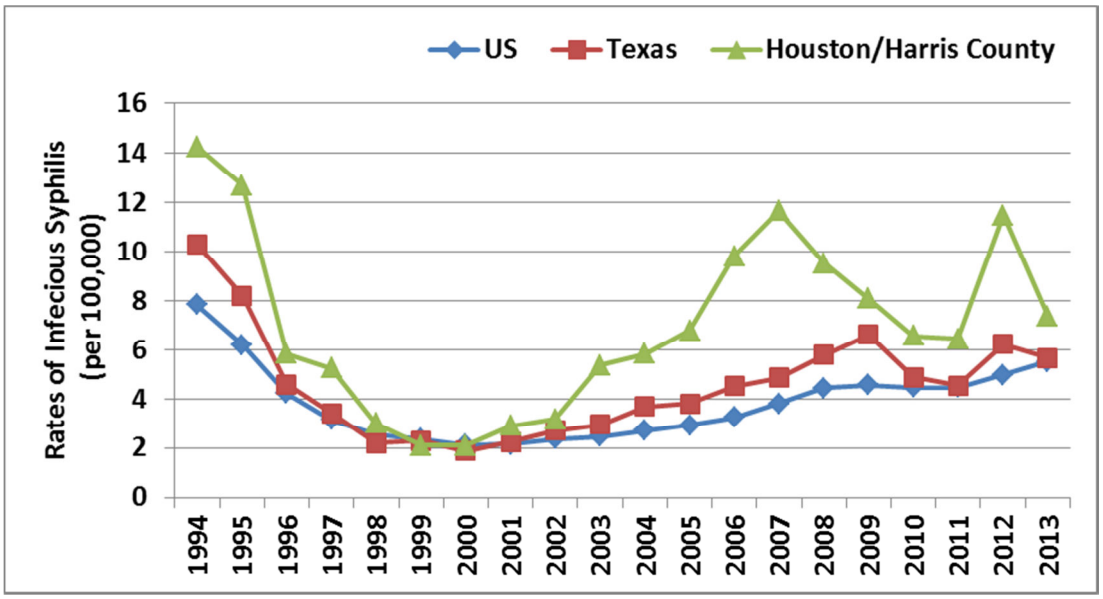
Figure 30: **Primary and Secondary Syphilis Cases and Rates in Houston/Harris County, 1995-2014**



*Source: STD*MIS, 2015.*

Figure 31 compares the primary and secondary syphilis trend for Houston/Harris County with Texas and national trends. National primary and secondary syphilis rates decreased from 1994 to 1999 and steadily increased from 1999 to 2013. The trend in Houston/Harris County generally mirrored that at the state and national levels with the exception of peaks in Houston/Harris County rates in 2007 and 2012.

Figure 31: **Primary and Secondary Syphilis Rates in Houston/Harris County, Texas and U.S., 1994-2013**



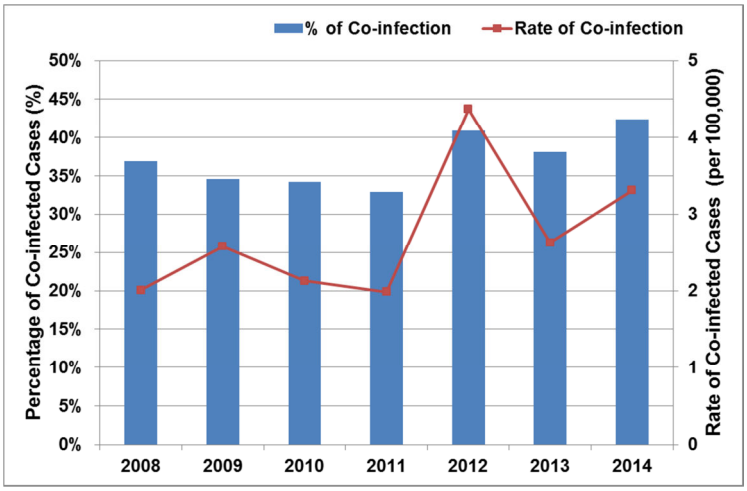
*Source: Houston/Harris County data were from STD*MIS, 2015. Texas and US data were from US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for HIV, STD and TB Prevention (NCHSTP), Division of STD/HIV Prevention, Sexually Transmitted Disease Morbidity 1984-2013, CDC WONDER Online Database, 2015. Population data were from Texas Demographer.*

HIV and Infectious Syphilis Co-infections

In 2014[15], Harris County ranked 9th highest in reported cases of primary and secondary syphilis among all counties in the U.S. The percentage of cases reported with infectious syphilis and HIV co-infection is, on average, 37.1% each year in Houston/Harris County. The highest co-infection rate was in 2012 and the lowest rate was 2011 (Figure 32).

One hundred and forty seven cases of infectious syphilis were reported to be co-infected with HIV during the year 2014 in Houston/Harris County, with a rate of 3.3 co-infection per 100,000 population. The majority were between the ages of 15 and 34 (62.6%), African American (48.3%) and MSM (91.2%). A total of 756 Syphilis cases at all stages were co-infected with HIV in 2014, a rate of 17.0 co-infected people for every 100,000 population in Houston/Harris County.

Figure 32: **Proportion and Rate of Cases with HIV and Infectious Syphilis in Houston/Harris County, 2008 - 2014**



Source: Data reflect estimates based on interview data by Disease Intervention Specialists (DIS), health department staff that attempt to conduct partner notification/elicitation on all new syphilis cases. Population data were based on ACS 1-year estimate in each year.

Table 7**: Syphilis Cases Co-infected with HIV in Houston/Harris County by Key Sub-populations, 2014**

	HIV & Infectious Syphilis			HIV & All Syphilis		
	Cases	**%**	**Rate**	**Cases**	**%**	**Rate**
Total Co-infected Cases	147	100.0%	3.3	756	100.0%	17.0
Sex						
Male	142	96.6%	6.4	728	96.3%	32.9
Female	5	3.4%	0.2	28	3.7%	1.3
Race/Ethnicity						
White	26	17.7%	1.9	147	19.4%	10.6
African American	71	48.3%	8.4	367	48.5%	43.3
Hispanic/Latino	44	29.9%	2.4	224	29.6%	12.1
Other/Unknown	6	4.1%	1.7	18	2.4%	5.2
Age at Diagnosis						
15-24 yrs	32	21.8%	5.1	121	16.0%	19.3
25-34 yrs	60	40.8%	8.4	293	38.8%	40.8
35-44 yrs	32	21.8%	5.0	175	23.2%	27.4
45-54 yrs	16	10.9%	2.8	121	16.0%	21.4
55 yrs and over	7	4.8%	0.8	45	6.0%	5.1
HIV Transmission Risk						
MSM	134	91.2%		667	88.2%	
Non-MSM	13	8.8%		89	11.8%	

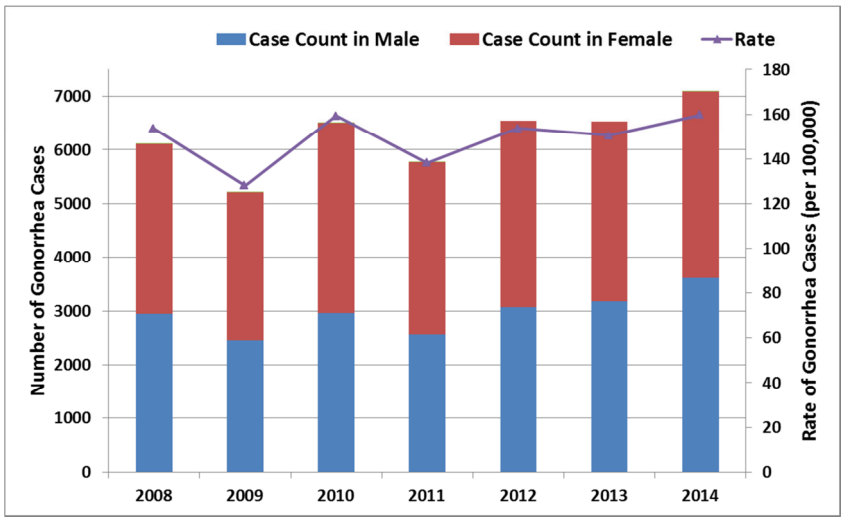
Source: Data reflect estimates based on interview data by Disease Intervention Specialists (DIS), health department staff that attempt to conduct partner notification/elicitation on all new syphilis cases. Population data were based on 2014 ACS 1- year estimate.

Gonorrhea and Chlamydia Infection

In 2014, Harris County ranked 3rd highest in reported cases of both chlamydia and among all counties in the U.S.[15] Higher STD rate may suggest the increased risk of HIV infection in the general population[11-14].

Figure 33 shows that reported gonorrhea cases in Houston/Harris County has been steady for males and females from 2008 to 2014 in Houston/Harris county, with relatively lower case counts and rates in both 2009 and 2011. In 2014, there were 7,096 gonorrhea cases in Houston/Harris County, of which 51% were males.

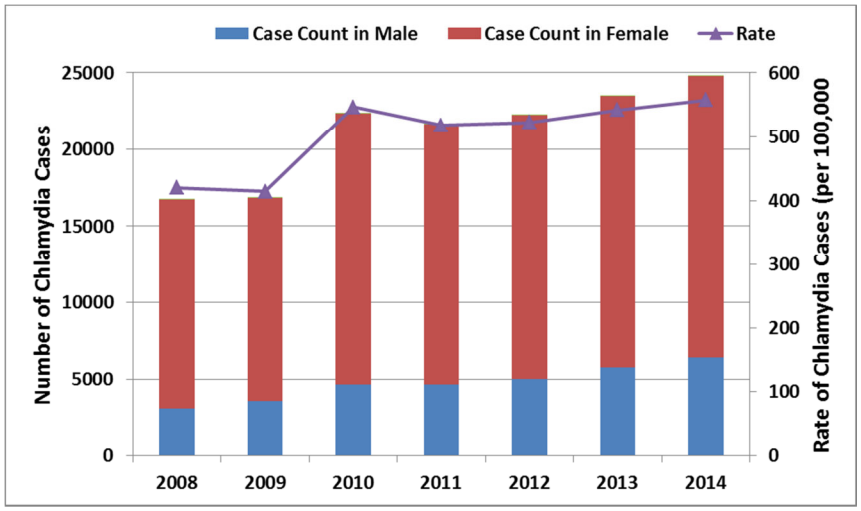
Figure 33: **Reported Gonorrhea Cases and Rates in Houston/Harris County, 2008-2014**



*Source: STD*MIS, 2015. Rates shown were Gonorrhea diagnosis rate in both sexes.*

Figure 34 shows a steady increase in both counts and rates of chlamydia cases in Houston/Harris County from 2008 to 2014, with a larger increase in both the case count and rate from 2009 to 2010. In 2014, there were 24,764 chlamydia cases, within which females accounted for 74%.

Figure 34: **Reported Chlamydia Cases and Rates in Houston/Harris County, 2008-2014**



*Source: STD*MIS, 2015. Rates shown were chlamydia diagnosis rate in both sexes.*

HIV and Viral Hepatitis Co-infection

Based on the surveillance data, a total of 117 HIV infected individuals in Houston/Harris County were diagnosed with Hepatitis B or C either in 2012 or 2013, including 14 cases of Hepatitis B and 103 cases of Hepatitis C. Among the PLWH in this area in 2013, 0.5% were co-infected with either Hepatitis B or C in 2012 or 2013. Considering the cases that have not been reported to the health department, the percentage of co-infection in PLWH is likely to be higher than displayed here.

Most of the people with HIV and Hepatitis B or C co-infection were male, African American, and ages 45 and older (Table 8). Although most of the co-infected cases have a reported transmission risk of MSM, injection drug use was also reported in almost 25% of the co-infected cases. These results are consistent with the research on Hepatitis transmission, specifically Hepatitis C, which is more effectively transmitted through exposure to blood than sexual contact[16].

Table 8: **HIV Cases with Hepatitis B or C in Houston/Harris County by Key Sub-population, 2012-2013**

	Number	%
Total co-infected cases	117	100%
Sex		
Male	91	77.8%
Female	26	22.2%
Race/Ethnicity		
White	27	23.1%
African American	65	55.6%
Hispanic	20	17.1%
Other/Unknown	5	4.3%
Age at Diagnosis		
13 - 34 yrs	15	12.8%
35 - 44 yrs	28	23.9%
45 - 54 yrs	36	30.8%
55 and over	38	32.5%
Transmission Risk		
MSM	49	41.9%
IDU	29	24.8%
MSM/IDU	7	6.0%
Heterosexual	16	13.7%
Other/Unknown	16	13.7%

Source: HIV data were from Texas eHARS, 2015. Hepatitis B and C data were from the Houston Electronic Surveillance System, 2015. Patient with no risk reported were not re-categorized into standard categories using CDC's multiple imputation program.

HIV and Tuberculosis (TB) Co-infection

In 2013, there were 22 TB cases diagnosed in patients with HIV, regardless of AIDS status. Among those, 59.1% were males. By race/ethnicity, 36.4% were African American and 54.5% were Hispanic. Among the 22, 551 PLWH in 2013, 629 patients (2.9%) had a diagnosis of TB by the end of 2013. Among the 629 PLWH who had a diagnosis of TB, 77.4% were males. By race/ethnicity, 51.8% were African Americans and 34.0% were Hispanics.

Table 9: **HIV and Tuberculosis Co-infection in 2013**

	TB cases diagnosed in 2013 in PLWH		PLWH in 2013 having a TB diagnoses by Dec 31, 2013	
	Number	**%**	**Number**	**%**
Total	22	100.0%	629	100.0%
Sex				
Male	13	59.1%	487	77.4%
Female	9	40.9%	142	22.6%
Race				
White	0	0.0%	60	9.5%
African American	8	36.4%	326	51.8%
Hispanic	12	54.5%	214	34.0%
Multi/Other	2	9.1%	29	4.6%
Transmission Risk*				
MSM	7.1	32.3%	220.9	35.1%
IDU or MSM/IDU	5.3	24.1%	190.3	30.3%
Heterosexual	9.6	43.6%	210.8	33.5%
Other	0.0	0.0	7	1.1%

Source: Texas eHARS, 2015.

**: Patients with no risk reported were re-categorized into standard categories using CDC's multiple imputation program*[7].

Preventing Secondary Transmission through Care: Re-linkage to Care Initiative (2012-2015) by Service Linkage Workers.

Service linkage workers (SLWs) are non-medical case managers who locate HIV-infected people not receiving medical care, facilitate their entry into care, and work to keep them in care once they have engaged with the medical care system. SLWs have been used in the Houston Area since 2008 to assist those newly-diagnosed with HIV. With funding from the Merck Foundation, the HHD initiated a project that utilized SLWs for a re-linkage to care initiative. SLWs funded under this initiative traveled throughout the city to meet with people not receiving care and assessed their willingness to return to care, along with the barriers that prevented them from seeking care. They assisted clients in making appointments and finding the resources to enable them to re-establish and remain in care.

For this project, SLWs worked with clients up to 90 days. Staff members of HHD selected three potential ways of identifying HIV-infected people who had left medical care:

1) Surveillance Referrals: As of January 1, 2010, Texas Administrative Code requires that all CD4 counts for those 13 years and older be reported. If a laboratory can differentiate between CD4 tests for HIV-infected and those uninfected, then CD4 counts for only HIV positive individuals may be submitted. If the laboratory is unable to distinguish between the two, they must send all of the CD4 results to their local health authority. Additionally, all HIV viral loads (both detectable and undetectable) must be reported. Performance of these tests at every routine HIV clinical visit constitutes minimum standard of care for HIV-infected patients. Routine visits at which these tests should be done is every 3 months. It was hypothesized that a patient who has not had these tests over a six-month period may not be in care and should be contacted to determine care status. Those who were out of care and eligible for the initiative (up to program capacity) were counseled on the importance of returning to care and assisted in overcoming any barriers that prevented them from returning to care.

2) Provider Referrals: Four major providers of care for HIV-infected people in Houston are funded by the Harris County Public Health and Environmental Services through the Ryan White Care Act. These are Harris Health System's (once known as Harris County Hospital District) Thomas Street Clinic, Legacy Community Health Services, St. Hope Foundation, and Houston Area Community Services. Each organization is required to identify patients who seem to have dropped out of care. They must attempt contact with each of these individuals three times by more than one method (e.g. phone, mail, email, text, home visit) to encourage them to return to care. HHD worked with three of these providers and one private provider to expand Point-of-Entry agreements to obtain a list of their out-of-care individuals. HHD personnel contacted people on the list to counsel them on the importance of returning to care and assist them in overcoming any barriers that prevented them from returning to care.

3) DIS Referrals: HHD's Disease Intervention Specialists (DIS) routinely contact HIV-positive people who have been diagnosed with other reportable sexually-transmitted diseases (e.g. syphilis, gonorrhea, chlamydia) to have their sexual partners tested and treated. This process, known as partner elicitation and notification, interrupts disease transmission in the community. In the course of these interviews, HIV-positive people discuss their care status with DIS through a brief readiness-to-care assessment. Some clients report they are no longer receiving care for their HIV infection but would like to return to treatment. These clients were referred to this re-linkage project so that SLWs could contact them for counseling on the importance of returning to care and assist them in overcoming any barriers that prevented them from returning to care.

Houston Medical Monitoring Project (HMMP)

Introduction

The Medical Monitoring Project (MMP) is a nationwide supplemental HIV surveillance system funded by CDC and designed to produce nationally representative estimates of behavioral and clinical characteristics of HIV-infected adults receiving medical care in the United States and Puerto Rico. It is supported by several government agencies and conducted by state and local health departments along with the Centers for Disease Control and Prevention (CDC). The City of Houston Health Department (HHD) is one of 23 city/state sites participating in the project. The purpose of the MMP is to produce population-based estimates of characteristics of persons living with HIV (PLWH) and receiving medical care in Houston/Harris County. The MMP provides information on risk behaviors, clinical outcomes, use of prevention services, and identifies met and unmet needs for HIV care and prevention services.

Sampling Methodology

From 2005-2014, the MMP used a three-stage probability proportional to size (PPS) sampling design to obtain cross-sectional samples of HIV-infected adults receiving medical care in the United States and Puerto Rico. The first stage involved the selection of participating geographic areas based on HIV/AIDS prevalence at the end of 2002; the second stage involved the selection of outpatient facilities providing HIV medical care (i.e., providers that prescribe antiretroviral therapy [ART] or order CD4 or HIV viral load tests) within the participating project areas. Facilities of different sizes (i.e. small, medium, and large) were included based on the estimated patient loads (EPLs) in order to obtain optimal representativeness. The third sampling stage involved the selection of patients at least 18 years of age who were receiving care for HIV at the selected facilities. Persons in care were sampled from January through April of each data collection cycle. The annual sample of facilities participating in MMP in Houston ranged from 20-25 healthcare facilities with a total of 400 patients sampled annually from the selected facilities. Through an informed consent process, selected patients were offered participation in a face-to-face or telephone interview by a trained interviewer with the understanding that their medical records will also be reviewed.

The interviews, which generally take about 45 minutes, cover questions about demographics (eg., sex, age, and health insurance or medical coverage), access to care, HIV treatment and adherence to medications, drug and alcohol use, sexual behavior, met and unmet needs for social services, and receipt of prevention counseling in a clinical setting. MMP abstractors then collect additional information on clinical outcomes, prescription of antiretroviral therapy, and other healthcare services provided and the quality of these services from patients' medical charts. Special precautions were implemented to ensure confidentiality throughout the entire process. Since 2009, 23 jurisdictions, which include over 80% of the total cases of HIV infection and AIDS in the United States, have been conducting MMP activities[14].

Data Collection

Since the project began in 2004, there have been nine data collection cycles. Approximately 60 HIV Care Providers in Houston/Harris County have participated in the project since data collection activities began in 2005. At the end of the 2014 cycle, a total of 1,485 interviews and 2,977 medical record abstractions have been completed. The success of the MMP is dependent upon high participation by both the selected HIV care providing facilities and patients from those facilities as this increases the likelihood of obtaining information that is truly representative of patients in care for HIV. The Houston project area has recorded increasing trends in participation rates with increased support from HIV care providers and community and provider advisory boards. These efforts have resulted in greater HMMP visibility in Houston/Harris County and led to a steady increase in provider and patient participation rates

(Figures 35-37). During the period under review, the participation rates among providers increased from 65% in the 2009 cycle to 85% in the 2014 cycle. Similarly, patients' participation rates, represented by the number of interviews completed increased from 166 in the 2009 cycle to 240 during the 2014 cycle (Figure 36). On the average, 99% of the medical records of sampled patients were completed between 2009 and 2014 (Figure 37). Figure 38 displays the proportion of sampled patients during 2009-2014 that refused to participate in HMMP (11.3-20.8%), were ineligible (0.3-6.0%) or who were lost-to-follow-ups or moved out of the Houston project area (24.5-39.5%).

Figure 35: **Response Rate of Sampled Providers that Participated in HMMP (2009 -2014)**

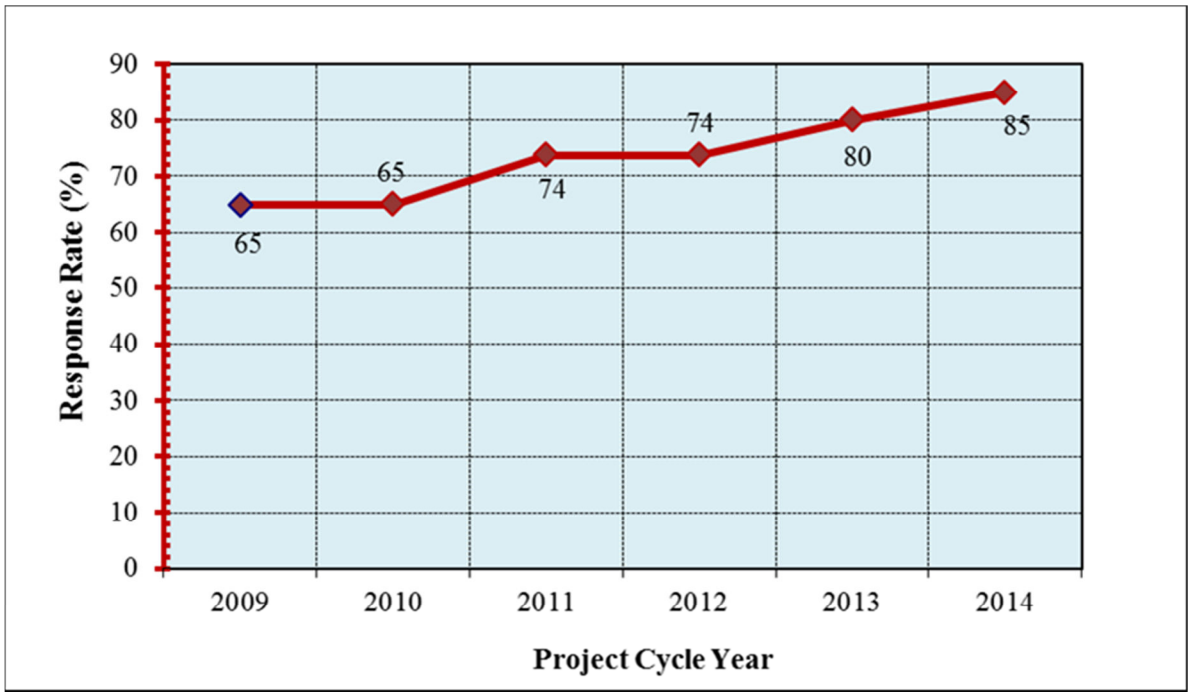


Figure 36: **Number of Interviews Completed, 2009-2014 Cycle Years**

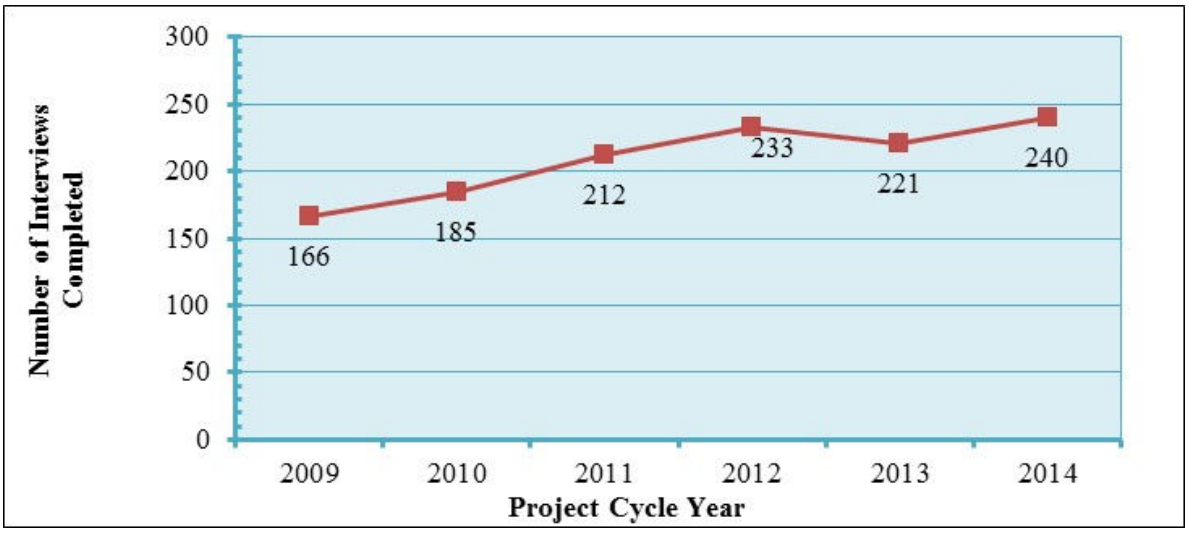


Figure 37: **Number of Medical Record Abstractions Completed, 2005-2014 Cycle Years**

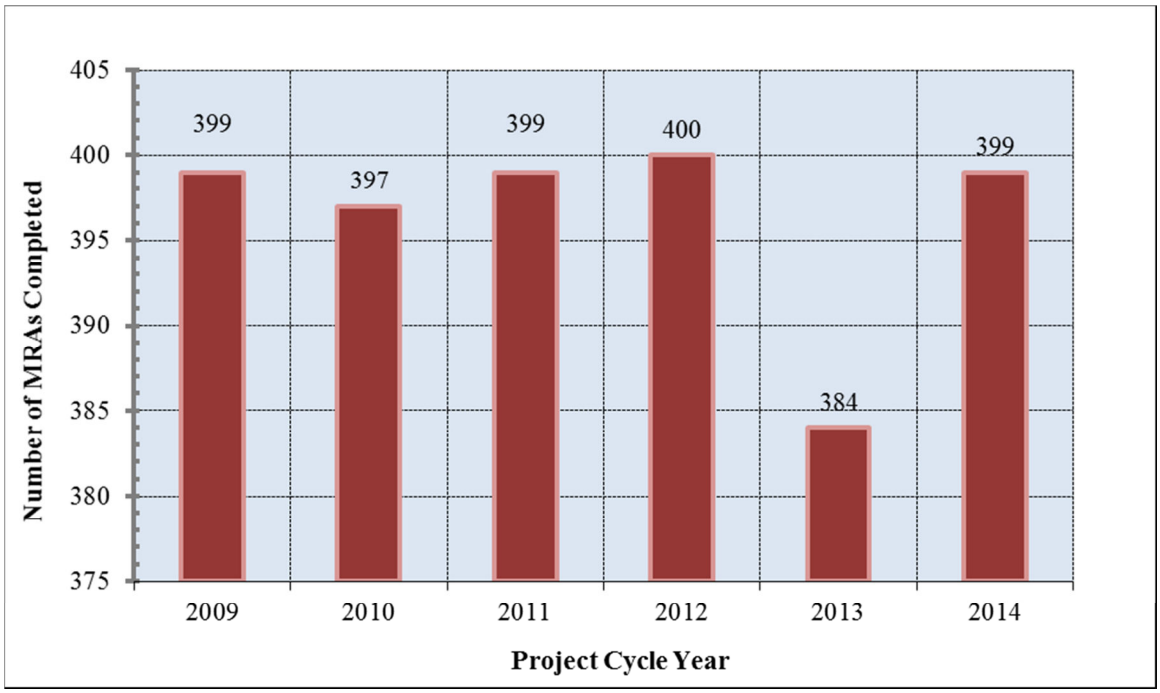
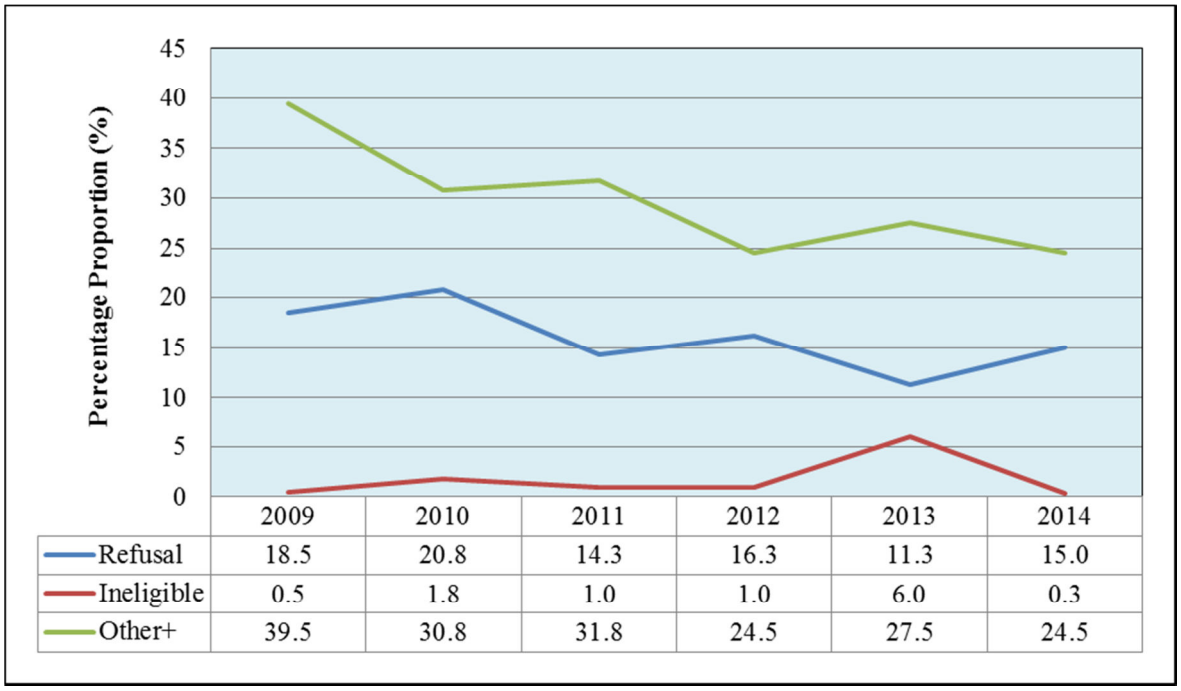


Figure 38: **Refusals, Ineligible Patients and Other Statuses+ 2009-2014 Cycle Years**



	2009	2010	2011	2012	2013	2014
Refusal	18.5	20.8	14.3	16.3	11.3	15.0
Ineligible	0.5	1.8	1.0	1.0	6.0	0.3
Other+	39.5	30.8	31.8	24.5	27.5	24.5

+ *Refer to those who were lost-to-follow-up or moved out of the Houston project area.*

Survey Outcomes

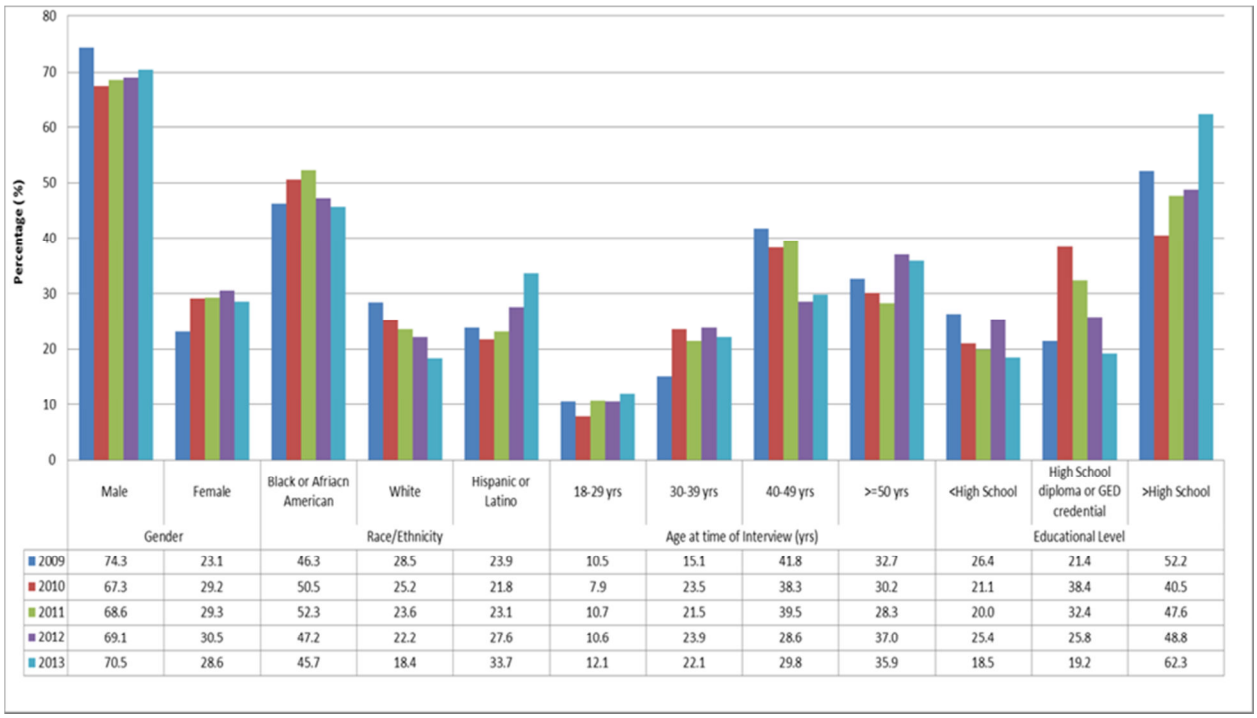
The HMMP survey outcomes presented below were based on data analysis conducted using weighted overlap datasets (data were weighted to adjust for non-response bias), which combine both the interview and medical record abstraction (MRA) data completed during the 2009-2013 data collection cycles. As a result, the number of

records may vary slightly from the actual numbers of interviews and MRAs completed during each project cycle. No statistical tests were performed and no attempts were made to infer any causal relationships.

Demographic Characteristics

Trends in demographic characteristics of MMP participants between 2009 and 2013 are shown in Figure 39. In general, the survey outcomes showed slight fluctuations in the demographic characteristics over the survey period. About 70% of participants were males. The majority of participants were African Americans (45.7-52.3%). While the proportions of White participants tended to decrease with each cycle year (28.5-18.4%), the proportion of Hispanics tended to increase (21.8-33.7%). Most participants were aged 40 years and above (65.5-74.5%) and generally had greater than high school education. Between 2010 and 2013 cycles, the proportion of participants with higher than high school education increased from 40.5% to 62.3%, while the proportion of those with only a high school diploma or GED decreased (38.4-19.2%) during the same period.

Figure 39: **Distribution of Demographic Characteristics of HMMP Participants, 2009-2013**

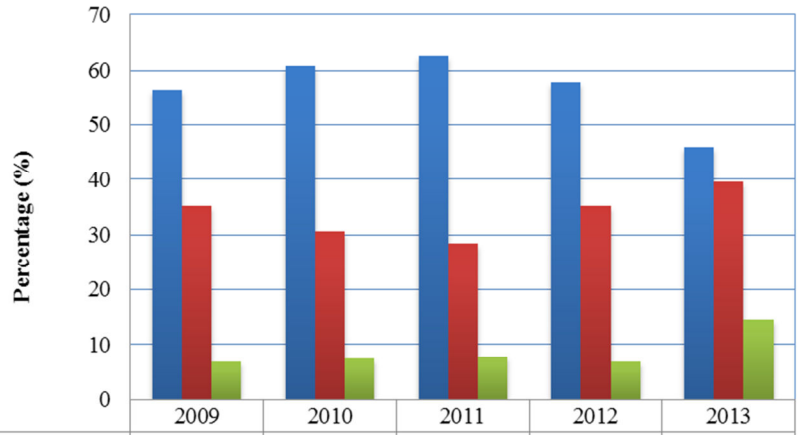


	Gender		Race/Ethnicity			Age at time of Interview (yrs)				Educational Level		
	Male	Female	Black or Afriacn American	White	Hispanic or Latino	18-29 yrs	30-39 yrs	40-49 yrs	>=50 yrs	<High School	High School diploma or GED credential	>High School
2009	74.3	23.1	46.3	28.5	23.9	10.5	15.1	41.8	32.7	26.4	21.4	52.2
2010	67.3	29.2	50.5	25.2	21.8	7.9	23.5	38.3	30.2	21.1	38.4	40.5
2011	68.6	29.3	52.3	23.6	23.1	10.7	21.5	39.5	28.3	20.0	32.4	47.6
2012	69.1	30.5	47.2	22.2	27.6	10.6	23.9	28.6	37.0	25.4	25.8	48.8
2013	70.5	28.6	45.7	18.4	33.7	12.1	22.1	29.8	35.9	18.5	19.2	62.3

Source: Medical Monitoring Project, 2009-2013

The sexual orientation of participants surveyed between 2009 and 2013 are displayed in Figure 40. Proportionally, heterosexuals were highest with a range of 45.9-62.6%; followed by homosexual, gay, or lesbian (28.5-39.5%) and bisexuals (6.7-14.6%). However, decreasing and increasing trends among heterosexuals and homosexuals, gays or lesbians, respectively, were noted between 2011 and 2013 project cycles.

Figure 40: **Sexual Orientation of HIV-infected Persons in Houston/Harris County, 2009-2013.**



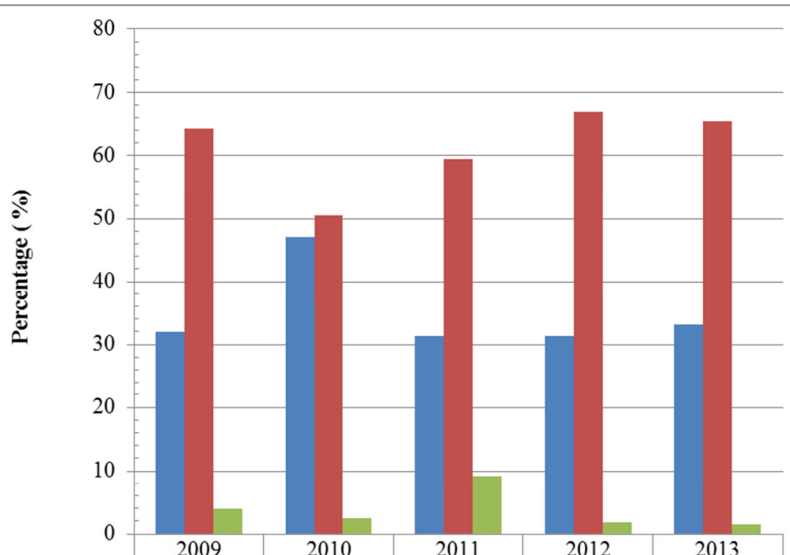
	2009	2010	2011	2012	2013
Heterosexual or straight	56.2	60.8	62.61	57.6	45.9
Homosexual, gay, or Lesbian	35.3	30.7	28.5	35.3	39.5
Bisexual	6.8	7.4	7.8	6.7	14.6

Source: Medical Monitoring Project, 2009-2013

Health Insurance Status

The health insurance status of participants (2009-2013) during the 12 months prior to the MMP interview is displayed in Figure 41. On average, approximately 61.3% of PLWHA had insurance coverage between 2009 and 2013. The uninsured participants during the same period ranged from 31.3-47.0% with about 3.8% of the uninsured persons on average receiving health service benefits through the Ryan White Care Act. During the 2011 cycle year, as much as 9.2% of participants who were uninsured received healthcare services through Ryan White programs.

Figure 41: **Distribution of Health Insurance Status of Participants, 2009-2013**



	2009	2010	2011	2012	2013
Uninsured	31.9	47	31.3	31.4	33.2
Insured	64.2	50.5	59.5	66.8	65.4
Uninsured (Ryan White only)	3.9	2.55	9.2	1.9	1.5

Source: Medical Monitoring Project, 2009-2013

HIV Diagnosis, Stage of Disease and Antiretroviral Medication

Table 10 indicates time since HIV Diagnosis, Stage of HIV Disease and Current Antiretroviral Therapy Status among HIV-Infected persons in Houston/Harris County, Texas, 2009-2013. On the average, the majority of participants (51.3%) in HMMP were diagnosed 10 or more years ago, followed by those diagnosed 5-9 years ago (27.5%) and less than 5 years (21.8%) ago. There was an increasing trend in the proportion of HIV patients taking antiretroviral therapy (ART) in Houston/Harris County with a range of 82.7% in 2009 to 94.9% in 2013. Based on the CDC surveillance classification of HIV disease stages, on average, 9.7% of the participants were at Stage I (No AIDS, CD4+ T-lymphocyte count ≥500 cells/µL (or CD4% ≥29); 19.0% were at Stage II (No AIDS, CD4+ T-lymphocyte count 200-499 cells/µL (or CD4% = 14 to <29); and 71.4% were at Stage III (Clinical AIDS or CD4+ T-lymphocyte count <200 cells/µL (or CD4% <14) (Table 10).

CD4+ T-lymphocyte Count and Most Recent HIV Viral Load

Table 11 presents the geometric mean CD4+ T-lymphocyte count and most recent HIV viral load detectability status of MMP participants, 2009-2013. Participants with a CD4 count of 500 or more cells/µL ranged from 38.6% in 2009 to 57.2% in 2012. The trends in CD4 count categories generally fluctuate across the period as follows: 4.8%-14.4% (*0-199 Cells/µL*); 9.8%-23.8% (*200-349 Cells/µL*) and 15.9%-22.8% (*350-499 Cells/µL*). On the average, about 67.6% of participants had undetectable viral loads based on their most recent HIV viral loads (Table 11). The year 2009 recorded the least proportion of patients with undetectable viral loads (55.6%) compared to the highest proportion of 78.9% obtained during 2012 cycle.

Table 10: **Time Since HIV Diagnosis, Stage of Disease and Current Antiretroviral Therapy Status among HIV-Infected persons in Houston/Harris County, Texas, 2009-2013.**

Characteristic	2009		2010		2011		2012		2013	
	N	Weighted % (95% CI)	N	Weighted % (95% CI)	N	Weighted % (95% CI)	N	Weighted % (95% CI)	N	Weighted % (95% CI)
Time Since HIV diagnosis										
<5 years	41	28.1 (21.0-35.2)	39	24.3 (17.3-31.3	54	27.5 (21.3-33.7)	51	29.1 (22.0-36.2)	42	25.6 (19.2-32.0)
5-9 years	27	19.8 (12.9-26.6)	26	16.8 (10.7-22.8)	57	28.5 (22.2-34.9)	43	17.74 (12.85-22.62)	60	26.0 (20.2-31.8)
≥ 10 years	71	52.1 (43.59-60.62)	94	58.9 (50.8-67.1)	90	44.0 (36.5-51.4)	128	53.2 (46.2-60.2)	116	48.5 (42.0-55.0)
Currently Taking ART										
Yes	118	82.7 (76.2-89.2)	140	88.5 (84.1-93.1)	179	90.1 (85.6-94.4)	208	93.6 (90.1-96.7)	207	94.9 (91.9-98.1)
No	23	17.3 (10.8-23.9)	17	11.5 (6.9-16.1)	20	10.0 (5.6-14.4)	13	6.5 (3.0-9.9)	11	5.1 (2.0-8.1)
Stage of HIV Disease*										
Stage I: No AIDS, CD4+ T-lymphocyte count ≥500 cells/µL (or CD4% ≥29)	14	11.9 (5.4-18.3)	16	10.4 (5.9-14.9)	13	6.6 (3.2-10.1)	21	10.1 (5.9-14.1)	21	9.7 (5.8-13.6)
Stage II: No AIDS, CD4+ T-lymphocyte count 200-499 cells/µL (or CD4% = 14 to <29)	21	17.0 (9.6-24.4)	25	16.1 (10.3-21.6)	37	18.6 (13.4-23.9)	41	19.3 (14.0-24.6)	48	23.8 (17.8-29.8)
Stage III: Clinical AIDS or CD4+ T-lymphocyte count <200 cells/µL (or CD4% <14)	104	71.1 (63.8-78.5)	118	73.7 (67.1-80.3)	151	74.8 (68.9-80.6)	159	70.7 (64.9-76.6)	149	66.5 (60.1-73.1)

** Based on CDC surveillance classification; Percentages may not sum up to 100 due to rounding and/or suppressed figures.*

Table 11: **Geometric Mean CD4+ T-lymphocyte Count and Most Recent HIV Viral Load detectability Status, 2009-2013**

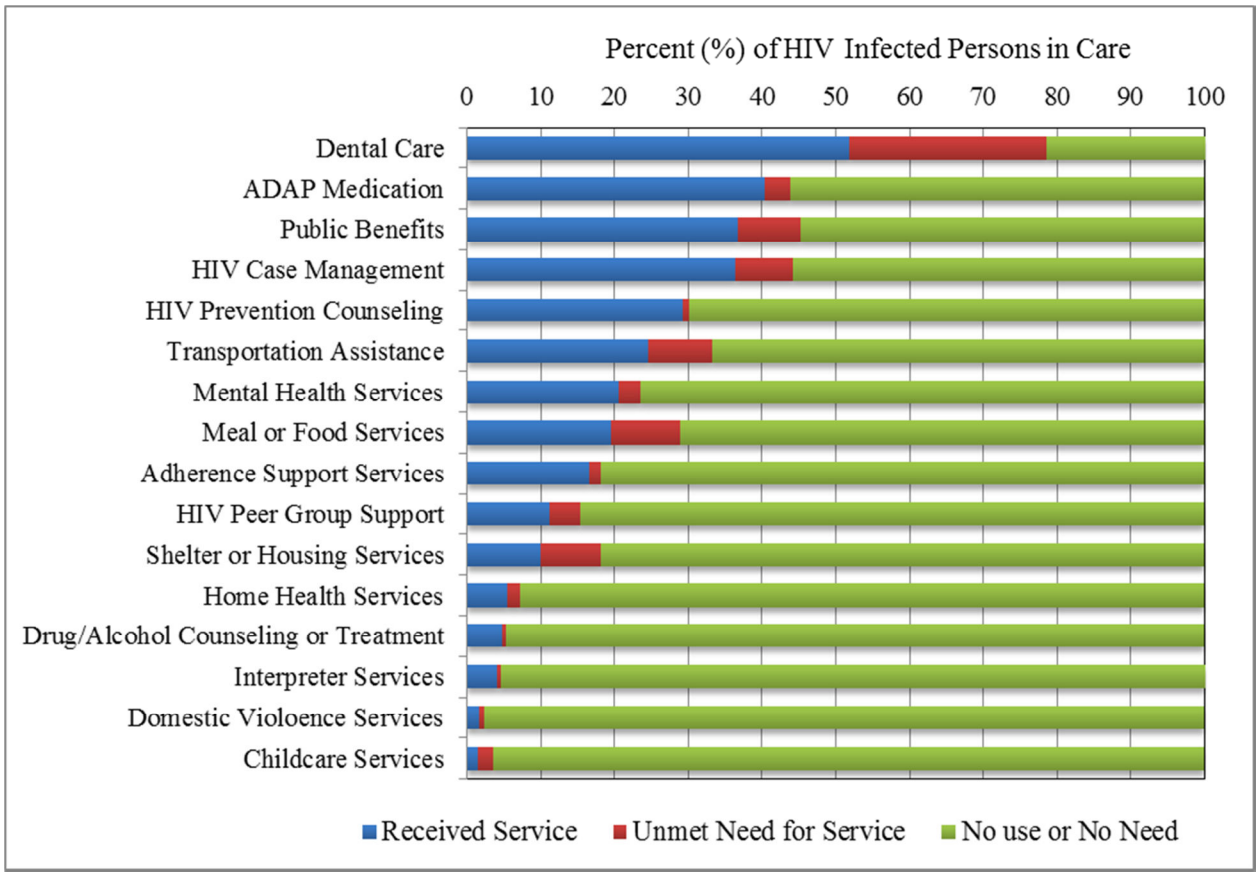
Characteristics	2009		2010		2011		2012		2013	
	N	Weighted % (95% CI)	N	Weighted % (95% CI)	N	Weighted % (95% CI)	N	Weighted % (95% CI)	N	Weighted % (95% CI)
Geometric mean CD4+ T-lymphocyte count (cells/µL)										
0-199	27	22.1 (14.4-29.5)	18	12.8 (7.2-18.4)	27	15.0 (9.4-20.6)	11	4.8 (2.1-7.6)	22	11.7 (6.9-16.5)
200-349	31	23.8 (16.2-31.3)	29	20.7 (12.7-28.7)	36	18.7 (13.2-24.3)	37	18.2 (13.3-23.2)	19	9.8 (5.6-14.1)
350-499	19	15.9 (9.0-22.8)	28	19.8 (12.7-26.9)	40	21.7 (15.5-28.0)	41	19.7 (13.8-25.6)	44	22.8 (16.4-29.2)
≥ 500	44	38.6 (29.7-47.1)	66	46.7 (38.7-54.8)	82	44.5 (36.3-52.7)	122	57.2 (50.6-63.9)	108	55.6 (48.3-63.0)
Most recent HIV viral load und etectable or <= 200 copies/mL										
HIV viral load undetectable or ≤200 copies/ml	80	55.6 (46.2-64.6)	107	66.5 (59.4-73.6)	133	65.8 (59.3-72.4)	176	78.9 (73.7-84.2)	160	72.2 (66.2-78.3)
HIV viral load detectable, >200 copies/ml or Missing/unknown	61	44.4 (35.4-53.4)	52	33.5 (26.4-40.6)	68	34.2 (27.6-40.7)	46	21.1 (15.8-26.3)	58	27.8 (21.7-33.9)

Percentages may not sum up to 100 due to rounding and/or suppressed figures.

Met and Unmet Needs for Ancillary Services

Figure 42 shows the met and unmet needs for auxiliary services among HIV infected persons in Care in Houston/Harris County, Texas, 2009-2013. Findings indicate that dental care (51.9%), ADAP medication (40.4%), public benefits (36.8%), HIV case management (36.4%), and HIV prevention counseling (29.2%) were the top five services received by patients. Services with the largest unmet needs include dental care (26.6%), meal or food services (9.4%), transportation assistance (8.7%), public benefits (8.5%), and shelter or housing services (8.2%). Except for dental care which had the highest proportion of unmet needs, the low proportions of patients with unmet needs may be an indication that most of the needed support services are available and accessible in Houston/Harris County. Patients are encouraged to make concerted efforts to access these services.

Figure 42: **Met and Unmet Needs for Services in Houston/Harris County, Texas, 2009-2013.**



Data Dissemination and Use

To disseminate the outcomes of this project, the Houston project area regularly conducts data analyses and shares the findings at numerous local, regional and national meetings and conferences. The project site has also published the first volume of the HMMP Book of Abstracts, which is a collection of abstracts emanating from these activities from 2005 through 2012[15]. Although some of the findings were considered preliminary, they have laid a strong foundation for a more comprehensive evaluation of the clinical and behavioral characteristics and health outcomes of patients receiving medical care for HIV in Houston/Harris County. In addition, the Houston project area also disseminates project information and news through the website (www.hmmptx.org) and the Community Monitor Newsletter. The HIV/STD Surveillance program continues to work in collaboration with the HIV/STD Prevention and Care programs to identify ways in which the Houston MMP data can supplement the HHD planning and prioritizing for activities such as identifying gaps in the scope and reach of HIV prevention interventions, and

strategies to enhance the coordination of HIV prevention in Houston/Harris County. At the national level, several surveillance reports and MMWRs based on MMP data have been published, and can be accessed at http://www.cdc.gov/hiv/statistics/systems/mmp/resources.html.

The Houston project area has also recently conducted a series of studies based on data obtained from the MMP Provider survey conducted between June and September of 2009. The outcomes of these studies have been published in peer-reviewed international journals[17-23].

Because MMP's estimates are representative, data and information gathered from this project may be used to monitor the U.S. National HIV/AIDS strategy goal of increasing access to care and optimizing health outcomes among persons living with HIV. Prevention planning groups, policy leaders, health-care providers, and people living with HIV infection can use the data to inform HIV prevention activities, highlight disparities in care and services, identify unmet needs, and evaluate services. The data are also used to guide policy and funding decisions aimed at reducing the spread of HIV and improving the quality of care for people living with HIV infection throughout the United States.

NATIONAL HIV BEHAVIORAL SURVEILLANCE (NHBS)

Introduction

In 2002, as an initial step towards meeting one of the goals of the CDC HIV Prevention Strategic Plan, CDC awarded supplemental funds to state and local health departments to develop and implement the National HIV Behavioral Surveillance System (NHBS). The goal was to strengthen the national capacity to monitor the HIV epidemic to better direct and evaluate prevention efforts, which has been further highlighted in the 2015 National HIV/AIDS Strategy for the United States[24]. As a result, NHBS was established to monitor HIV-associated selected behaviors that put people at risk for HIV infection. NHBS targets three high-risk populations for HIV: men who have sex with men (MSM), injection drug users (IDU), and heterosexuals at increased risk of HIV infection (HET). NHBS project sites are comprised of state and local health departments in areas with the highest HIV/AIDS prevalence[25,26]. Houston has been one of the NHBS participating sites since the project's inception in 2003. As of 2015, 20 jurisdictions with high AIDS prevalence are funded to conduct NHBS.

Rationale for the Development of NHBS

NHBS resulted from the need to develop an ongoing bio-behavioral surveillance to strengthen the national capacity to monitor the HIV epidemic. The goals of the project are to ascertain the prevalence and trends of HIV risk behaviors, develop an ongoing program to evaluate changes over time in behaviors, and to develop a mechanism to incorporate and utilize the behavioral data gathered during this project and other sources of HIV-related behavioral risk data to effectively summarize what is currently known about HIV risk taking behaviors, specially of those at highest risk for HIV infection. The overarching goal of NHBS is to help evaluate and direct local and national prevention efforts[25,26].

Survey Methodology

NHBS consists of a repeated, cross-sectional survey that utilizes an anonymous standardized questionnaire. The NHBS data collection focuses primarily on sexual and drug-use behaviors that place individuals at risk for HIV infection, as well as their use of HIV prevention services. Data on demographic characteristics, alcohol use, other health conditions, discrimination, intimate partner violence, HIV stigma, and HIV testing history and incarceration history are also collected for each cycle. The NHBS activities are implemented in rotating annual cycles from three different populations at high risk for HIV so that data are collected from each risk group every three years. The NHBS cycles are referred to by the group of interest or at risk group (NHBS-MSM, NHBS-IDU and NHBS-HET).

Data Collection

For each NHBS cycle, formative research is conducted to prepare for the recruitment of hard to reach populations. Formative research activities include ethnographic mapping, observations, interviews, review of secondary data sources, focus groups and other operational activities including identification of interview locations. During recruitment, eligible consenting participants are asked to complete a standardized anonymous questionnaire and HIV testing is offered to all study participants. NHBS data collection in Houston has been ongoing for approximately 11 years. Table 12 presents NHBS data collection periods in Houston since 2003.

***Table 12:* Data Collection Periods – Completed and Upcoming* Cycles (from 2003-2016)**

NHBS Round	NHBS Cycle		
	MSM	IDU	HET
1	Dec 2003-Dec 2004	Jan-Dec 2005	Jan 2006-Oct 2007
2	Jan-Dec 2008	Jan-Dec 2009	Jan-Dec 2010
3	Jan-Dec 2011	Jan-Dec 2012	Jan-Dec 2013
4	Jan-Dec 2014	Jan-Dec 2015	Jan-Dec 2016*

Sampling Methodology

Two sampling methods are used in NHBS namely Respondent Driven Sampling (RDS) and Venue Based Sampling (VBS). The sampling method used during the IDU and HET cycles of NHBS is the RDS, a type of peer-

driven chain-referral sampling. During the MSM cycle, a VBS is used. The VBS relies on a sampling frame and a two stage sampling design.

RDS

RDS begins with the non-random selection of a small number of initial recruiters or "seeds." These "seeds" recruit project participants who in turn recruit other participants. This chain of recruiters and recruits then continues for multiple "waves" of recruitment. Ongoing recruitment is fostered with a dual incentive system: one incentive for participating in the project and another incentive for each person recruited who participates. Recruiters are linked to their recruits by an encoded number on the recruitment coupons, who are limited to the number of people they can recruit, based on the number of recruitment coupons they are given. The NHBS protocol states that the maximum number of coupons that can be distributed to each participant is five but it can range from 3 to 5 (Centers for Disease Control and Prevention, 2015).

VBS

- **Constructing sampling frames**

Before sampling can begin for VBS, two sampling frames need to be constructed: a venue frame and a day-time frame. The *venue frame* is a list of venues where recruitment could potentially take place during the upcoming month and the *day-time frame* is a list of day and time periods when recruitment could occur at each venue.

- **Stage 1 sampling: venue selection**

The selection of venues where recruitment will occur during the upcoming month is done by a random selection of venues from the venue frame that will correspond to the number of recruitment events planned for that particular month.

- **Stage 2 sampling: day-time period selection**

Starting with the venue with the fewest number of day-time periods, project staff will randomly select a day-time period and schedule it on the recruitment calendar for the upcoming month. The process of stage 2 sampling is repeated for each of the venues selected in stage 1 until all venues have been scheduled on the recruitment calendar.

Eligibility Criteria

An eligible NHBS participant is an individual aged 18 years and above living in the participating project area who has not previously participated in the current cycle and is able to complete the interview in English or Spanish. Specific population eligibility criteria are presented in Table 13.

***Table 13:* Eligibility criteria for specific NHBS cycles**

MSM	Were born male and self-identify as male Have ever had oral or anal sex with another man Report having had sex with another man in the past 12 months
IDU	Present a valid NHBS-IDU coupon Have injected drugs without a prescription in the past 12 months Is male or female (not transgender)
HET	Present a valid NHBS-IDU coupon Are between 18 and 60 years of age* Have had vaginal or anal sex with an opposite sex partner in the past 12 months Are male or female (not transgender) Have not injected drugs without a prescription in the past 12 months Have low socioeconomic status (SES)**

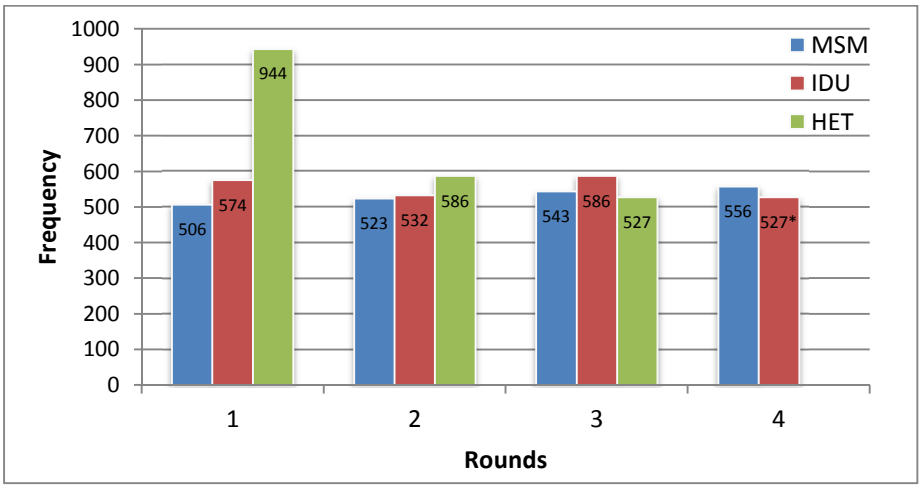
**The upper age limit for the NHBS-HET cycles is based on unpublished analyses of NHBS-HET1 data and information from CDC's Incidence Surveillance System; rates of new HIV diagnoses were higher in participants 25 years old and younger.*

***Low SES is defined as having income that does not exceed Health and Human Services (HHS) poverty guidelines or educational attainment not greater than high school*

Recruitment

Every NHBS project site must complete at least 500 interviews for each cycle period. Nationwide, data from approximately 10,000 interviews is collected each year for the NHBS. Figure 43 shows the total number of eligible participants recruited for each cycle period in the Houston project area.

***Figure 43:* Recruitment of NHBS eligible participants**



Source: please see Table 12 for details about data source.

**The number of eligible participants recruited for IDU4 is preliminary. The final data has not been released by CDC.*

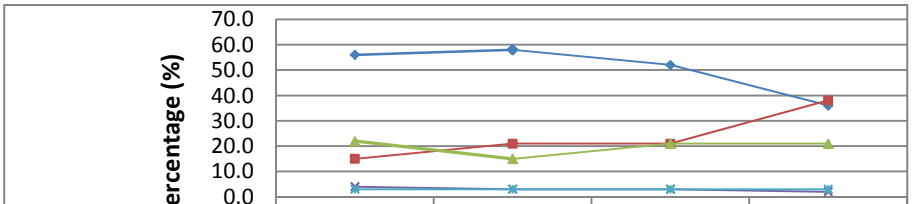
Survey Outcomes

The survey outcomes presented below are based on data analysis conducted using unweighted data. No statistical tests were performed and no attempts were made to infer any causal relationships.

Demographic Characteristics

Figure 44 presents the race/ethnicity of MSM who participated in the NHBS by cycle periods. From MSM1 to MSM3, Whites represented more than 50% of the study participants (52%-58%); this percentage was lower for MSM4 (36%). The proportion of African Americans participants increased over the years from 15% (in 2004) to 38% (in 2014).

***Figure 44:* Distribution of Eligible Survey Participants during NHBS-MSM Cycles by Race/Ethnicity**

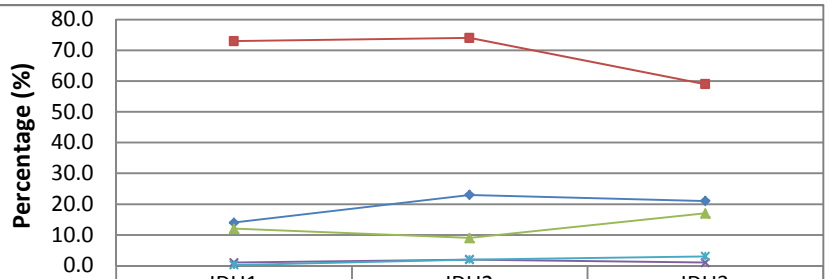


	MSM1 (2003-2004)	MSM2 (2008)	MSM3 (2011)	MSM4 (2014)
White	56.0	58.0	52.0	36.0
African American	15.0	21.0	21.0	38.0
Hispanic	22.0	15.0	21.0	21.0
Other	4.0	3.0	3.0	2.0
Multiple	3.0	3.0	3.0	3.0

Source: please see Table 12 for details about data source.

Figure 45 presents the race/ethnicity of IDUs who participated in the NHBS by cycle periods. Consistently, participants have been predominantly African American, with a decline from 74% to 59% (2009-2012).

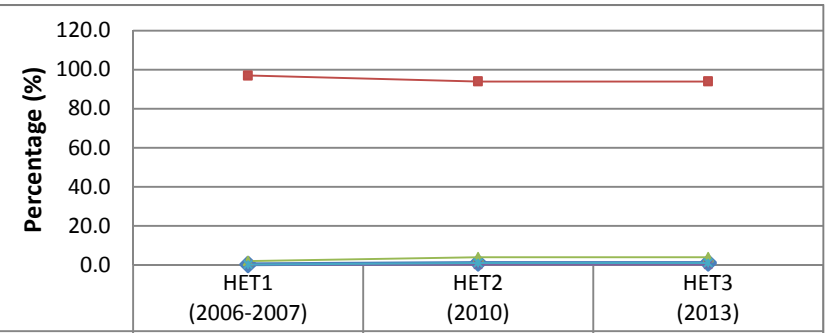
Figure 45: **Distribution of Eligible Survey Participants during NHBS-IDU Cycles by Race/Ethnicity**



	IDU1 (2005)	IDU2 (2009)	IDU3 (2012)
White	14.0	23.0	21.0
African American	73.0	74.0	59.0
Hispanic	12.0	9.0	17.0
Other	1.0	2.0	1.0
Multiple	0.2	2.0	3.0

Figure 46 presents the race/ethnicity of heterosexuals who participated in the NHBS by cycle periods. Overall, HET participants were primarily African American (more than 90% in all cycles).

Figure 46: **Distribution of Eligible Survey Participants during NHBS-HET Cycles by Race/Ethnicity**



	HET1 (2006-2007)	HET2 (2010)	HET3 (2013)
White	0.3	1.0	1.0
African American	97.0	94.0	94.0
Hispanic	2.0	4.0	4.0
Other	0.2	0.2	0.2
Multiple	0.2	1.0	1.0

Risk Behaviors

Table 14 presents high risk behaviors reported by men who have sex with men (MSM) during the four cycle periods conducted among MSM in Houston. The data shows that more than 25% of MSM had unprotected anal sex (UAS) with their main partner in the past 12 months. MSM participants showed higher rates of unprotected sex when they engaged in insertive sex (anal sex where participant puts his penis in his partner's anus) than when compared to receptive sex (anal sex where partner puts his penis in the participant's anus). In general, nearly 30% of MSM were unaware of the HIV status of their last sex partner. Almost half of the time in all MSM cycles, alcohol and or drugs were used during their most recent sexual encounter. Consistently throughout the years, very high rates of ever being tested for HIV have been reported among MSM participants.

Table 14: **MSM High Risk Behaviors by Survey Cycle**

High Risk Behaviors	MSM1 2004	MSM2 2008	MSM3 2011	MSM4 2014
UAS* with main partner** in past 12 months	26.7%	26.4%	28.2%	26.1%
UAS with casual partner*** in past 12 months	0.6%	7.3%	5.0%	5.9%
UAS with main partner at last sex (insertive)	24.3%	23.7%	23.8%	22.8%
UAS with main partner at last sex (receptive)	18.2%	15.3%	18.8%	18.6%
Use of alcohol and drugs during the last sex	--	45.3%	49.9%	47.3%
Did not know HIV status of last sex partner	---	28.7%	36.1%	34.2%
Ever tested for HIV	95.8%	93.1%	90.8%	93.2%

**UAS* - *unprotected anal sex*
***Main partner* - *a person you have sex with and who you feel committed to above anyone else. This is a partner you would call your girlfriend/boyfriend, wife/husband, significant other, or life partner.*
****Casual partner* - *a person you have sex with but do not feel committed to or don't know very well.*

High risk behaviors reported among injection drug users (IDUs) during the three completed cycles of NHBS-IDU are displayed in Table 15. Sharing of injection equipment comprised one of the major drug-related risk behaviors for current injectors (people who have injected non-prescribed drugs in the past 12 months). The results indicate a slight decrease in the proportions of participants involved in these risk behaviors during IDU3 (2012) when compared to the previous IDU2 cycle in 2009. The proportions of non-awareness of the HIV status of the last injecting partner were considered high, ranging from 37.6% to 55.1%, with no clear pattern identified. However, the HIV testing rates increased consistently from 76.0% in IDU1 (2005) to 92.5% in IDU3 (2012).

Table 15: **IDU High Risk Behaviors by Survey Cycle**

High Risk Behaviors	IDU1 2005	IDU2 2009	IDU3 2012
Shared injection equipment in past 12 months - last IDU partner	33.7%	57.2%	35.3%
Divided drugs with same syringe in past 12 months - last IDU partner	51.1%	28.3%	17.8%
Shared syringe in the past 12 months - last IDU partner	45.5%	28.5%	17.8%
Did not know HIV status of last injecting partner	37.6%	55.1%	37.6%
Ever tested for HIV	76.0%	89.6%	92.5%

Table 16 and 17 present high risk behaviors among heterosexuals (HET) during the three cycles conducted among this population.

Table 16 shows that over the cycle periods, there has been a decrease in males who had unprotected vaginal sex (UVS) with both main and casual partners in the past 12 months. The number of males who did not know the HIV status of their last sex partner has increased over the cycle periods, from 44.0% to 61.9%. Although showing a slight decrease, the use of alcohol and drugs during their most recent sexual encounter continues to be consistently high among study participants during the cycle periods. Testing rates in this male population seem to be increasing over time, from 76.2% to 82.6%.

***Table 16:* HET High Risk Behaviors in Males by Survey Cycle**

High Risk Behaviors in Males	HET1 2006	HET2 2010	HET3 2013
UVS* with main female partner in past 12 months	53.4%	45.5%	39.6%
UAS** with main female partner in past 12 months	4.5%	9.0%	7.8%
UVS with casual female partner in past 12 months	8.8%	7.6%	6.7%
UAS with casual female partner in past 12 months	1.9%	6.9%	2.7%
Use of alcohol and drugs during the last sex	65.3%	55.9%	53.7%
Did not know HIV status of last sex partner	44.0%	55.2%	61.9%
Ever tested for HIV	76.2%	78.0%	82.6%

**UVS*: *Unprotected vaginal sex* ***UAS:* *Unprotected anal sex*
****Main partner* - *a person you have sex with and who you feel committed to above anyone else. This is a partner you would call your girlfriend/boyfriend, wife/husband, significant other, or life partner.*
*****Casual partner* - *a person you have sex with but do not feel committed to or don't know very well.*

High risk heterosexual females maintained high rates of UVS in the past 12 months with their main male partners. Although rates for ever being tested are increasingly high, from 82.9% to 90.0%, the rates for not knowing the HIV status of the last sex partner are also high, ranging from 47.5% - 61.9%. The use of alcohol and drugs during their most recent sexual encounter continues to be a high risk behavior throughout the cycle periods (> 40%).

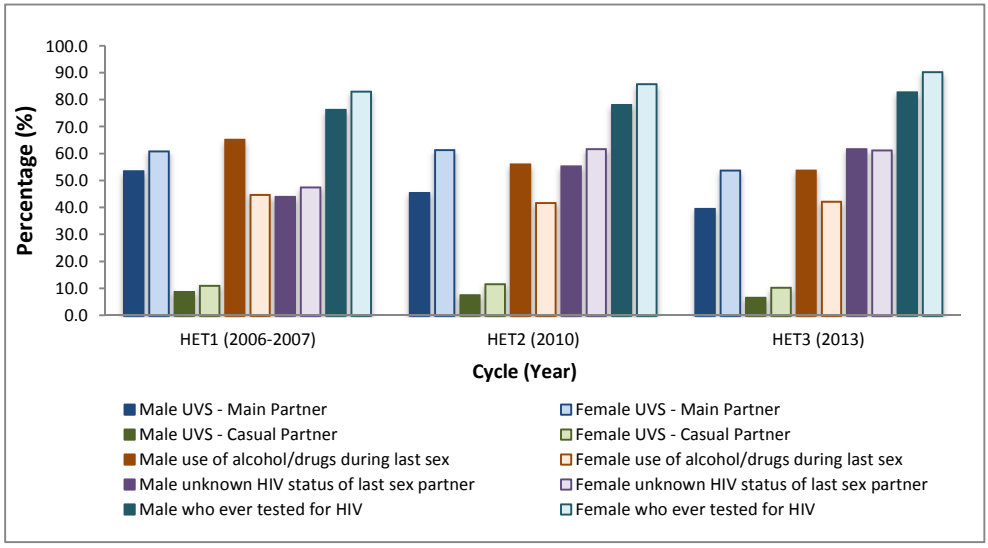
***Table 17:* HET High Risk Behaviors in Females by Survey Cycle**

High Risk Behaviors in Females	HET1 2006	HET2 2010	HET3 2013
UVS with main male partner in past 12 months	61.0%	61.5%	53.7%
UAS with main male partner in past 12 months	7.8%	17.7%	14.7%
UVS with casual male partner in past 12 months	11.1%	11.7%	10.3%
UAS with casual male partner in past 12 months	0.68%	6.4%	5.9%
Use of alcohol and drugs during the last sex	44.8%	41.8%	42.3%
Did not know HIV status of last sex partner	47.5%	61.9%	61.4%
Ever tested for HIV	82.9%	85.6%	90.0%

**UVS:* *Unprotected vaginal sex* ***UAS:* *Unprotected anal sex*
****Main partner** - a person you have sex with and who you feel committed to above anyone else. This is a partner you would call your girlfriend/boyfriend, wife/husband, significant other, or life partner.
*****Casual partner** - a person you have sex with but do not feel committed to or don't know very well.

Figure 47 presents high risk behaviors reported by heterosexual males and females who participated in NHBS-HET (1, 2 and 3). Overall, females maintained higher rates of UVS in the past 12 months with their main and casual partners when compared to males. The use of alcohol and drugs during their most recent sexual encounter was persistently higher in males. The proportions of females who were unaware of the HIV status of their last sex partner were slightly higher than that of males for the years 2007 and 2010, but lower in 2013. Although the rates for ever being tested among the HET males and females increased over time, females tend to get tested more often than males do.

Figure 47: **HET High Risk Behaviors by Survey Cycle (Year)**



Data Dissemination and Use

Data obtained from the NHBS project is used at the local, state, and federal levels to help direct and evaluate local and national HIV prevention efforts. Dissemination efforts are directed to inform prevention/treatment-utilization-services. Although HIV behavioral surveillance data cannot be used to evaluate the efficacy of specific interventions, they are important for monitoring whether HIV prevention efforts in the Houston-Baytown-Sugar Land Metropolitan Statistical Area are reaching at-risk hard to reach populations and whether these efforts meet national and local prevention goals. At the individual level, NHBS participants may benefit directly from HIV prevention counseling, knowledge of their HIV status, and referrals for additional HIV care services.

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Appendix B: Glossary

Active surveillance	Surveillance program staff regularly contact reporting facilities (hospitals, clinics, physicians, laboratories) to identify potential/suspected cases of HIV infection, or to confirm no cases; staff review medical records at provider sites or receive information over the telephone and US mail to establish a case and to elicit information for HIV case report forms.
Acute	Severe, but of a short duration.
AIDS	Acquired Immunodeficiency Syndrome; most often caused by chronic infection with the human immunodeficiency virus, HIV; a syndrome diagnosed when the patient's immune system is weakened or damaged to such an extent that the CD4+ lymphocyte cell count is below 200 cells per microliter, or when an opportunistic infection is present.
American Community Survey (ACS)	Yearly population estimates provided by U.S. Census Bureau.
Antibody	Protein molecule produced by white blood cells to bind and disable infectious agents such as viruses and bacteria.
Antigen	Substance such as a virus or bacterium that provokes an immune (antibody) response when introduced into the body.
Antiretroviral therapy	Drugs used specifically for the treatment of retrovirus infection including HIV infection. See also HAART.
Bias	The tendency of a measurement process to over- or under-estimate the value of a parameter.
BRFSS	Behavioral Risk Factor Surveillance System (BRFSS) is the world's largest, on-going telephone health survey system.
CD4 ("helper T") cell	Type of white blood cell that oversees the action of the human immune system and is a main target of HIV infection.
Case	Occurrence of the disease or event of interest.
CDC	Centers for Disease Control and Prevention; located in Atlanta, Georgia.
Chlamydia	Sexually transmitted disease (STD) caused by the bacteria *Chlamydia trachomatis*; in men, Chlamydia is characterized by a discharge from the urethra; in women, most will have no symptoms; if left untreated, however, pelvic inflammatory disease (PID) can develop, which can lead to chronic pain or infertility; Chlamydia is curable when treated with appropriate antibiotics.
Chronic	Ongoing and recurring.
Cirrhosis	A liver disease involving destruction of liver cells and diminished liver function.
Combination therapy	Use of two or more drugs to fight infections; combinations may be more effective in some ways than single-drug treatments; see also HAART.
Co-morbidity	Disease that coexists in addition to the index condition.
Communicable disease	An illness due to specific infectious agent that arises through transmission of that agent from infected person, animal or inanimate reservoir to a susceptible host.

Critical populations	For prevention planning purposes, these are subpopulations within each Priority Population; individuals who are most impacted by the epidemic and who may be at increased risk of acquiring or transmitting HIV.
Cross-sectional study	Study that examines the relationship between diseases and other variables of interest as they exist in a defined population at one particular time – such as a one-time survey.
Demographic	Pertaining to characteristics of a population such as age, race/ethnicity, and gender.
Epidemic	Dramatic increase above the usual or expected rate of occurrence of a particular disease in a population.
Epidemiology	Study of the distribution and determinants of disease in a specified population in order to promote, protect, and restore health in that population.
Exposure	Contact with a factor or behavior that is suspected to influence the risk for a person developing a particular disease.
Formative Research	Formative research is the process by which researchers or public health practitioners define the community of interest, ways of accessing that community, and the attributes of the community relevant to a specific public health issue.
GIS	Geographic Information System (GIS) that incorporates digitally constructed maps.
Gender	Term or variable to classify persons as male or female; recent gender categories now include both male-to-female and female-to-male transgender persons.
Geographical Center	The mean center is the average x and y coordinate of all the features in the study area; it's useful for tracking changes in the distribution or for comparing the distributions of different types of features; the geographic mean center for AIDS is a spatial point constructed from the average values of the geographic coordinates (latitude and longitude) for all AIDS cases within a defined area.
Gonorrhea	Common sexually transmitted disease caused by the organism *Neisseria gonorrhea*.
HAART	Highly Active Antiretroviral Therapy; combination of three or more anti-HIV drugs, of which at least one is usually a protease inhibitor.
HARS (or eHARS)	HIV/AIDS Reporting System; surveillance database containing HIV and AIDS reports.
Hemophiliac	A person who has hemophilia, a genetic disorder in which excessive bleeding occurs due to the absence or abnormality of a clotting factor in the blood.
Hepatitis	Inflammation of the liver, often caused by viruses, drugs, or other chemicals.
Hepatitis A	Called "infectious hepatitis," a form of viral hepatitis caused by the hepatitis A virus (HAV); HAV may be transmitted through oral contact with infected feces (stool) or surfaces and objects recently contaminated with infected feces; usually causes acute mild illness that resolves within weeks.
Hepatitis B	Called "serum hepatitis," a more severe form of viral hepatitis caused by the hepatitis B virus (HBV); HBV may be transmitted through contact with infected blood, saliva, seminal fluid, vaginal secretions, and breast milk; persistent diseases may lead to cirrhosis, liver failure, and/or death.
Hepatitis C	Once called "non-A/non-B hepatitis," a severe form of viral hepatitis caused by the hepatitis C virus (HCV); HCV is most often transmitted through contact with other

	body fluids; HCV may persist for decades, often leading to cirrhosis, liver failure, and/or death.
Hepatocellular carcinoma	Liver cancer; often associated with chronic hepatitis B or C disease.
Heterosexual	Sexual orientation of a person to persons of opposite sex.
HIV	Human Immunodeficiency Virus; infection with HIV is the cause of AIDS.
IDU	Injecting drug user; a person who injects illicit drugs into their body, usually to get high performance enhancement, or for cosmetic purposes.
Immunology	Study of the body's response to foreign organisms and how humans and other animals fight off disease-causing microorganisms such as viruses and bacteria.
Immunosuppressed	State of the body where immune system defenses do not work normally; this can be the result of an immune deficiency from birth, an illness such as cancer or AIDS, or from the administration of certain drugs.
Incidence	Number or proportion of persons in a given population who have developed or acquired a particular disease or condition within a specified period of time.
Incidence rate	Rate at which new events, such as cases of a particular disease, arise in a given population.
Incidence rate ratio	The ratio of two incidence rates; the incidence rate among the exposed proportion of the population, divided by the incidence rate in the unexposed portion of the population gives a relative measure of the effect of a given exposure.
Incubation period	Period of time between contact with an infectious agent and the first clinical evidence of illness resulting from that infection; also called a latent period.
Infant mortality rate	Rate of the number of deaths in a year among children less than one year old for every 1,000 live births in that year.
Internal Validity	The index and comparison groups are selected and compared in such a manner that the observed differences between them on the dependent variables under study may, apart from sampling error, be attributed only to the hypothesized effect under investigation.
Kappa statistic	A statistical measure of the degree of non-random agreement between observers or measurements of the same categorical variable.
Last sex	Most recent sexual encounter
Latent period	See incubation period.
Mean	An average of all values.
Median	That value which divides a set of measurable values into 2 equal halves, such that half of all values are above the median and half are below.
Mortality	Statistics on death within a population.
Morbidity	Statistics on sickness within a population.
MSM	Men who have sex with men, no matter how they identify themselves; by definition, includes MSM/W unless MSM/W are counted separately.
MSM/IDU	Men who have sex with men and who also use injection drugs.
MSM/W	Men who have sex with men and women, no matter how they self-identify.

NIR	No identified risk; cases of HIV or AIDS in which no risk behavior for infection was identified.
Neurologic Complication	Complications related to nervous system.
Opportunistic infection (OI)	Diseases cause by agents commonly present in our bodies or environment but only cause illness when the host immune system become damaged or depressed, as in AIDS.
Passive surveillance	The health department receives HIV/AIDS case reports from physicians, laboratories, or other individuals or institutions without regularly contacting the reporting sources.
Perinatal	Period of time before, during, and immediately after birth.
Prevalence	Proportion of persons in a given population who have a particular disease at a specified point or interval of time.
Priority populations	For prevention planning purposes, non-mutually exclusive populations identified to be at risk for HIV infection or transmission.
Proportion	Percentage of a part of the whole to the whole – e.g. 45% of Angelinos are Latino.
Random sample	Sample in which all individuals have a precisely defined and equal chance of being selected.
Rate	Measure of the frequency of a disease in a specified population during a specified period of time; used to compare the impact of a disease on one subpopulation compared with others or to monitor the impact on groups across time.
Respondent-driven sampling (RDS)	Technique for developing a research sample where exiting study subjects recruit future subject from among their acquaintances; a mathematical model is used to weight the sample to compensate for the fact that the sample was collected in a non-random way; see Snowball sampling; for more information, see www.respondentdrivensampling.org.
Sample	Subset of a population that is chose for investigation; see random sample.
Sensitivity	Sensitivity is the proportion of truly diseased persons in the screened population who are identified as diseased by the screening test.
Serology	Study of the components and properties of a patient's blood serum; for example, serum antibodies to HIV.
Seroprevalence	Proportion of a specified population who have antibodies to a particular organism in their blood serum – for instance, HIV.
Seroconvert	Positive blood serum test indicative of HIV infection in a person with a history of having been negative.
Seroreverters	Uninfected infants born to HIV-infected mothers, in which maternal HIV antibodies that were measurable in infant blood at birth disappear over time, thereby reverting to HIV negative.
Serostatus	Status with respect to being seropositive or seronegative for a particular antibody.
Specificity	Specificity is the proportion of truly non-diseased persons who are so identified by the screening test.

STARHS	Serologic Testing Algorithm for Recent HIV Seroconversion (STARHS) is a method allowing identification of probable recent HIV infections for population based purposes.
Stratified	Separating a sample into several subsamples according to the criteria, such as age groups, socioeconomic status, etc.
Syphilis	A sexually transmitted disease caused by the Spirochete *Treponema Pallidum*.
Time space sampling	A sampling technique of data collection where sampling events are randomly selected from a venue frame and a day-time frame.
Unweighted data	Data that is strictly proportional to the distribution of cases in the database and not proportional to the distribution of cases in the universe population.
Venue-based sampling (VBS)	Sampling method used to produce probability estimates of hard-to-reach populations when sampling frames of the individual members of those populations do not exist or are difficult to construct. Venue-day-time units (VDTs) which represent the universe of locations, days, and times of congregation form the sampling frame.
Z-test	A statistical test to test if the distribution of the test statistics could be approximated by a normal distribution, a very common continuous probability distribution.

Appendix C: Data Sources

U.S. Census Bureau

The United States Census Bureau is the principal agency to producing data about the American people and economy. The most recent decennial census of the American population was conducted in 2010. In addition, the U.S. Census Bureau also provides yearly estimates via the American Community Survey (ACS). Because the ACS is conducted every year, it provides more current estimates of population statistics throughout the decade. Therefore, the decennial census and ACS 1-year estimate is used to provide the population and demographic statistics in Harris County. For more information about the methodology and limitations of these data sources, please visit the following:

U.S. Census: http://www.census.gov/
American Fact Finder: http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml

Texas Demographer

Since population data from ACS is not available before 2005, Texas population estimates and projections from Texas Demographer are used to obtain population data from 1990 in this document. The population data from Texas Demographer can be accessed at Texas Department of State Health Services (https://www.dshs.state.tx.us/chs/popdat/downloads.shtm)

Enhanced HIV/AIDS Reporting System (eHARS)

The Texas Enhanced HIV/AIDS Reporting System (eHARS) is an HIV/AIDS surveillance system deployed at all state and local health departments by the Centers for Disease Control and Prevention (CDC). Its purpose is to serve as a centralized source for the ongoing systematic collection and dissemination of data on HIV/AIDS in local jurisdictions. All laboratory evidence of HIV/AIDS disease is entered into the eHARS system using case reports and laboratory reports. The eHARS database is the source of data on HIV/AIDS diagnoses, prevalence, and mortality presented in this document. For the document sections on Houston/Harris County, data were extracted directly from the HHD instance of eHARS in November 2015; For more information about the methodology and limitations of these data sources, please visit the following:

- Centers for Disease Control and Prevention (CDC) HIV/AIDS Surveillance System: http://www.cdc.gov/hiv/topics/surveillance/index.htm
- Texas Department of State Health Services (DSHS) HIV-STD Epidemiology and Surveillance Branch: http://www.dshs.state.tx.us/hivstd/contractor/surveillance.shtm

Sexually Transmitted Disease Management Information System (STD*MIS)

The Sexually Transmitted Disease Management Information System (STD*MIS) is an application provided by the CDC to state and local health departments for the purpose of STD surveillance, including managing evidence of reportable STDs received from laboratories, health care providers, facilities, and Disease Intervention Specialists (DIS) as well as tracking STD treatment, partner services, and other public health follow-up activities. STD*MIS is the source of data on chlamydia, gonorrhea, and syphilis in Houston/Harris County presented in this document. For more information about the methodology and limitations of this data source, please visit the following:

- Centers for Disease Control and Prevention (CDC) STD Surveillance System: http://www.cdc.gov/std/std-mis/default.htm

Houston Electronic Disease Surveillance System (Maven)

The Houston Electronic Disease Surveillance System (Maven) is a commercial-off-the-shelf, Web-based business rules engine. It provides interactive, automated information gathering and decision support processes for each reportable communicable disease and occupational disease in Houston Health Department. Maven is the source of data on hepatitis in Houston/Harris County presented in this document.

Other Sources

Additional sources are used throughout this document as indicated in the source and footnotes. Please refer directly to these sources for more information about their methodology and limitations.