HEPATITIS B AND C IN NEW YORK CITY 2015

ANNUAL REPORT

by the New York City Department of Health and Mental Hygiene

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EXECUTIVE SUMMARY

Viral hepatitis B and C are blood-borne pathogens that are prevalent in New York City (NYC). Both can lead to severe liver disease, cancer and premature death. An estimated 1.2 percent of all New York City residents (about 100,000 people) have hepatitis B, and 2.4 percent of New York City residents aged 20 and older (about 146,500 people) have hepatitis C.

This report presents an overview of the New York City Health Department's 2015 surveillance and research data on hepatitis B and C in NYC, as well as the Health Department's programmatic activities to address these epidemics.

NEW IN 2015

- Ten-year trends in chronic hepatitis B and chronic hepatitis C surveillance
- Liver cancer incidence with hepatitis B and C by ZIP code
- Check Hep B Patient Navigation Program and NYC Hep C Peer Navigation Program
- Text message-based linkage to care of patients reported to the Health Department's surveillance registry
- Clinical capacity building of hospitals and community health centers

Surveillance Data

- In 2015, 7,719 people were newly reported with chronic hepatitis B, an increase (3.5 percent) from 2014.
- In 2015, 7,328 people were newly reported with chronic hepatitis C, a decrease (4.7 percent) from 2014.
- From 2005 to 2015, the rate of newly reported hepatitis C cases declined in NYC overall.
- From 1999 to 2014, hepatitis C-related deaths increased 38 percent.

Research and Evaluation

Research and evaluation conducted in 2015 revealed that:

- Incidence and mortality of liver cancer remain high among NYC residents
- The number of Medicaid recipients treated for hepatitis C has been increasing since 2011. Harvoni (sofosbuvir/ledipasvir) accounted for three-quarters of hepatitis C prescribed treatment in 2015, a change from 2014 when Sovaldi (sofosbuvir) was the most commonly prescribed treatment.

Direct Services, Capacity Building, Education and Policy

In 2015, the Health Department:

- Administered more than 15,000 hepatitis B vaccine doses
- Managed three patient navigation programs reaching more than 2,000 hepatitis B and C patients
- Managed a comprehensive hepatitis C care coordination program enrolling 1,370 patients
- Administered more than 12,000 hepatitis C screening tests to people who are incarcerated
- Trained 800 service providers on hepatitis B– and hepatitis C–related topics
- Hosted 15 Hep Free NYC network meetings on best practices in prevention and care
- Supported six federally qualified health centers to increase hepatitis C screening and confirmatory testing
- Formed a hepatitis C clinical learning collaborative and recruited 55 representatives from 31 hospitals
- Developed a Viral Hepatitis Program legislative agenda and organized a Viral Hepatitis Legislative Awareness Breakfast
- Supported increased access to hepatitis C treatment and syringe exchange services and ensured that New Yorkers can fill prescriptions at the pharmacy of their choice
- Collaborated on the New York State End of Hepatitis C initiative

SURVEILLANCE DATA

When interpreting hepatitis B and C surveillance data presented in the following pages, note that:

- Rates are reported per 100,000 people.
- Neighborhood poverty level by ZIP code is defined as the percentage of residents with incomes below 100 percent of the federal poverty level (FPL), per American Community Survey data from 2009 to 2013:
    - Low (less than 10 percent below FPL)
    - Medium (10 to less than 20 percent below FPL)
    - High (20 to less than 30 percent below FPL)
    - Very high (greater than or equal to 30 percent below FPL)

Acute Hepatitis B in New York City

Monitoring acute hepatitis B infections enables the Health Department to monitor trends in recent transmission of hepatitis B and inform the development of targeted interventions to prevent new infections.

DATA HIGHLIGHTS

In 2015, 48 people were reported with acute hepatitis B in New York City:

- No children and adults under 30 were diagnosed with acute hepatitis B due to effective vaccination policies.
- Sexual transmission was the most common risk factor—50.0 percent cited heterosexual sex and 18.8 percent reported being men who have sex with men as risk factors for infection.
- Two-thirds of those with acute hepatitis B were Black or Latino.

PUBLIC HEALTH OPPORTUNITY

Promote hepatitis B prevention strategies to sexual partners of people chronically infected with hepatitis B as well as other high-risk individuals.

Patient Characteristics

Table 1. Characteristics of people reported with acute hepatitis B in New York City, 2015

Characteristic	Number	Percentage of Each Group	Rate Per 100,000 People
Overall	48	N/A	0.6
Sex			
Female	17	35.4	0.4
Male	31	64.6	0.8
Age at Time of First Report (in years)			
0-19	0	0.0	0.0
20-29	8	16.7	0.6
30-39	13	27.1	1.0
40-49	14	29.2	1.2
50-59	8	16.7	0.7
60+	5	10.4	0.3
Race/Ethnicity			
Latino	13	27.1	0.5
White, non-Latino	9	18.8	0.3
Black, non-Latino	19	39.6	1.0
Asian, non-Latino	6	12.5	0.5
Other	1	2.1	0.7
Borough of Residence			
Bronx	14	29.2	1.0
Brooklyn	12	25.0	0.5
Manhattan	7	14.6	0.4
Queens	13	27.1	0.6
Staten Island	2	4.2	0.4
Neighborhood Poverty Level by ZIP Code			
Low	6	12.5	0.4
Medium	13	27.1	0.5
High	17	35.4	0.7
Very high	12	25.0	0.7
Reported Risk Factors (mutually exclusive[1])			
Injection drug use	2	3.5	N/A
Household contact	1	2.1	N/A
Men who have sex with men	9	18.8	N/A
Heterosexual contact (multiple partners)	10	20.8	N/A
Heterosexual contact (one partner)	14	29.2	N/A
Health care-related exposure	2	4.2	N/A
Other	4	8.3	N/A
Unknown	6	12.5	N/A

[1] "Mutually exclusive" means that each patient is represented by the risk factor, among the reported risk factors, that poses the highest risk of hepatitis B infection. For example, a person who injected drugs and had a health care-related exposure is represented only once, in the "Injection drug use" row. The table lists risk factors from highest to lowest risk.

Chronic Hepatitis B in New York City

Trends

DATA HIGHLIGHTS

Overall, chronic hepatitis B case rates have been decreasing since 2007. However, a slight increase has been seen since 2013.

Figure 1. People newly reported with chronic hepatitis B in New York City, 2005-2015

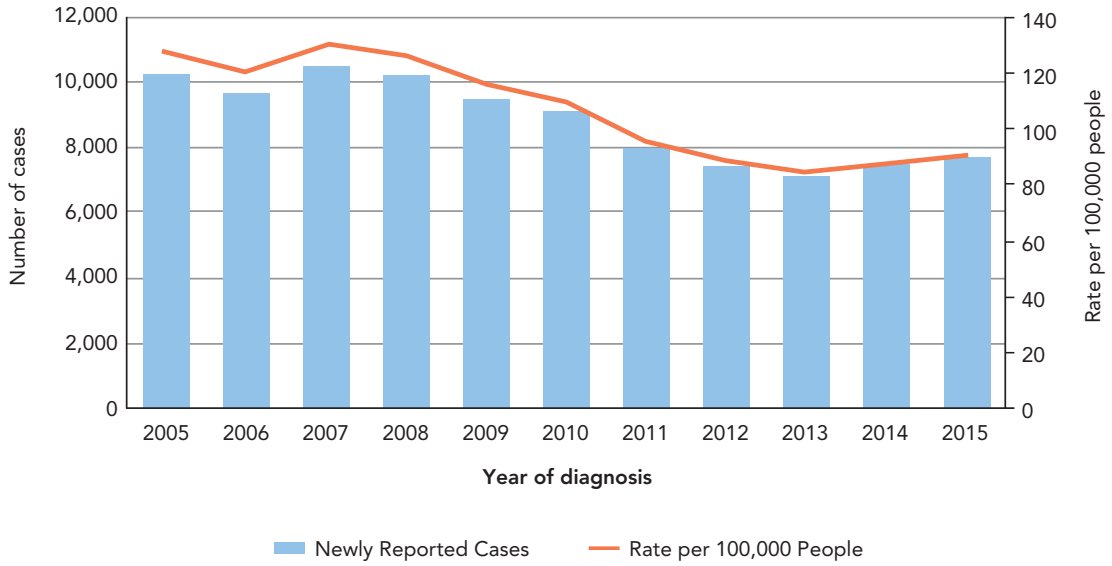


Table 2. Annual average percent change in the rate of people newly reported with chronic hepatitis B in New York City, 2005-2015

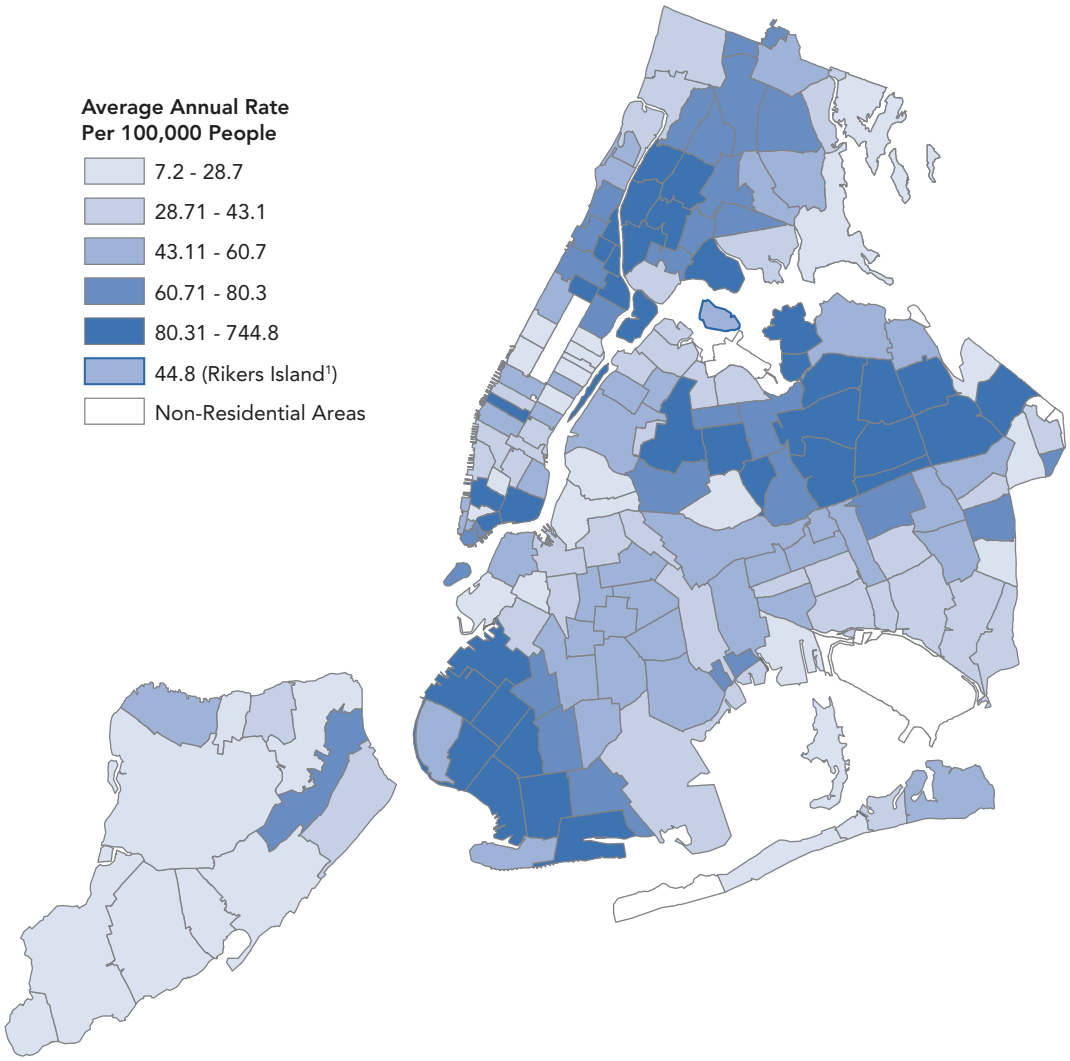
Characteristic	Rate Trend	Percent Change*	*p* value
Overall		-2.9*	<0.01
Sex			
Female		-2.9*	<0.01
Male		-3.2*	<0.01
Age at Time of First Report (in years)			
0-19		-11.6*	<0.01
20-29		-5.1*	<0.01
30-39		-2.8	0.2
40-49		-3.3*	<0.01
50-59		-1.6	0.2
60-69		1.5	0.5
70-79		-0.4	0.9
80+		-0.6	0.6

Characteristic	Rate Trend	Percent Change*	*p* value
Borough of Residence			
Bronx		-0.4	0.9
Brooklyn		-2.0	0.1
Manhattan		-6.4*	<0.01
Queens		-1.8*	<0.01
Staten Island		-6.2*	<0.01
Neighborhood Poverty Level by Zip Code			
Low		-4.1*	<0.01
Medium		-1.9	0.2
High		-3.0	0.1
Very high		-0.2	0.9

*The annual average percent change is significantly different from zero at $p<0.05$

Geographic Distribution

Map 1. Newly reported cases of chronic hepatitis B in New York City by ZIP code, 2014-2015



DATA HIGHLIGHTS

In 2015:

- There were 7,719 people newly reported with chronic hepatitis B in NYC.
- Two-thirds of people newly reported with chronic hepatitis B were 20 to 49 years of age.
- Neighborhoods with the highest chronic hepatitis B rates were Sunset Park, Brooklyn, and Flushing, Queens—neighborhoods with high Asian populations.

Patient Characteristics

Characteristics of reported hepatitis B patients from 2012 to 2015 can serve as a proxy for all people currently living with hepatitis B in New York City.

Table 3. Characteristics of people reported with chronic hepatitis B in New York City, 2015

	People Newly Reported in 2015			All Case Reports, 2012-2015	
	Number	Percentage of Each Group	Rate Per 100,000 People	Number	Percentage of Each Group
Overall	7,719	N/A	90.9	86,340	N/A
Sex					
Female	3,321	43.0	74.8	38,620	44.7
Male	4,377	56.7	108.1	47,479	55.0
Transgender	0	0.0	N/A	3	0.0
Unknown	21	0.3	N/A	238	0.3
Age at Time of First Report (in years)					
0-19	173	2.2	8.7	4,911	5.7
20-29	1,556	20.2	110.3	21,666	25.1
30-39	2,004	26.0	150.5	23,251	26.9
40-49	1,564	20.3	138.9	17,891	20.7
50-59	1,271	16.5	117.2	11,410	13.2
60-69	796	10.3	98.7	5,239	6.1
70-79	250	3.2	55.9	1,486	1.7
80+	105	1.4	35.8	486	0.6
Borough of Residence					
Bronx[1]	1,028	13.3	71.5	8,501	9.8
Brooklyn	2,620	33.9	99.9	30,833	35.7
Manhattan	1,223	15.8	74.7	18,685	21.6
Queens	2,263	29.3	97.5	24,847	28.8
Staten Island	132	1.7	27.9	1,600	1.9
Unknown	453	5.9	N/A	1,874	2.2
Neighborhood Poverty Level by ZIP Code[2]					
Low	543	7.1	34.4	6,543	7.6
Medium	2,043	26.6	75.2	23,488	27.3
High	2,583	33.6	102.5	32,407	37.7
Very high	2,049	26.6	122.3	21,639	25.1
Unknown	474	6.2	N/A	1,993	2.3

[1] The Bronx includes people in Rikers Island facilities. In 2015, 10 people were reported from Rikers Island.
[2] Excludes 27 people incarcerated at time of report.

Perinatal Hepatitis B in New York City

To prevent perinatal hepatitis B infection, the Health Department conducts disease surveillance, case management and health counseling for pregnant and postpartum women infected with hepatitis B and their sexual and household contacts. To learn more, visit nyc.gov and search "provider perinatal hepatitis B."

In an effort to increase identification of hepatitis B-infected pregnant women and to improve prenatal reporting, the NYC Health Code was amended in 2014 to require laboratories to include pregnancy status, if known, with positive hepatitis B reports. The proportion of cases of hepatitis B in pregnancy, first identified by the Perinatal Hepatitis B Prevention Program through a laboratory report specifying pregnancy status, increased from 29.0 percent in 2014 to 43.2 percent in 2015. Of the 1,493 hepatitis B-infected women who delivered a live birth in 2015, 1,009 (67.9 percent) were reported to the Perinatal Hepatitis B Prevention Program prenatally.

Table 4. Hepatitis B-positive women in New York City who delivered at least one live birth, 2015

Group	Number	Percentage of Each Group	Rate[1] Per 100,000 People
Overall	1,493	N/A	1,338
Borough of Residence			
Bronx	165	11.1	824
Brooklyn	679	45.5	1,648
Manhattan	161	10.8	887
Queens	449	30.1	1,667
Staten Island	39	2.6	742
Race/Ethnicity			
Latino	38	2.6	111
White, Non-Latino	97	6.5	280
Black, Non-Latino	175	11.7	781
Asian, Non-Latino	1,080	72.3	5,689
Other	101	6.8	N/A
Unknown	2	0.1	N/A
Region of Birth[2]			
China	937	62.8	12,001
Africa	203	13.6	4,358
USA	47	3.2	90
West/Central Asia	51	3.4	2,868
Caribbean (excl. Haiti)	51	3.4	398
East Asia (excl. China)	38	2.6	2,309
South Asia	39	2.6	751
Southeast Asia	25	1.7	2,180
Eastern Europe	24	1.6	773
Haiti	20	1.3	1,350
Southern Europe	21	1.4	2,248
South America	25	1.7	405
Middle East	6	0.4	253
Mexico and Central America	1	0.1	13
Unknown	5	0.3	853

Source: Denominators for rates from the Health Department Office of Vital Statistics, based on 2014 data
[1] Rate per 100,000 live births
[2] Excludes regions that were not reported as a region of birth for any case (Australia/Oceania, Pacific Islands, Canada, Northern and Western Europe)

DATA HIGHLIGHTS

In 2015, 1,493 hepatitis B-infected women delivered a live birth. Most of these women (76.4 percent) were born in China (62.8 percent) and Africa (13.6 percent). Most resided in Brooklyn (45.5 percent). In 2015, 99.2 percent of infants born to hepatitis B-infected mothers received post-exposure prophylaxis (PEP) at time of delivery and 87.7 percent received the complete vaccine series.

PUBLIC HEALTH OPPORTUNITY

To eliminate perinatal hepatitis B infection in New York City, the Health Department supports a universal hepatitis B birth dose to ensure all infants receive the first dose of hepatitis B vaccine before hospital discharge and complete a valid hepatitis B vaccine series.

Table 5. Hepatitis B vaccination, post-exposure prophylaxis (PEP), and testing for infants born to mothers with hepatitis B in New York City, 2014

Group	Number	Percentage of Each Group
Overall	1,671	N/A
PEP[1] and Vaccination Status		
PEP	1,658	99.2
Vaccine series completion[2]	1,478	88.5
PEP and vaccine series completion[2]	1,466	87.7
Testing Status		
Tested	1,338	80.1
Test Results (among those tested)		
Infected	3	0.2
Immune	1,281	95.7
Susceptible	35	2.6
Indeterminate	19	1.4

[1] Defined as administration of hepatitis B immune globulin and first dose of hepatitis B vaccine series within one day of life.
[2] Defined as receiving all three doses of hepatitis B vaccine with final dose given at ≥164 days of age.

Table 6. Hepatitis B status for sexual and household contacts of hepatitis B-infected pregnant women in New York City, 2015

Contacts	Number	Percentage of Each Group
Total Identified	1,927	N/A
Children Aged 18 or Younger	911	N/A
Children Tested	725	79.6
Immune	1,466	93.0
Infected	10	1.4
Susceptible	15	2.1
Inconclusive	26	3.6
Adults	1,016	N/A
Adults Tested	231	22.7
Immune	115	49.8
Infected	77	33.3
Susceptible	29	12.6
Inconclusive	10	4.3

Chronic Hepatitis C in New York City

Trends

DATA HIGHLIGHTS

- In New York City, the number and rate of people newly reported with chronic hepatitis C have decreased overall across the boroughs, specifically for the following groups:
  - Men
  - People aged 40 to 59
  - Those born before 1966 (including the baby boomer generation)
  - Those living in high-poverty neighborhoods

Figure 2. People newly reported with chronic hepatitis C in New York City, 2005-2015

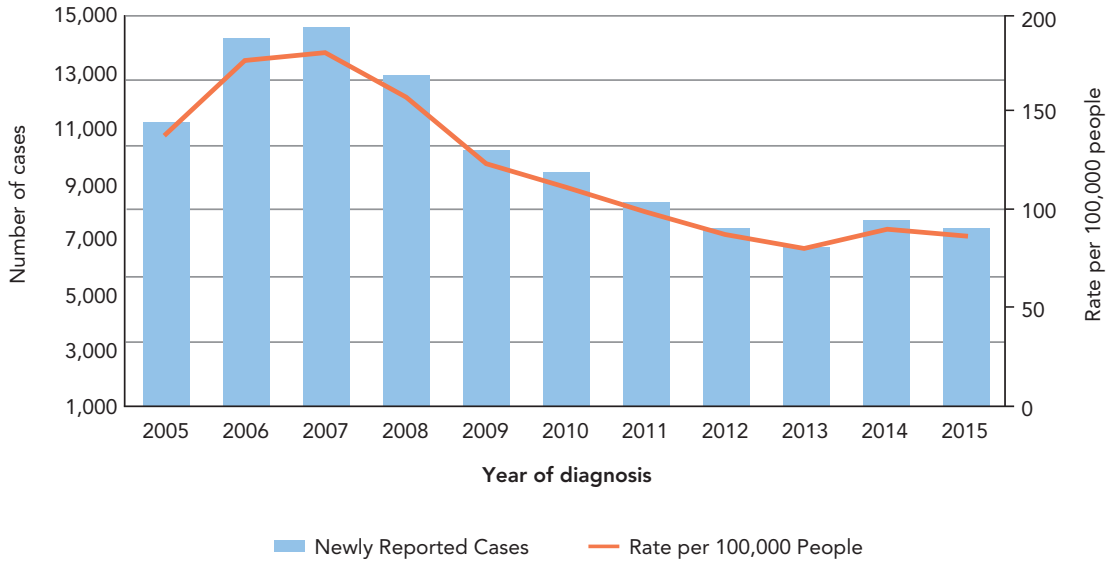


Table 7. Annual average percent change in the rate of people newly reported with chronic hepatitis C in New York City, 2005-2015

Characteristic	Rate Trend	Percent Change*	*p* value
Overall		-5.1*	<0.01
Sex			
Female		-4.4	0.1
Male		-5.3*	<0.01
Age at Time of First Report (in years)			
0-19		-3.6	0.2
20-29		1.2	0.4
30-39		-3.3	0.4
40-49		-10.5*	<0.01
50-59		-8.6*	<0.01
60-69		0.9	0.8
70-79		-0.7	0.8
80+		-0.1	1.0
Birth Cohort[1]			
1900-1944		-10.3*	<0.01
1945-1965		-9.0*	<0.01
1966-1983		0.0	1.0
1984-2015		19.7*	<0.01
Borough of Residence			
Bronx		-6.5*	<0.01
Brooklyn		-4.3*	<0.01
Manhattan		-7.2*	<0.01
Queens		-2.8*	<0.01
Staten Island		-6.9*	<0.01
Neighborhood Poverty Level by ZIP Code			
Low		-3.0	0.5
Medium		-3.0	0.1
High		-3.9*	<0.01
Very high		-7.3*	<0.01

*The annual average percent change is significantly different from zero at $p<0.05$.
[1] People in each birth cohort grow older over time; those born from 1984-2015 are aging into adulthood, while their birth cohort is increasing in size

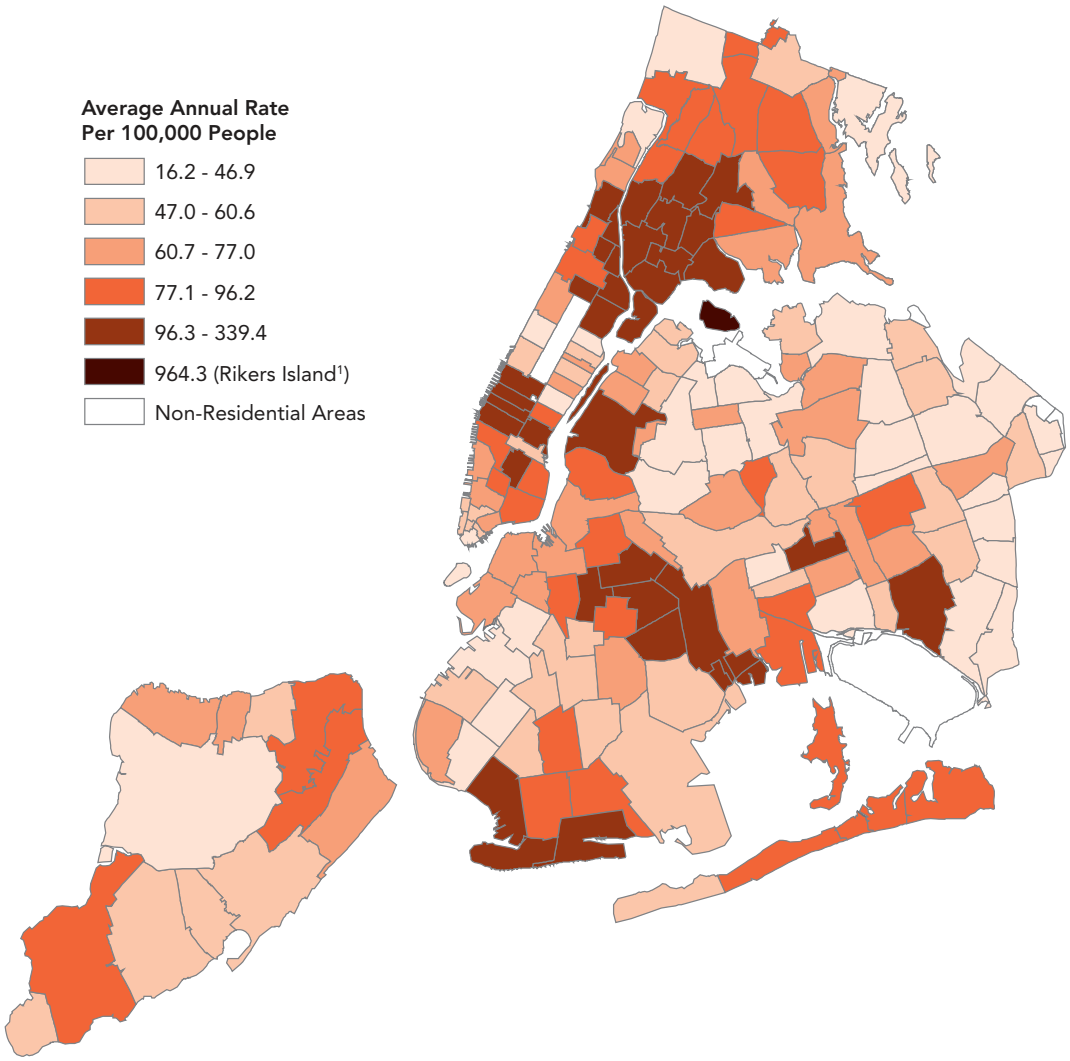
Geographic Distribution

DATA HIGHLIGHTS

In 2015:

- The highest rate of newly reported chronic hepatitis C was in the incarcerated population, at 964.3 people per 100,000.
- Nearly two-thirds of people newly reported with chronic hepatitis C were male (62.9 percent) and half were born between 1945 and 1965 (49.7 percent).
- Neighborhoods with the highest rates of newly reported cases were East Harlem and Chelsea-Clinton in Manhattan and Hunts Point/Morrisania in the Bronx.

Map 2. People newly reported with chronic hepatitis C in New York City by ZIP code, 2014-2015.



Patient Characteristics

Characteristics of patients reported from 2012 to 2015 can serve as a proxy for all people currently living with hepatitis C in New York City.

Table 8. Characteristics of people reported with chronic hepatitis C in New York City, 2015

	People Newly Reported in 2015			All Case Reports, 2012-2015	
	Number	Percentage of Each Group	Rate Per 100,000 People	Number	Percentage of Each Group
Overall	7,328	N/A	86.3	96,691	N/A
Sex					
Female	2,749	37.5	61.9	35,386	36.6
Male	4,579	62.5	113.1	60,822	62.9
Transgender	0	0	N/A	1	0
Unknown	0	0	N/A	482	0.5
Age at Time of First Report (in years)					
0-19	90	1.2	4.5	885	1.0
20-29	796	10.9	56.4	6,555	6.8
30-39	1,151	15.7	86.4	14,755	15.3
40-49	1,136	15.5	100.9	27,905	28.9
50-59	1,859	25.4	171.5	29,662	30.7
60-69	1,660	22.7	205.8	12,473	12.9
70-79	447	6.1	100.0	3,310	3.4
80+	189	2.6	64.4	1,146	1.2
Year of Birth					
1900-1944	592	8.1	86.7	9,793	10.1
1945-1965	3,638	49.7	186.7	62,314	64.5
1966-1983	2,032	27.7	94.5	20,085	20.8
1984-2015	1,066	14.6	28.7	4,499	4.7
Borough of Residence					
Bronx[1]	1,688	23.1	117.4	25,614	26.5
Brooklyn	2,009	27.4	76.6	27,126	28.1
Manhattan	1,548	21.1	94.6	21,857	22.6
Queens	1,291	17.6	55.6	16,271	16.8
Staten Island	273	3.7	57.7	4,013	4.2
Unknown	519	7.1	N/A	1,810	1.9
Neighborhood Poverty Level by ZIP Code[2]					
Low	833	12.2	52.7	13,904	15.2
Medium	1,943	28.4	71.5	21,582	23.5
High	1,998	29.2	79.3	17,946	19.6
Very high	1,539	22.5	91.9	30,584	33.3
Unknown	535	7.8	N/A	7,761	8.5

[1] The Bronx includes people in Rikers Island facilities. In 2015, 380 people were reported from Rikers Island.
[2] Excludes 480 people incarcerated at the time of report.

RNA and Genotype Tests

People with a positive hepatitis C antibody (screening) test need the hepatitis C RNA test to confirm infection. Providers use genotype tests to determine appropriate hepatitis C treatment. Hepatitis C RNA and genotype tests reported to the Health Department can inform patient and provider-targeted interventions to promote confirmatory testing and linkage to hepatitis C medical care.

DATA HIGHLIGHTS

- In 2015, 77.7 percent of people with a positive hepatitis C antibody test received hepatitis C RNA testing.
- In 2015, 72.2 percent of patients were infected with genotype 1, followed by 3, 2 and 4. Genotypes 5 and 6 were rarely reported.

Table 9. Hepatitis C RNA and Genotype Test Results in New York City, 2015

	People Newly Reported in 2015		All Case Reports, 2012-2015	
	Number	Percentage of Each Group	Number	Percentage of Each Group
Overall	7,328	N/A	96,691	N/A
RNA Test Performed[1]				
Yes	5,690	77.7	83,935	86.8
No	1,638	22.4	12,756	13.2
RNA Latest Result				
Positive	3,343	58.8	49,030	50.7
Negative	2,242	39.4	33,550	34.7
Indeterminate	105	1.9	1,355	1.4
RNA Test Performed Within Three Months of Initial Report				
Yes	4,941	67.4	N/A	N/A
No	2,387	32.6	N/A	N/A
Genotype Test Performed				
Yes	2,655	36.5	52,187	54.0
No	4,621	63.5	44,504	46.0
Genotype				
1a	1,218	45.7	25,357	48.6
1b	655	24.6	12,192	23.4
1 unspecified, other, or 1a/1b	51	1.9	3,950	7.6
2	278	10.4	4,589	8.8
3	321	12.0	4,193	8.0
4	114	4.3	1,444	0.3
5	0	0.0	11	0.0
6	21	0.8	236	0.5
Mixed	10	0.4	215	0.4

[1] Based on Health Department's hepatitis C surveillance data as of April 2016. Reporting of negative RNA test results to the Health Department was mandated July 21, 2014.

PUBLIC HEALTH OPPORTUNITY

All people with a positive hepatitis C antibody (screening) test should receive the hepatitis C RNA test to confirm infection. However, too often the RNA test is not ordered after a positive antibody test. As a result, the Health Department recommends that clinicians order the hepatitis C antibody to reflex RNA test. With the reflex test, the laboratory will immediately do a quantitative RNA test on the same specimen as the antibody test if the result is positive without the patient having to come in for the additional test.

People Aged 0 to 29 years

Identifying new hepatitis C infections is challenging because new infections are usually asymptomatic. Younger patients are a useful proxy for recent hepatitis C infection. Newly reported hepatitis C patients who are young are more likely to have been recently infected than older people. Understanding the characteristics of this population can inform effective hepatitis C prevention strategies.

DATA HIGHLIGHTS

- In people aged 0 to 29 years, the highest rate of newly reported hepatitis C cases is seen in the incarcerated population at 169.2 per 100,000 people.
- Among all boroughs in 2015, Manhattan had the highest rate of newly reported hepatitis C cases in people aged 0 to 29 years (34.7 per 100,000 people).
- Neighborhoods with the highest rates of newly reported hepatitis C in young people are East Harlem, Chelsea-Clinton and the Lower East Side (Manhattan), Coney Island (Brooklyn), Port Richmond and Stapleton-Fort George (Staten Island).
- In 2015, rates of newly reported hepatitis C in people aged 0 to 29 years were higher for men than women.

Map 3. Newly reported cases of hepatitis C in people aged 0 to 29 in New York City by United Hospital Fund (UHF) neighborhood, 2015

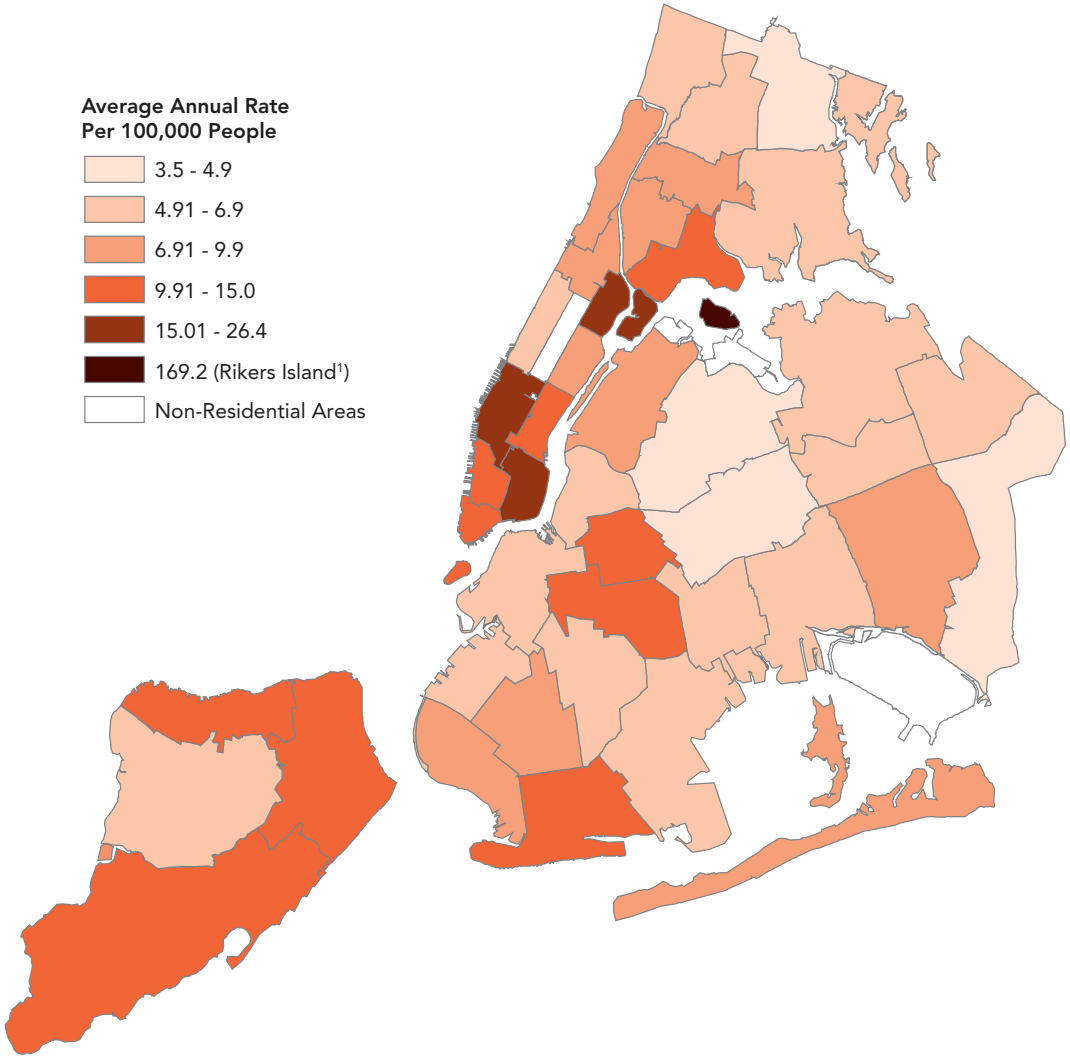


Table 10. Newly reported hepatitis C in people aged 0 to 29 in New York City, 2015

Characteristic	Number	Percentage of Each Group	Rate Per 100,000 People
Overall	886	N/A	26.0
Sex			
Female	372	42.0	21.8
Male	514	58.0	30.3
Age at Time of First Report (in years)			
0-4	24	2.7	4.2
5-9	11	1.2	2.3
10-14	7	0.8	1.5
15-19	48	5.4	10.1
20-24	260	29.4	41.2
25-29	536	60.5	68.2
Borough of Residence			
Bronx[1]	200	22.6	30.9
Brooklyn	249	28.1	22.6
Manhattan	207	23.4	34.7
Queens	139	15.7	15.9
Staten Island	48	5.4	26.6
Unknown	43	4.9	N/A
Neighborhood Poverty Level by ZIP Code[2]			
Low	114	14.5	7.2
Medium	260	33.2	9.6
High	227	29.0	9.0
Very high	137	17.5	8.2
Unknown	46	5.9	N/A

[1] The Bronx includes people in Rikers Island facilities (92 people aged 0 to 29 reported in 2015).
[2] Excludes 102 people incarcerated at time of report.

Acute Hepatitis C Surveillance

In 2015, the Health Department identified nine acute cases of hepatitis C, but estimates the actual infection rate to be higher. Data on acute hepatitis C infections can inform effective prevention programs; therefore, the Health Department asks that health care providers report acute hepatitis C cases. To learn how to report acute hepatitis C cases, visit nyc.gov and search "provider hepatitis reporting."

RESEARCH AND EVALUATION

Deaths from Hepatitis B and C

DATA HIGHLIGHTS

- In New York City, the hepatitis C-related death rate increased 38 percent from 1999 to 2014, while the hepatitis B-related death rate remained stable.
- More than half of deaths related to both hepatitis B and C occurred in people younger than 65 years of age.
- In New York City, the HIV-related death rate continues to decrease. If this trend continues, the hepatitis C-related death rate will soon surpass the HIV-related death rate.

PUBLIC HEALTH OPPORTUNITY

Earlier screening, care and treatment of hepatitis B and C can prevent liver disease and premature death.

Figure 3: Age-Adjusted Death Rates of Hepatitis B, Hepatitis C and HIV in New York City, 1999-2014

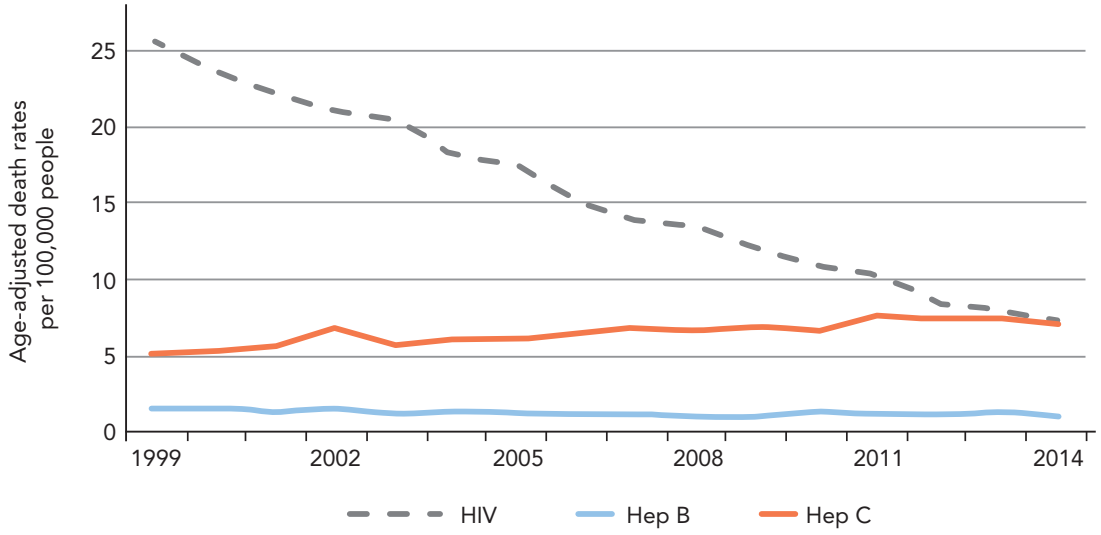
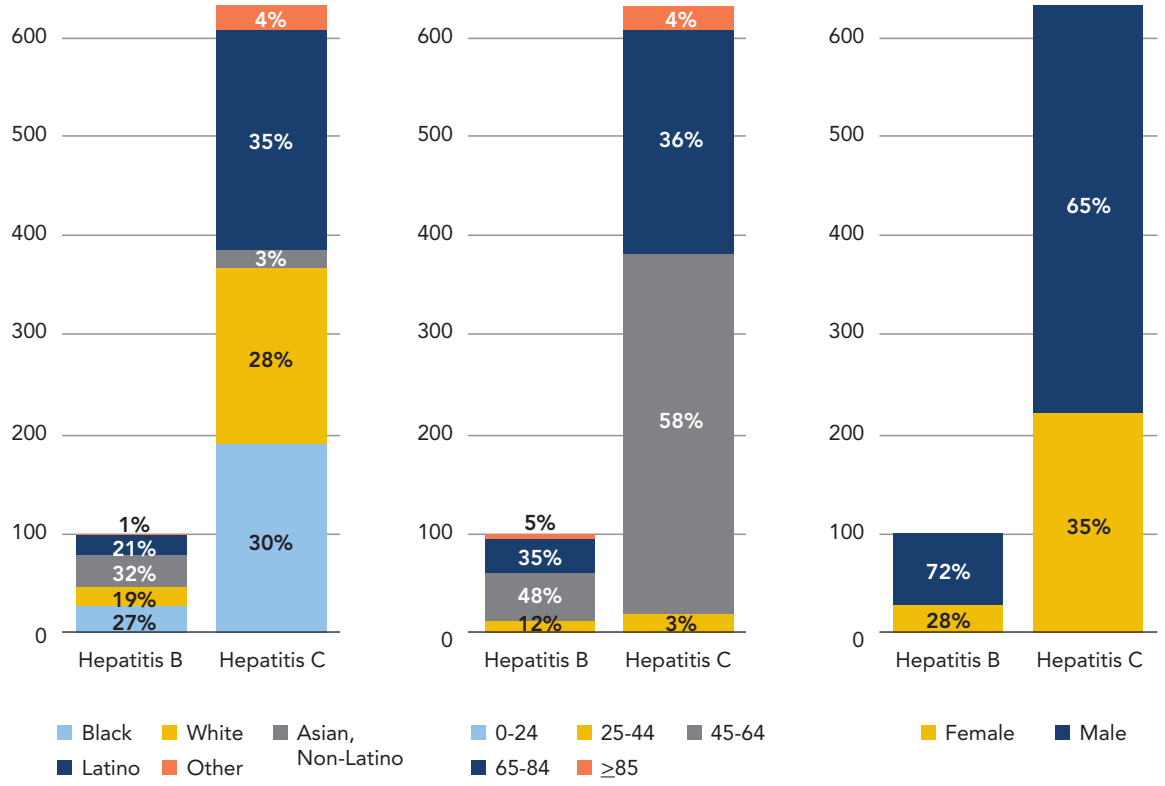


Figure 4: Characteristics of patients with deaths associated with hepatitis B or C as the underlying or contributing cause of death, New York City residents, 2014



Liver Cancer: Geographic Distribution and Trends

Hepatocellular carcinoma, the most common type of liver cancer, is often caused by chronic hepatitis B or C.

DATA HIGHLIGHTS

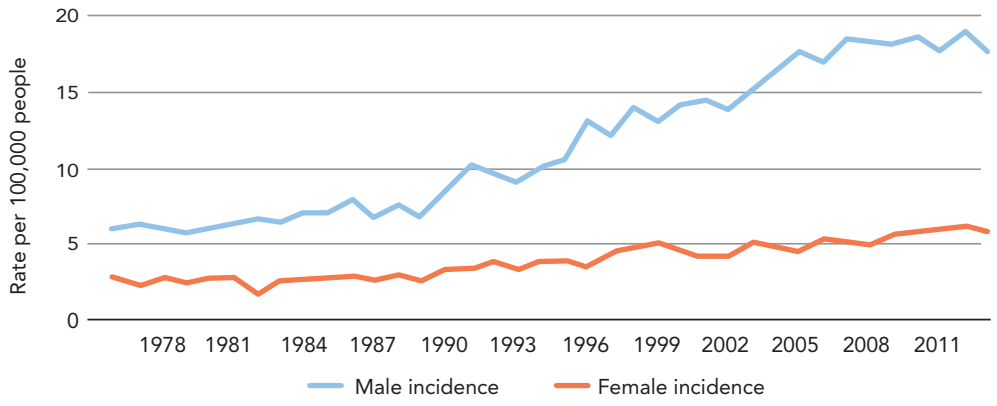
- Liver cancer incidence and mortality remain high among New York City residents. From 2009 to 2013, the incidence of liver cancer was higher in New York City (rate of 18.2 per 100,000 men and 5.9 per 100,000 women) than in the rest of New York State (rate of 10.4 per 100,000 men and 3.4 per 100,000 women).
- Brooklyn has the highest incidence and mortality rates of all New York City boroughs.
- In 2013, there were 718 cases of liver cancer among men (rate of 17.7 per 100,000 people) and 305 cases among women (rate of 5.9 per 100,000 people).
- Men consistently experience higher liver cancer incidence and mortality than women.

Table 11. Liver cancer incidence and mortality in New York City by borough, 2009-2013

Borough	Incidence				Mortality			
	Men		Women		Men		Women	
	Number*	Rate Per 100,000 People	Number*	Rate Per 100,000 People	Number*	Rate Per 100,000 People	Number*	Rate Per 100,000 People
New York City (total)	705**	18.2	293	5.9	416	11.2	207	4.1
Bronx	162	28.1	64	8.3	90	16.4	38	4.9
Brooklyn	188	16.9	80	5.5	111	10.3	62	4.2
Manhattan	142	17.9	63	6.0	90	11.8	43	4.0
Queens	173	15.4	71	5.1	99	9.2	52	3.7
Staten Island	41	15.9	15	5.1	26	11.0	12	4.0

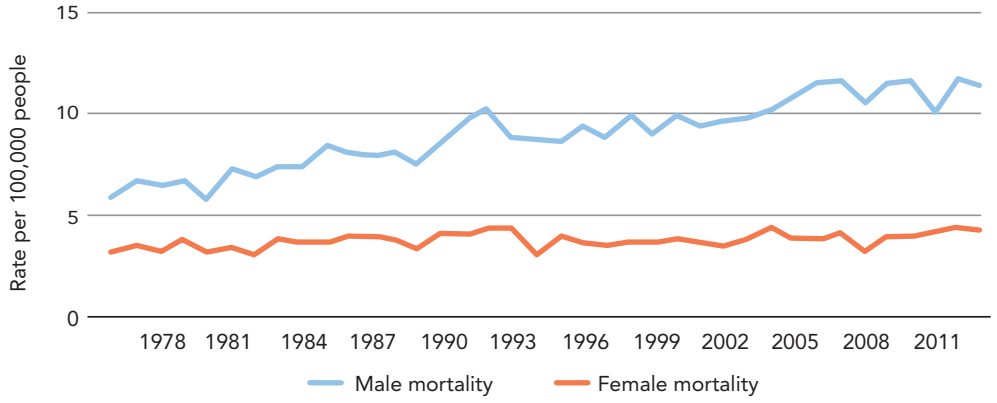
*Average annual cases
**Total is 705 due to rounding.

Figure 5. Liver cancer incidence in New York City by year and sex, 1976-2013



Source: New York State Cancer Registry

Figure 6. Liver cancer mortality in New York City by year and sex, 1976-2013



Source: New York State Cancer Registry

Liver Cancer with Hepatitis B and C

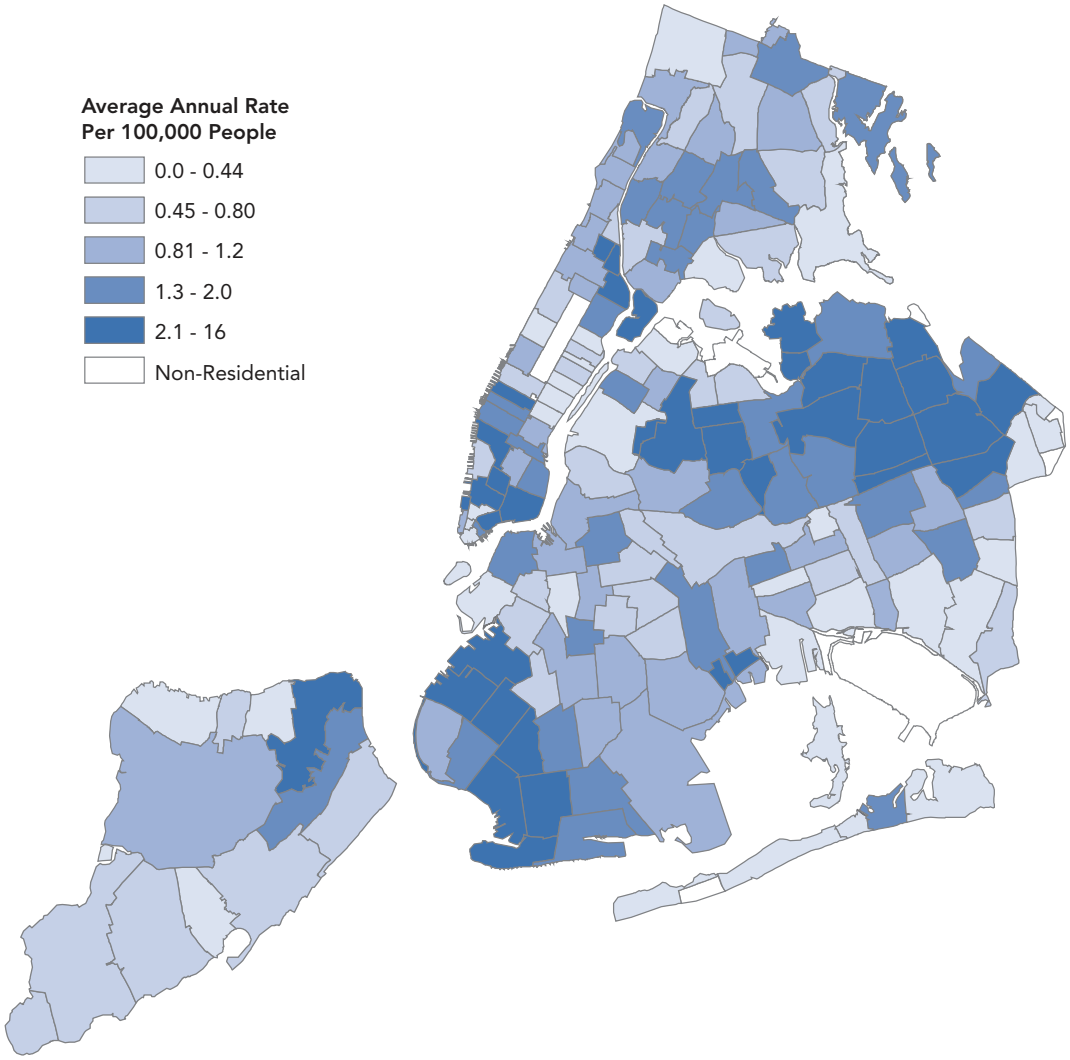
DATA HIGHLIGHTS

- In New York City, incidence of liver cancer with hepatitis B and C affects geographically distinct neighborhoods.
- Neighborhoods disproportionately affected by liver cancer, hepatitis B and hepatitis C include the Bronx, Upper Manhattan, Southern Brooklyn and Northern Queens.

PUBLIC HEALTH OPPORTUNITY

People with chronic hepatitis B should be screened for liver cancer every six months.

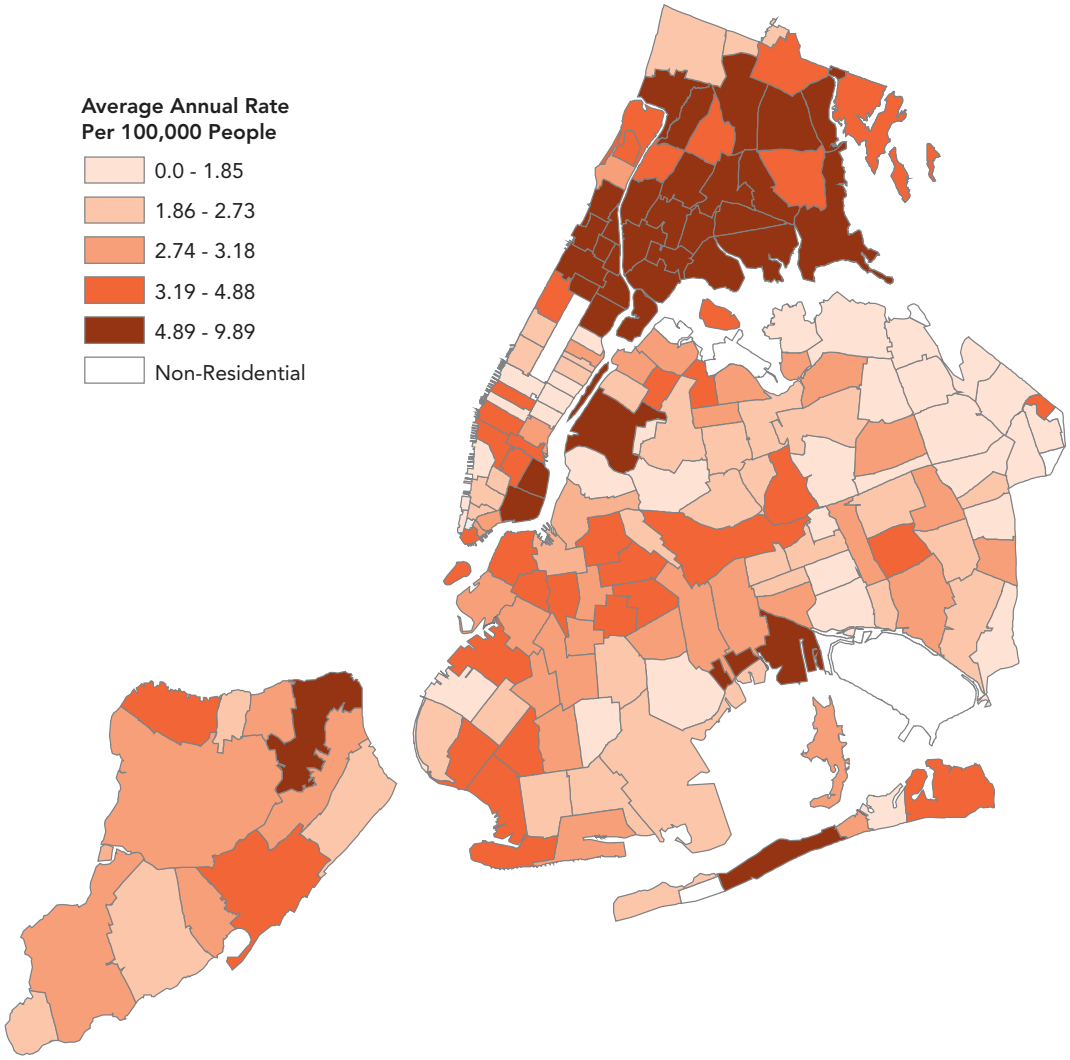
Map 4. Annual average liver cancer incidence rates with hepatitis B infection, by ZIP code, 2001-2012



PUBLIC HEALTH OPPORTUNITY

People with chronic hepatitis C and cirrhosis should be screened for liver cancer every six months.

Map 5. Annual average liver cancer incidence rates with hepatitis C infection, by ZIP code, 2001-2012



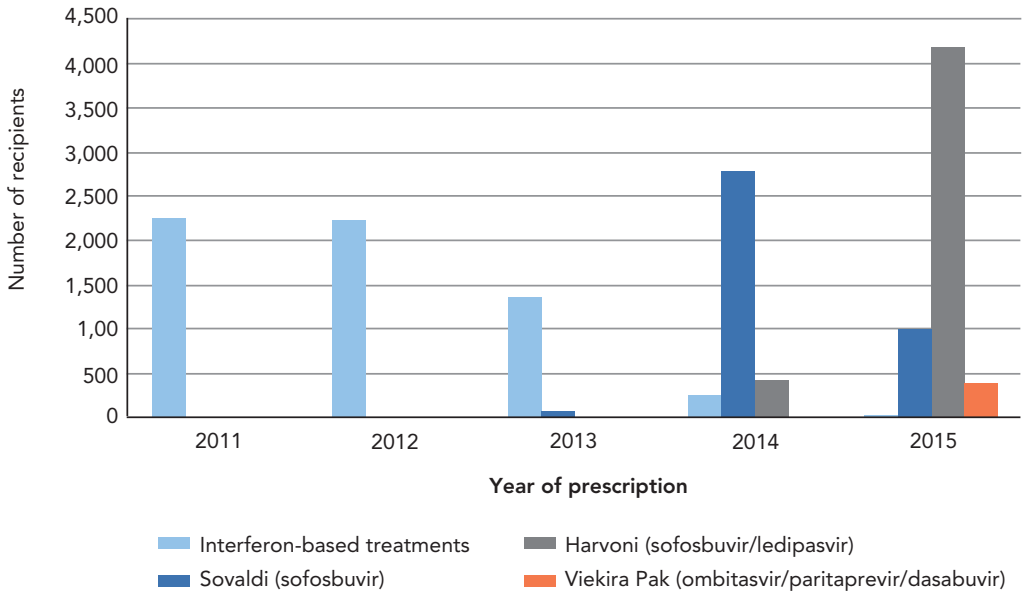
Hepatitis C Medications Prescribed for Medicaid-Covered Patients

DATA HIGHLIGHTS

In 2015:

- Approximately 5,600 Medicaid recipients were prescribed hepatitis C treatments, a 63 percent increase from 2014.
- Harvoni (sofosbuvir/ledipasvir) accounted for 75 percent of hepatitis C prescribed treatments, whereas in 2014 the majority of Medicaid recipients were prescribed Sovaldi (sofosbuvir) (81 percent).
- Very few people were prescribed interferon-based treatments, and Viekira Pak (ombitasvir, paritaprevir, dasabuvir), approved by the FDA in December 2014, comprised 7 percent of prescriptions.

Figure 8. Hepatitis C medications prescribed to New York City Medicaid recipients by year of prescription, 2011-2015



Note: Some Medicaid recipients were prescribed interferon-based treatment and Sovaldi (sofosbuvir) or Harvoni (sofosbuvir/ledipasvir). Recipients with dual prescriptions are removed from the interferon-based treatment counts to avoid duplication.

DIRECT SERVICES

Hepatitis B Vaccinations

The Health Department provides three-dose hepatitis B vaccinations to at-risk patients in its health facilities.

Table 12: Number of hepatitis B vaccines provided by Health Department facilities, 2015

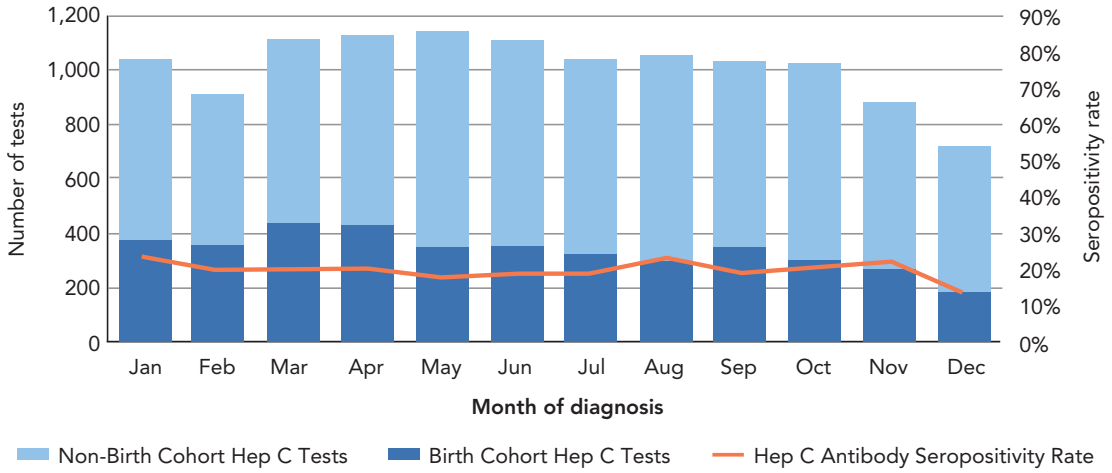
Facility	Total Hepatitis B Vaccine Doses	Third Hepatitis B Vaccine Doses
Immunization Clinic (aged 4 to 18)	3,183	1,055
Immunization Clinic (aged 19 and older)	6,788	1,514
Sexually Transmitted Disease Clinics (hepatitis B only)	3,105	680
Sexually Transmitted Disease Clinics (hepatitis A/B combination)	1,025	173
Correctional Health Services facilities	1,557	155
Total	**15,658**	**3,577**

In addition, 118,313 third doses of hepatitis B antigen-containing vaccines were administered by New York City medical providers to individuals aged 0 to 18 in 2015, a proxy for the number of individuals vaccinated.

Hepatitis C Screening in Correctional Facilities

Since 2013, New York City Health + Hospitals' Correctional Health Services implemented hepatitis C screenings for inmates born between 1945 and 1965 during intake, following U.S. Preventive Services Task Force recommendations. In 2015, the number of hepatitis C tests provided remained high.

Figure 9: Number of hepatitis C antibody tests, total and by birth cohort (born 1945-1965), and seropositivity rate of hepatitis C antibody tests by month, New York City jails, 2015



Linkage to Care and Care Coordination Services

New York City Council Hepatitis B and C Initiative

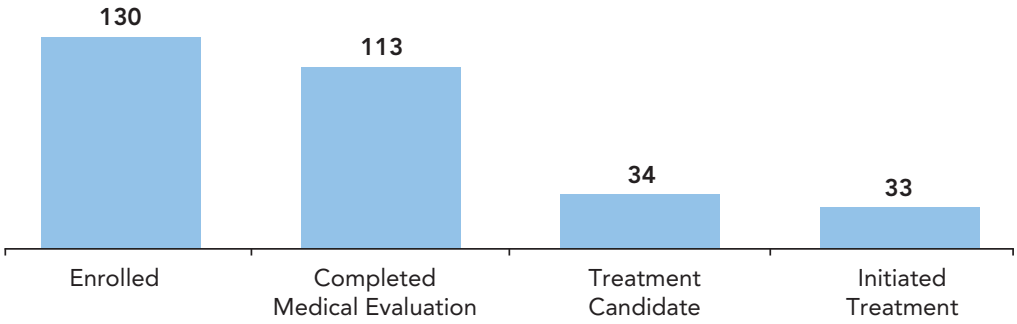
In 2014-2015, the New York City Council Hepatitis B and C Initiative allocated funding to support three hepatitis B and C patient and peer navigation programs at 23 health care facilities, community-based organizations and syringe exchange programs across New York City.

Check Hep B and Check Hep C Patient Navigation Programs

The Check Hep B and Check Hep C Patient Navigation programs provide linkage to care and clinical care coordination services to patients living with chronic hepatitis B and C respectively.

Check Hep B Patient Navigation Program

Figure 10: Number of patients receiving Check Hep B program services at 3 organizations, 2015



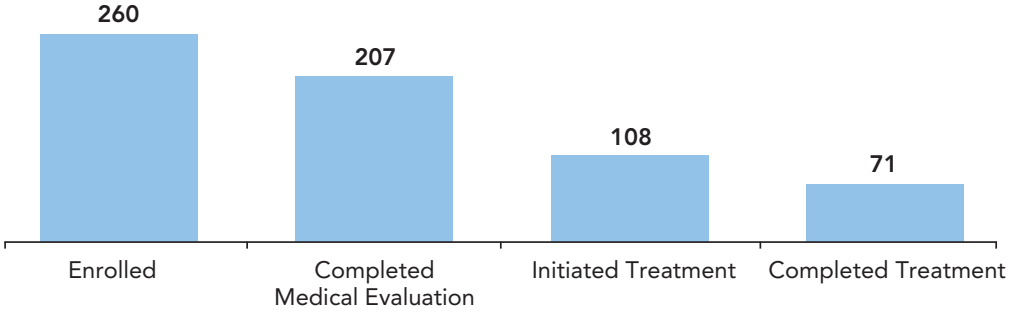
Check Hep B Patient Characteristics

- 130 patients enrolled, 113 completed a medical evaluation and 33 initiated treatment
- Enrollees represented 13 birth countries (the most common were South Korea, 35 percent; China, 29 percent; Senegal, 18 percent)
- Nine preferred languages spoken (the most common were Korean, 35 percent; Chinese 28 percent; French, 14 percent; Wolof, 11 percent)
- 54 percent were uninsured
- 32 percent were covered by Medicaid

In addition, Bellevue Hospital participated in Check Hep B and reported all data in the aggregate from April 2015 to June 2016. The program enrolled 58 participants, 58 completed medical evaluation and 45 initiated treatment.

Check Hep C Patient Navigation Program

Figure 11: Number of patients receiving Check Hep C program services at four organizations, 2015



Check Hep C Patient Characteristics

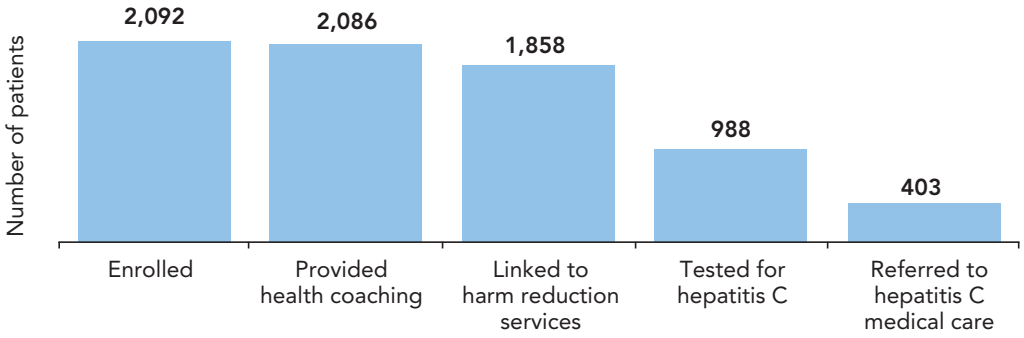
- 260 patients enrolled, 207 completed a medical evaluation, 108 initiated treatment and 71 completed treatment
- 43 percent were Latino and 42 percent were Black, non-Latino
- 36 percent were homeless or unstably housed
- 21 percent reported injection drug use in the last year
- 56 percent had a psychiatric condition
- 77 percent were covered by Medicaid

In addition, Bellevue Hospital participated in Check Hep C and reported all data in the aggregate from April 2015 to June 2016. The program enrolled 235 participants, 235 completed medical evaluation, 184 initiated treatment and 152 completed treatment.

New York City Hep C Peer Navigation Program

The New York City Hep C Peer Navigation Program provides health education on preventing hepatitis C transmission and links individuals at risk for or living with hepatitis C to testing and care services.

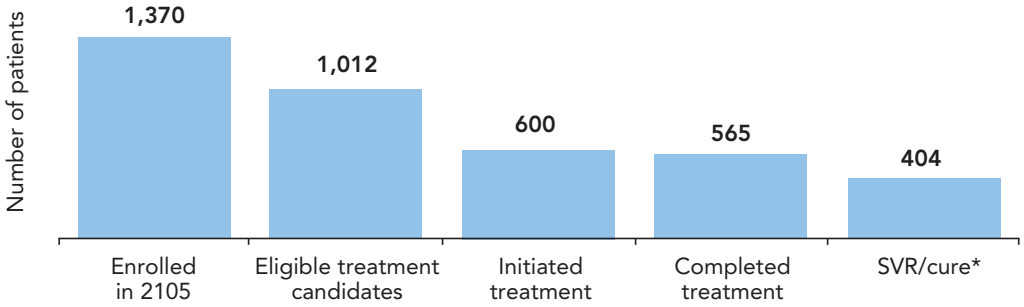
Figure 12: Number of patients receiving Hep C Peer Navigation Program services, 2015



Project INSPIRE Hepatitis C Care Coordination Program

Funded by the Centers for Medicare & Medicaid Services, Project INSPIRE is a three-year hepatitis C care coordination program serving Medicaid and Medicare beneficiaries in Upper Manhattan and the Bronx in collaboration with two clinical partners (Mount Sinai School of Medicine and Montefiore Medical Center), two managed care organizations (VNSNY Choice and HealthFirst) and other partners.

Figure 13: Number of patients receiving Project INSPIRE program services, 2015



*Data on SVR/cure was collected through May 2016

PATIENT CHARACTERISTICS

- Median age was 57 years
- 1,012 (74 percent) were born between 1945 and 1965
- 640 patients (47 percent) were Latino and 468 (35 percent) were Black, non-Latino
- 54 percent reported current or former alcohol use
- 57 percent reported current or former injection drug use

Funding for Project INSPIRE will continue until August 31, 2017. Until August 2017, project staff members will assess the sustainability of care coordination services by analyzing cost and utilization data. They will also seek alternative payment models to reimburse clinical providers for the cost of providing the comprehensive services started under Project INSPIRE.

SURVEILLANCE-BASED LINKAGE TO CARE

The Health Department sends letters and educational booklets to newly reported patients to increase awareness of hepatitis B and C and promote linkage to medical care. In 2015, the Health Department mailed 5,980 letters to newly reported chronic hepatitis B patients and 4,371 letters to newly reported chronic hepatitis C patients.

In 2015, the Health Department piloted a project to link patients with a positive hepatitis C test result to care via text message. The Health Department sent messages to 791 patients. Of patients who received messages, 161 (31 percent) completed a subsequent hepatitis C RNA or genotype test indicating that they received medical care.

Hepatitis C Screening among HIV-Infected People Linked to Care

The Health Department's Bureau of HIV/AIDS Prevention and Control's Field Services Unit conducts outreach to people with a positive HIV test who appear to be out of HIV care. These individuals are reported to the Health Department and linked to medical providers who evaluate and provide both HIV and hepatitis C care.

Table 13: People living with HIV who returned to care, January 2013 to September 2015

	Number (Percentage)
Number of Patients with Unknown Hepatitis C Status	612
First Hepatitis C Antibody Test After Return to HIV Care (RTC) (% out of total patients)	216 (35%)
Positive[1]	47 (22%)
Negative[2]	168 (78%)
Unknown	1 (0%)
First Hepatitis C RNA Test After RTC[3]	50
Positive[1]	48 (96%)
Negative[1]	2 (4%)
Total Number of Hepatitis C Tests[4] (% out of total patients)	230 (38%)
Time from RTC to First Hepatitis C Test[5] (% out of total number of tests)	
<1 months	203 (88%)
1 to <2 months	4 (2%)
2 to <3 months	4 (2%)
≥3 months	19 (8%)

[1] Ascertained via hepatitis C registry and/or chart review
[2] Ascertained via chart review only
[3] Includes patients with RNA only results and 1 patient with a negative only antibody test
[4] Includes patients with antibody and RNA only results
[5] Hepatitis C test within 1 year post HIV RTC

CAPACITY BUILDING AND EDUCATION

Capacity Building for Community-Based Service Providers

Organized by the Health Department, Hep Free NYC (hepfree.nyc) is a citywide network comprised of the NYC Hep B Coalition and NYC Hep C Task Force, which brings together organizations and health care providers seeking to build their capacity to prevent, manage and treat hepatitis B and C. In 2015, the network reached 11,939 website visitors, more than 3,000 e-newsletter subscribers, more than 1,000 followers on social media and 435 attendees at 15 network meetings in all five boroughs.

In 2015, the Health Department trained approximately 800 service providers at the following events:

- Four Hep C 101 trainings and four Hepatitis C Rapid Test trainings
- Four Alcohol Screening, Brief Intervention and Referral for Treatment trainings
- Monthly training and technical assistance meetings with hepatitis B and C patient and peer navigators
- The annual Hepatitis C Clinical Trials and Pharmaceutical Pipeline Training

In 2015, the Hep Free NYC network and its partners organized:

- 100 partners at the National Hepatitis Testing Day and National Hispanic Hepatitis Awareness Day commemorations on the steps of New York City Hall
- 200 marchers in the Chinese Lunar New Year Parade to raise hepatitis B awareness
- Four Patient Navigator Network tours of health care facilities offering comprehensive hepatitis care
- The annual New York City World Hepatitis Day commemoration in Washington Square Park
- Advocacy at the Hepatitis C Legislative Awareness Day in Albany and reaching New York City Council members to increase funding for viral hepatitis patient navigation services and clinical capacity building

In a 2015 survey of Hep Free NYC members, close to 95 percent of 142 respondents reported that the Hep Free NYC network helped to identify and respond to hepatitis B and C needs in the community.

Technical Assistance for Community Health Centers

In 2015, the Health Department provided technical assistance to six federally qualified health centers, encompassing 18 clinical locations throughout New York City. The goal was to increase rates of hepatitis C screening and confirmatory testing through electronic health record modifications, implementation of reflex testing, and identification of clinic patients who needed confirmatory testing from the Health Department surveillance registry.

Clinical Capacity Building for Hospitals

In September 2015, the Health Department launched the New York City Hepatitis C Clinical Exchange Network (HepCX), a peer-to-peer learning collaborative that aims to increase clinical capacity for screening, diagnosing, managing and treating hepatitis C infection. By December 2015, HepCX organized and met with 55 representatives (HepCX Champions) from 31 NYC hospitals. HepCX Champions are clinical leaders in hepatitis C treatment and management: 38 percent are gastroenterology specialists (including hepatology), 35 percent are infectious disease specialists (including HIV medicine) and 17 percent are primary care providers. A baseline survey of 27 HepCX hospitals showed that:

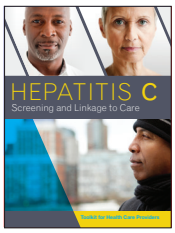
- 65 percent had an electronic health record alert to screen all patients born between 1945 and 1965 for hepatitis C
- 41 percent screened less than half of patients at risk for hepatitis C
- 18 percent used hepatitis C antibody with reflex to RNA testing to confirm infection

Educational Resources

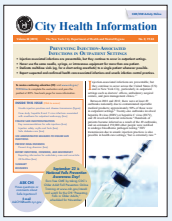
In 2015, the Health Department launched a social media campaign to raise awareness of hepatitis C risk. In the month the campaign was launched, there were close to 28,000 visits to Health Department webpages that promote hepatitis C testing and linkage to care.

The Health Department also developed, updated and disseminated awareness and educational materials for providers, patients and the public. Email hep@health.nyc.gov to order materials.

Educational Materials for Providers

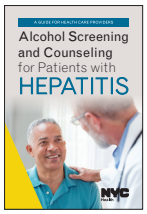


Hepatitis C Screening and Linkage to Care Toolkit for Health Care Providers



City Health Information: Diagnosing and Managing Hepatitis C

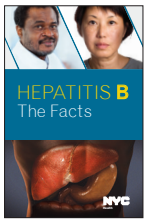
City Health Information: Preventing Injection-Associated Infections in Outpatient Settings



Alcohol Screening and Counseling for Patients with Hepatitis: A Guide for Health Care Providers

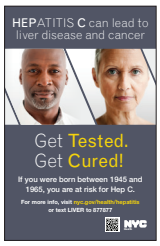
Alcohol and Hepatitis Palm Card
Languages: English and Spanish

Educational Materials for Patients and the Public



Hepatitis B: The Facts Booklet
Languages: English, Spanish, Chinese, French, Korean, Russian

Hepatitis C: The Facts Booklet
Languages: English, Spanish, Arabic, Russian, Urdu



Hepatitis C: Get Tested, Get Cured! Poster

Hepatitis C Treatment Poster
Languages: English and Spanish

NYC Liver Health App on iOS and Android

NYC Liver Health App Palm Card

POLICY EFFORTS

In 2015 the Health Department:

- Supported the No Mandatory Mail Order pharmacy provision of the New York State insurance law to ensure that New York State patients can fill their prescriptions at a pharmacy of their choice, either by mail or at their local pharmacy allowing for greater access to medications. This bill did not pass during the legislative session and remains an area of action.
- Supported the modification to the syringe access funding rider included in the House FY 2016 Labor, Health and Human Services, Education and Related Agencies Appropriations bill. This bill was signed into law and for the first time allows federal funding for services associated with syringe exchange programs, allowing local government to exercise their own discretion in allocating federal support for crucial tools that prevent the spread of HIV and hepatitis C among high-risk populations.
- Advocated for the New York State Drug Utilization Board to reconsider the current hepatitis C medication restrictions in the New York State Medicaid program and to follow current clinical guidelines and new recommendations from the Centers for Medicaid and Medicare Services in order to expand treatment options for New York City residents living with hepatitis C.

End of Hepatitis C Initiative

Launched in 2015, the New York State End of Hepatitis C initiative is a five-year collaborative effort by the New York City and New York State health departments and the newly formed New York State Hepatitis C Coalition (hepcnewyork.org) to develop a strategy to control and eventually eliminate hepatitis C in New York State.

BEST PRACTICES AND GOALS

The Health Department recommends the following best practices to prevent and manage hepatitis B and C infections.

Hepatitis B

Vaccination

The most effective way to prevent hepatitis B infection and its consequences is through vaccination. An effective vaccination strategy must include:

- Starting the hepatitis B vaccine series at birth
- Screening pregnant women at first prenatal visit and providing post-exposure immunoprophylaxis to infants born to hepatitis B-positive women
- Vaccinating all children and adolescents who were not vaccinated previously
- Vaccinating all unvaccinated adults at risk for hepatitis B infection
- Using opportunities to provide vaccination at other medical appointments
- Identifying and vaccinating contacts of patients with chronic hepatitis B:
    - Asking patients for names of contacts
    - Encouraging those contacts to get tested or vaccinated
    - Linking contacts to culturally appropriate primary care providers experienced in hepatitis B care
- Routinely vaccinating health care workers and residents of long-term care facilities
- Providing post-exposure immunoprophylaxis to people who have been exposed to hepatitis B

Contact Management

- Agencies that serve foreign-born people from areas of high hepatitis B prevalence (e.g., Africa, Asia, the Pacific Islands) should test all patients or refer them for hepatitis B testing
- Refer hepatitis B-positive patients to a physician with expertise in chronic liver disease management for evaluation for antiviral treatment
- Provide hepatitis B-positive patients with counseling to manage factors that can contribute to disease progression, such as alcohol consumption, diet, medications, herbal remedies and other liver disease-causing infections
- Educate patients on prevention of hepatitis B transmission

Hepatitis C

Prevention

- Increase access to syringe exchange programs and other tools ("works")
- Provide targeted education regarding safer sex practices to men who have sex with men and provide access to free condoms

Care and Treatment

- Offer the hepatitis A and hepatitis B vaccines if patient is susceptible
- Tailor your hepatitis C education materials to your population
    - Focus on the hepatitis C risk factors that most affect them
    - Provide education materials that are culturally appropriate
    - Request Health Department education materials in languages most prevalent in your patient population
- Adhere to national standards for Culturally and Linguistically Appropriate Services (CLAS) from the Office of Minority Health at the U.S. Department of Health and Human Services (https://www.thinkculturalhealth.hhs.gov/pdfs/EnhancedCLASStandardsBlueprint.pdf)
- Screen all HIV-infected patients for hepatitis C annually
- Develop programs to train or coach providers in the case of patient drug use, including education on substance use, creating a friendly environment and clinical competency in substance use associated medical issues
- Co-locate outreach and hepatitis C screening services with homeless shelters, harm reduction centers and other places where individuals from high-risk populations receive services
- Provide warm handoff linkage to care for recently released jail and prison inmates to facilitate obtaining insurance and completing their hepatitis C treatment

Health Department's Viral Hepatitis Program 2016 Strategic Goals

- Educate clinical providers and communities on hepatitis B and C infection
- Enhance hepatitis B and C surveillance activities and use of data to inform policy and intervention development
- Improve hepatitis B and C testing and direct access to health care and treatment
- Advance hepatitis B- and C-related public health policies and infrastructure
- Promote policies and practices to eliminate perinatal hepatitis B transmission
- Prevent new hepatitis B and C infections

PUBLICATIONS AND PRESENTATIONS

In 2015, the Health Department published the following peer-reviewed journal articles on hepatitis B and C and shared surveillance, research and direct service program data at local, regional and national conferences.

Publications

- Breskin A, Drobnik A, Pathela P, et al. Factors associated with hepatitis C infection among HIV-infected men who have sex with men with no reported injection drug use in New York City, 2000-2010. Sex Transm Dis. 2015;42(7):382-6.
- Prussing C, Bornschlegel K, Balter S. Hepatitis C surveillance among youth and young adults in New York City, 2009-2013. J Urban Health. 2015;92(2):387-99.
- Greene SK, Levin-Rector A, Hadler JL, Fine AD. Disparities in reportable communicable disease incidence by census tract-level poverty, New York City, 2006-2013. Am J Public Health. 2015;105(9):e27-34.

Presentations

- Ford M, Johnson N, Rude E, Desai P, Laraque F. Engaging high-risk persons with hepatitis C in care and treatment through community-based care coordination. Check Hep C Year 2. Paper presented at: National Summit on HCV and HIV Diagnosis, Prevention and Access to Care; June 2015; Arlington, VA.
- Ford M, Ivanina E, Laraque F. Geographic epidemiology of hepatocellular carcinoma and viral hepatitis in New York City. Paper presented at: National Summit on HCV and HIV Diagnosis, Prevention and Access to Care; June 2015; Arlington, VA.
- Ford M, Johnson N, Desai P, Rude E, Laraque F. From care to cure: improving the hepatitis C care cascade through patient navigation in the Check Hep C Program in New York City. Paper presented at: 2015 Meeting of the American Association for the Study of Liver Diseases; November 2015; San Francisco, CA.
- Johnson N, Ip M, Moore M, Laraque F. Using text messaging (SMS) to promote hepatitis C testing and linkage to care. Paper presented at: National Conference on Health Communication, Marketing, and Media; August 2015; Atlanta, GA.
- Laraque F, Bresnahan M, Ford M, et al. Project INSPIRE: a comprehensive care coordination program for hepatitis C infection. Paper presented at: IDweek: meeting of the Infectious Diseases Society of America; October 2015; San Diego, CA.
- Halperin J, Schranz A, Laraque F, et al. Hepatitis C surveillance markers study: a validation of genotype as a laboratory proxy for linkage to care. Paper presented at: IDweek: meeting of the Infectious Diseases Society of America; October 2015; San Diego, CA.
- Laraque F, Bornschlegel K, Bresnahan M, Ford M, Johnson N, Rude E. The New York City public health approach to hepatitis C. Paper presented at: National Summit on HCV and HIV Diagnosis, Prevention and Access to Care; June 2015; Arlington, VA.

TECHNICAL NOTES

When interpreting New York City hepatitis B and C surveillance data, please note:

Surveillance:

- This report includes surveillance data on people who meet the CDC and Council of State and Territorial Epidemiologists' case definition. For more information, visit www.cdc.gov/osels/ph_surveillance/nndss/casedef/case_definitions.htm.
- Laboratories are required to report hepatitis B and C cases to the Health Department, including negative results for hepatitis C nucleic acid tests (RNA). For more information on hepatitis labs reportable to the Health Department, visit www.wadsworth.org/sites/default/files/WebDoc/618150225/CDRG%202016%20Complete.pdf
- The Health Department often receives more than one hepatitis B or C laboratory report per person and uses automatic deduplication methods to identify repeat reports based on name, date of birth and other information. Only the first report is counted in the data presented here.
- The Health Department does not investigate all chronic hepatitis B and C cases, so only minimal information—patient name, address, date of birth and sex—from lab reports is available.
- The Health Department investigates all positive hepatitis B core IgM antibody reports and other positive hepatitis B reports that include significantly elevated liver function tests.
- Veterans Affairs (VA) health care facilities do not report cases through routine surveillance; therefore, people with hepatitis who only receive health care at VA facilities are not represented in this report.
- Differences in data between this report and previous reports may be due to factors such as delays in disease reporting, correction of errors and refinements in data processing (e.g., the removal of duplicate reports).
- To analyze trends in newly reported cases of hepatitis B and C, the average annual percent change was calculated using Joinpoint, a statistical software program from the National Cancer Institute.
- Many people with acute hepatitis B or C have no or mild symptoms. As a result, the infection may not be diagnosed at the time of infection. Therefore, surveillance data underestimates the true incidence of acute hepatitis B and C in New York City.
- Many patients with chronic hepatitis B or C are asymptomatic; as a result, many cases are not diagnosed or reported. Therefore, surveillance data underestimates the true level of chronic hepatitis B and C in New York City.

Rates:

- Rates presented include people newly reported to the Health Department. They are not prevalence rates or incidence rates.
- Rates based on small numerators may not be reliable and should be interpreted with caution.
- Age adjustment was performed using the population age categories of 0-24, 25-44, 45-64, 65-84 and 85+ years and weighting to the U.S. 2000 standard population.
- Rates stratified by age group are presented as age-specific rates (i.e., no age adjusting within a presented age stratum was performed).
- Denominators used throughout this report are intercensal estimates for 2014, except denominators for the Rikers Island population, which were provided by New York City Correctional Health Services.
- The jail at Rikers Island is part of the borough of the Bronx, although it has a Queens ZIP code (11370; note that ZIP code 11370 includes parts of mainland Queens as well as Rikers Island). Therefore:
    - For numbers and rates presented by borough, Rikers Island cases are included with other Bronx cases.
    - For numbers and rates presented by ZIP code, Rikers Island is included in ZIP code 11370.
    - For numbers and rates presented by UHF neighborhood, Rikers Island is included in the United Hospital Fund neighborhood of West Queens.
- To protect confidentiality and avoid the publication of small numbers of diagnoses per specific geographic area, the Health Department is presenting maps containing two years of data for each disease shown and using the larger United Hospital Fund neighborhood designation, rather than ZIP code tabulation area (ZCTA), where appropriate. (ZIP codes in maps are represented by ZCTAs.) For details on the United Hospital Fund neighborhoods, please see nyc.gov/html/doh/downloads/pdf/tracking/uhf42.pdf.

Death Data:

- Deaths occurring outside New York City or those of non-New York City residents are not included.
- Both underlying and contributing causes are included. Underlying cause of death is the disease or condition that set off the chain of events leading to death. Contributing causes of death are diseases, morbid conditions or injuries that either resulted in or contributed to death.
- Causes of death were coded using ICD-10. The codes used for hepatitis B were B16, B170, B180 and B181; and for hepatitis C, B171 and B182. Both acute and chronic conditions were included for hepatitis B and C.
- Causes of death were not mutually exclusive.

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