

# BLOOD-BORNE AND SEXUALLY TRANSMITTED DISEASES



Exposure to blood and other body fluids can transmit diseases. Sexually transmitted infections (STIs) are spread predominantly by sexual contact, sometimes through non-sexual means such as via blood or blood products. STIs can have serious health consequences beyond the immediate impact of the infection itself. HIV, for example, is an incurable viral infection that requires lifelong treatment.

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**SEXUALLY  
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## HEPATITIS B

Hepatitis B virus is a small DNA virus that belongs to the *Hepadnaviridae* family. Infection with HBV may cause acute hepatitis which is characterised by jaundice and abdominal pain. Some patients develop chronic hepatitis which may lead to liver cirrhosis and liver cancer, while some have a persistent but asymptomatic carrier state. Patients with these chronic infection states can transmit the disease to susceptible persons, including vertical transmission from mother to child. Cure remains elusive currently.

A total of 47 cases of acute hepatitis B were reported in 2016, compared to 52 cases reported in 2015 (Figure 5.1). All cases were serologically confirmed with the presence of anti-HBc IgM antibody which is associated with acute clinical presentation.

**Figure 5.1**  
Weekly distribution of reported acute hepatitis B cases, 2015-2016



The incidence rate was highest in the 35-44 age group, with an overall male to female ratio of 3.2:1 (Table 5.1). Among the three major ethnic groups, Chinese had the highest incidence rate (Table 5.2). The majority of the cases (91.3%) were local cases (Table 5.3).

**Table 5.1**  
Age-gender distribution and age-specific incidence rate of acute hepatitis B cases<sup>^</sup>, 2016

Age group	Male	Female	Total	%	Incidence rate per 100,000 population*
0-4	0	0	0	0	0.0
5-14	0	0	0	0	0.0
15-24	3	0	3	6.5	0.4
25-34	8	5	13	28.3	1.0
35-44	14	2	16	34.8	1.6
45-54	5	2	7	15.2	0.9
55-64	4	1	5	10.9	0.8
65+	1	1	2	4.3	0.4
<b>Total</b>	<b>35</b>	<b>11</b>	<b>46</b>	<b>100</b>	<b>0.8</b>

<sup>^</sup>Excluded one foreigner seeking medical treatment in Singapore.

\*Rates are based on 2016 estimated mid-year population.

(Source: Singapore Department of Statistics)

**Table 5.2**  
**Ethnic-gender distribution and ethnic-specific incidence rate of acute hepatitis B cases<sup>^</sup>, 2016**

	Male	Female	Total	%	Incidence rate per 100,000 population*
Singapore residents					
Chinese	21	2	23	50.0	0.8
Malay	2	1	3	6.5	0.6
Indian	1	0	1	2.2	0.3
Others	0	0	0	0	0.0
Foreigners	11	8	20	41.3	1.1
<b>Total</b>	<b>35</b>	<b>11</b>	<b>46</b>	<b>100</b>	<b>0.8</b>

<sup>^</sup>Excluded one foreigner seeking medical treatment in Singapore.

\*Rates are based on 2016 estimated mid-year population.

(Source: Singapore Department of Statistics)

**Table 5.3**  
**Total number of notifications\* received for acute hepatitis B cases, 2012-2016**

Age Group	2012		2013		2014		2015		2016	
	Local	Imported	Local	Imported	Local	Imported	Local	Imported	Local	Imported
0 -4	0	0	0	0	0	0	0	0	0	0
5-14	0	0	0	0	0	0	0	0	0	0
15-24	2	7	2	0	1	1	0	0	3	0
25-34	18	4	15	6	12	3	19	1	13	0
35-44	12	5	14	2	10	1	14	1	14	2
45-54	3	1	9	0	8	2	7	0	5	2
55-64	4	0	3	0	4	3	6	0	5	0
65+	1	0	4	0	1	2	2	0	2	0
<b>Total</b>	<b>40</b>	<b>17</b>	<b>47</b>	<b>8</b>	<b>36</b>	<b>12</b>	<b>48</b>	<b>2</b>	<b>42</b>	<b>4</b>

\*Excluded tourists and foreigners seeking medical treatment in Singapore.

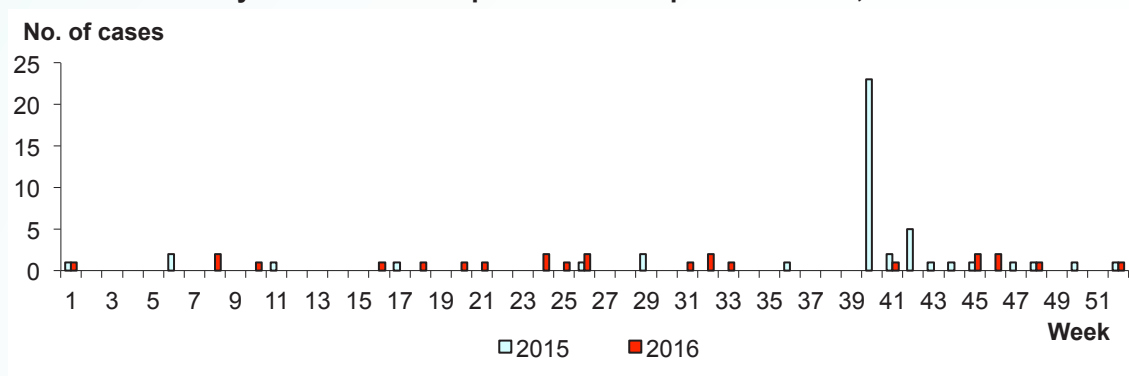
A total of 19,350 blood samples were screened at the KK Women's and Children's Hospital for HBsAg and HBeAg in 2016. Of these, 372 (1.9%) were HBsAg positive and 106 (0.5%) were HBeAg positive.

## HEPATITIS C

Hepatitis C virus (HCV) is an enveloped RNA virus in the *Flaviviridae* family. HCV infection may result in acute hepatitis, but may also be asymptomatic. A significant proportion of patients develop chronic hepatitis which can result in chronic liver diseases such as cirrhosis and liver cancer. Patients with chronic hepatitis C are infective, and HCV is most efficiently transmitted by direct percutaneous exposure to infected blood or intravenous drug use. Currently, curative treatment is expensive and not always effective.

A total of 24 cases of acute hepatitis C were reported in 2016, compared to 46 cases reported in 2015 (Figure 5.2).

**Figure 5.2**  
Weekly distribution of reported acute hepatitis C cases, 2015-2016



The incidence rate was highest in the 35-44 age group, with an overall male to female ratio of 2.3:1 (Table 5.4). Among the three major ethnic groups, Malays had the highest incidence rate (Table 5.5). The majority of cases (95.6%) were local cases (Table 5.6).

**Table 5.4**  
Age-gender distribution and age-specific incidence rate of reported acute hepatitis C cases<sup>^</sup>, 2016

Age group	Male	Female	Total	%	Incidence rate per 100,000 population*
0-4	1	0	1	4.3	0.4
5-14	0	0	0	0	0.0
15-24	0	2	2	8.7	0.3
25-34	1	2	3	13.0	0.2
35-44	4	2	6	26.1	0.6
45-54	4	0	4	17.4	0.5
55-64	5	0	5	21.7	0.8
65+	1	1	2	8.7	0.4
<b>Total</b>	<b>16</b>	<b>7</b>	<b>23</b>	<b>100</b>	<b>0.4</b>

<sup>^</sup>Excluded one foreigner seeking medical treatment in Singapore.

\*Rates are based on 2016 estimated mid-year population.

(Source: Singapore Department of Statistics)

**Table 5.5**  
Ethnic-gender distribution and ethnic-specific incidence rate of reported acute hepatitis C cases<sup>^</sup>, 2016

	Male	Female	Cases (%)	%	Incidence rate per 100,000 population*
Singapore residents					
Chinese	6	3	9	39.1	0.3
Malay	7	3	10	43.5	1.9
Indian	3	0	3	13.0	0.8
Others	0	0	0	0	0.0
Foreigners	0	1	1	4.3	0.1
<b>Total</b>	<b>16</b>	<b>7</b>	<b>23</b>	<b>100</b>	<b>0.4</b>

<sup>^</sup>Excluded one foreigner seeking medical treatment in Singapore.

Rates are based on 2016 estimated mid-year population.

(Source: Singapore Department of Statistics)

**Table 5.6**  
**Total number of notifications\* received for acute hepatitis C cases, 2012-2016**

Age Group	2012		2013		2014		2015		2016	
	Local	Imported	Local	Imported	Local	Imported	Local	Imported	Local	Imported
0-4	0	0	0	0	0	0	0	0	1	0
5-14	0	0	0	0	0	0	0	0	0	0
15-24	0	0	0	0	0	0	4	0	2	0
25-34	0	0	0	0	0	0	7	0	2	1
35-44	1	0	0	0	1	0	5	0	6	0
45-54	1	0	1	0	2	1	12	0	4	0
55-64	0	0	1	0	1	0	15	0	5	0
65+	0	0	0	0	0	0	2	0	2	0
<b>Total</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>4</b>	<b>1</b>	<b>45</b>	<b>0</b>	<b>22</b>	<b>1</b>

\*Excluded tourists and foreigners seeking medical treatment in Singapore

## HUMAN IMMUNODEFICIENCY VIRUS INFECTION

Human immunodeficiency virus (HIV) belongs to the lentivirus group of the retrovirus family. HIV, the cause of the Acquired Immunodeficiency Syndrome (AIDS), remains a global cause for concern. According to the UNAIDS Global AIDS Update for 2016, there were an estimated 2.1 million new HIV infections and 36.7 million people globally living with HIV at the end of 2015.

HIV can be transmitted from person to person through unprotected sexual intercourse, the use of HIV contaminated needles including the sharing of needles among intravenous drug users, transfusion of infected blood or blood products, mucosal exposures with infected body fluid and the transplantation of HIV-infected tissues or organs. Mother-to-child or vertical transmission is the most common route of HIV infection in children.

AIDS is the advanced stage of HIV infection, when a person's immune system is severely damaged and vulnerable to opportunistic infections. Previously, people with HIV could progress to AIDS in eight to ten years. However, since the introduction of Highly Active Anti-Retroviral Therapy (HAART) in the mid 1990s, the lifespan of an HIV infected individual on treatment has greatly increased.

Singapore's multi-pronged National HIV/AIDS Control Programme comprises education of the general public and high-risk groups, protection of the national blood supply through screening of blood and blood products, management of cases and contact tracing, epidemiological surveillance, scaling up the prevention and control of sexually-transmitted infections (STIs), and legislation.

The National HIV/AIDS Policy Committee, which comprises representatives from seven ministries (Health; Defence; Home Affairs; Social and Family Development; Manpower; Education; Communications and Information), the Communicable Disease Centre, the National Skin Centre, the Health Promotion Board, Action for AIDS and the Singapore National Employers Federation, provides guidance on all policy matters related to HIV infection/AIDS, including public health, legal, ethical, social and economic issues, and coordinates a broad-based multi-sectoral approach to the prevention and control of HIV infection/AIDS in Singapore.

A total of 408 new HIV infections were reported among Singapore residents in 2016, compared to 455 cases in 2015 (Table 5.7). This brings the cumulative total number of HIV/AIDS infections among residents since the first case was diagnosed in 1985 to 7,548, of which 1,888 had died. 41% of the newly reported patients presented with late-stage<sup>1</sup> HIV infection.

A total of 79 cases of AIDS<sup>2</sup> were reported (Table 5.8), of which 77 had no known history of HIV infection and presented with AIDS. The remaining two were previously diagnosed, asymptomatic HIV patients, who had progressed to AIDS.

The notification rate of HIV/AIDS in 2016 was 103.7 per million population, compared to 116.6 per million population in 2015 (Figure 5.3). The rates for newly-reported AIDS cases was 20.1 per million population in 2016, compared to 23.3 per million population in 2015. In 2016, 72 HIV/AIDS related deaths were reported, bringing the mortality rate to 18.3 per million population.

<sup>1</sup> Defined by CD4+ cell count of less than 200 per cu mm OR AIDS-defining opportunistic infections OR both.

<sup>2</sup> AIDS is no longer a notifiable disease since October 2016.

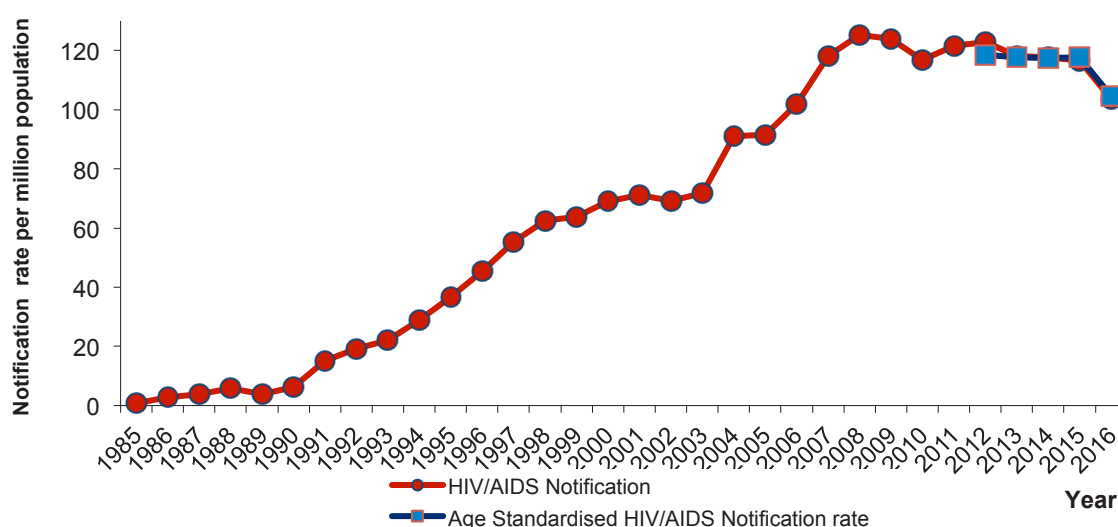
**Table 5.7**  
**Distribution of Singapore residents with HIV/AIDS by gender, 1985-2016**

<b>Year</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>	<b>No. of cases per million population</b>
1985	2	0	2	0.8
1986	6	1	7	2.8
1987	10	0	10	3.9
1988	15	0	15	5.8
1989	9	1	10	3.8
1990	17	0	17	6.2
1991	39	3	42	15.0
1992	49	6	55	19.3
1993	58	6	64	22.0
1994	76	10	86	29.1
1995	102	9	111	36.8
1996	123	16	139	45.3
1997	157	16	173	55.4
1998	167	32	199	62.6
1999	171	35	206	63.8
2000	193	33	226	69.0
2001	204	33	237	71.3
2002	206	28	234	69.2
2003	212	30	242	71.9
2004	290	21	311	91.1
2005	287	30	317	91.4
2006	327	32	359	101.8
2007	392	31	423	118.1
2008	426	30	456	125.2
2009	418	45	463	124.0
2010	403	38	441	116.9
2011	430	31	461	121.7
2012	437	32	469	122.8
2013	428	26	454	118.1
2014	422	34	456	117.8
2015	423	32	455	116.6
2016	380	28	408	103.7
<b>Total</b>	<b>6,879</b>	<b>669</b>	<b>7,548</b>	

**Table 5.8**  
**Distribution of Singapore residents with AIDS by gender, 1985-2016**

Year	Male	Female	Total	No. of cases per million population
1985	0	0	0	0
1986	1	0	1	0.4
1987	3	0	3	1.2
1988	6	0	6	2.3
1989	5	0	5	1.9
1990	8	0	8	2.9
1991	12	0	12	4.3
1992	17	1	18	6.3
1993	19	3	22	7.6
1994	44	4	48	16.2
1995	51	5	56	18.6
1996	89	3	92	30.0
1997	80	8	88	28.2
1998	112	13	125	39.3
1999	125	15	140	43.3
2000	128	15	143	43.7
2001	136	16	152	45.7
2002	133	13	146	43.2
2003	130	13	143	42.5
2004	162	11	173	50.7
2005	91	9	100	28.8
2006	118	9	127	36.0
2007	153	6	159	44.4
2008	157	5	162	44.5
2009	142	12	154	41.2
2010	151	14	165	44.0
2011	174	13	187	49.3
2012	148	11	159	41.0
2013	110	6	116	30.2
2014	110	9	119	30.7
2015	81	11	92	23.3
2016	73	6	79	20.1
<b>Total</b>	<b>2,769</b>	<b>231</b>	<b>3,000</b>	

**Figure 5.3**  
**Notification rates of HIV/AIDS in Singapore residents, 1985-2016**



### Distribution by age and gender

As in previous years, HIV/AIDS cases were predominantly male, with a male to female ratio of 10:1. In 2016, the highest notification rates were observed for males in the 20-29 age group and for females in the 50-59 age group (Table 5.9).

**Table 5.9**  
**Age-gender distribution and age-specific notification rate of HIV/AIDS in Singapore residents, 2016**

Age group	Male	Female	Total	%	Notification rate per million population*		
					Male	Female	Total
0-14	2	0	2	0.5	6.6	0	3.4
15-19	3	0	3	0.7	24.4	0	12.5
20-29	93	5	98	24.0	345.4	18.4	181.2
30-39	87	4	91	22.3	311.7	13.0	154.9
40-49	95	7	102	25.0	316.7	22.2	166.0
50-59	70	8	78	19.1	226.9	26.1	126.8
60+	30	4	34	8.3	86.7	10.2	46.0
<b>Total</b>	<b>380</b>	<b>28</b>	<b>408</b>	<b>100</b>			
<b>Crude rate</b>					<b>196.9</b>	<b>14.0</b>	<b>103.7</b>
<b>Age-standardised rate</b>					<b>199.5</b>	<b>13.7</b>	<b>104.7</b>

\*Rates are based on 2016 estimated mid-year population.  
Standardised population for age-standardised rate using 2010 mid-year population.  
(Source: Singapore Department of Statistics)

### Ethnic distribution

Among the three major ethnic groups, Malays had the highest HIV notification rate at 167.3 per million population, followed by Chinese (Table 5.10).

**Table 5.10**  
**Ethnic-gender distribution and ethnic-specific notification rate of HIV/AIDS in Singapore residents, 2016**

Ethnic group	Male	Female	Total	%	Notification rate per million population*		
					Male	Female	Total
Chinese	257	18	275	67.4	180.3	12.0	94.1
Malay	80	8	88	21.6	305.9	30.3	167.3
Indian	28	1	29	7.1	153.1	5.7	81.3
Others	15	1	16	3.9	250.9	14.7	125.4
<b>Total</b>	<b>380</b>	<b>28</b>	<b>408</b>	<b>100</b>	<b>196.9</b>	<b>14.0</b>	<b>103.7</b>

\*Rates are based on 2016 estimated mid-year population.  
(Source: Singapore Department of Statistics)

### Mode of HIV/AIDS transmission

The main mode of HIV transmission was through sexual intercourse, representing 95.3% of cases in 2016 (Table 5.11). Heterosexual transmission accounted for 36.3% of all cases in 2016, while homosexual and bisexual transmission accounted for 59.1%.



**Table 5.11**  
**Distribution of Singapore residents with HIV/AIDS by mode of transmission, 2016**

<b>Mode of transmission</b>	<b>No.</b>	<b>%</b>
Sexual Transmission		
Heterosexual	148	36.3
Homosexual	213	52.2
Bisexual	28	6.9
Intravenous drug use	4	1.0
Blood Transfusion	0	0
Renal Transplant overseas	0	0
Perinatal (mother to child)*	2	0.5
Uncertain/Others	13	3.2
<b>Total</b>	<b>408</b>	<b>100</b>

\*Children born overseas to HIV positive mothers

### **Mode of detection**

About 40.4% of the newly reported cases were detected by HIV tests done in the course of medical care provisioning. Another 27.2% were detected during routine programmatic HIV screening while 24.3% were detected as a result of voluntary HIV screening. The rest were detected through other types of screening.

**Table 5.12**  
**Distribution of Singapore residents with HIV/AIDS by mode of detection, 2016**

<b>Mode of detection</b>	<b>No.</b>	<b>%</b>
Medical care*	165	40.4
Routine programmatic HIV screening^	111	27.2
Voluntary	99	24.3
Others/Uncertain	33	8.1
<b>Total</b>	<b>408</b>	<b>100</b>

\*Included cases that presented with HIV-specific symptoms and cases with non-HIV related medical conditions.

^Included screening programmes for individuals with sexually transmitted infections, hospital inpatients and those identified through contact tracing.

### **Contact tracing and notification**

In 2016, a total of 385 HIV cases (excluding those who had died or were in prison) were identified for contact tracing. Of these, 374 cases were interviewed. The remaining cases were hospitalised, overseas or pending interview (as at 31 December 2016).

A total of 72 spouses (excluding spouses who had died, were divorced or overseas) were identified for notification under the spousal notification programme. Of these, 61 cases were notified. The remaining spouses were not notified as it was assessed that there was no ongoing risk of transmission.

A total of 316 sexual contacts were reported during contact tracing interviews conducted among cases diagnosed. Of these, 206 contacts were contactable, notified of their exposure to HIV, and advised to undergo testing. 127 of these notified contacts reported that they tested for HIV, and 22 of those tested were positive.

## HIV surveillance programmes

Table 5.13 shows the overall results for three HIV surveillance programmes in Singapore. The proportion of cases tested positive for HIV within each programme has declined or remained stable over the last five years. In 2016, the prevalence of HIV infection among cases tested in anonymous test sites was highest, at 1.0%, followed by inpatient opt-out testing and antenatal screening, at 0.17% and 0.04% respectively.

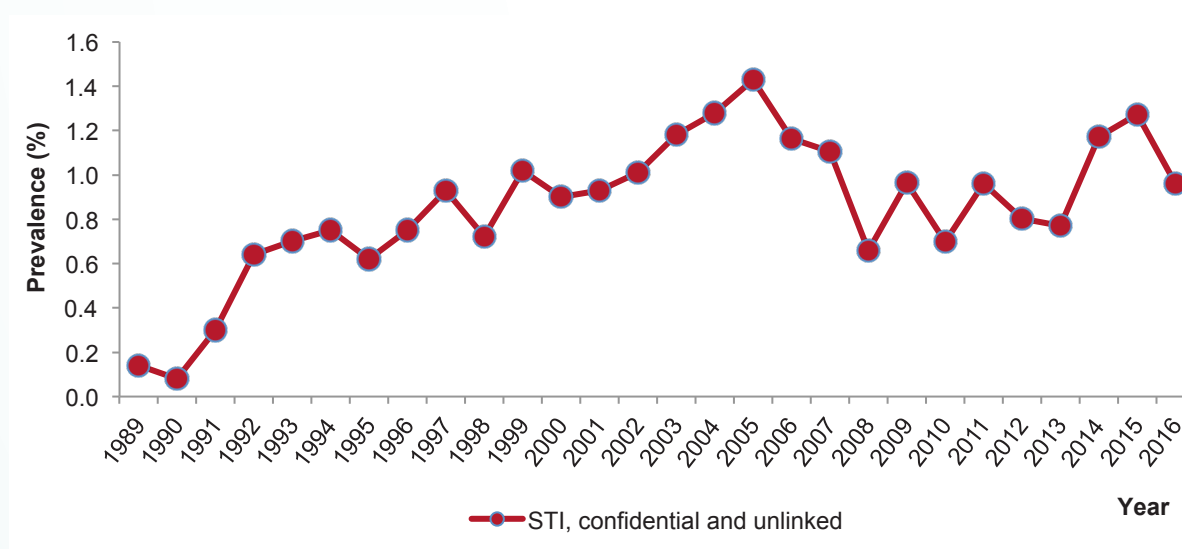
**Table 5.13**  
**Results for HIV surveillance programmes, 2012-2016**

Programme		2012	2013	2014	2015	2016
Anonymous test sites	Total number of tests done	11,243	13,893	15,950	15,641	17,781
	Number tested positive	173	227	202	223	179
	Percentage tested positive (%)	1.54	1.63	1.27	1.43	1.01
Inpatient opt-out testing	Total number of tests done	34,515	33,297	30,834	30,123	28,684
	Number tested positive	39	41	58	49	49
	Prevalence (%)	0.11	0.12	0.19	0.16	0.17
Antenatal screening	Total number of tests done	33,030	38,088	38,679	33,945	27,498
	Number tested positive	8	13	20	19	10
	Prevalence (%)	0.02	0.03	0.05	0.06	0.04

## Unlinked anonymous HIV seroprevalence surveillance

One sentinel population is currently monitored through unlinked anonymous testing to monitor HIV seroprevalence. These are the patients with sexually transmitted infections (STIs) who are seen at the Department of STI Control (DSC) clinic. The HIV seroprevalence among all STI attendees decreased slightly from 1.3% in 2015 to 1.0% in 2016 (Figure 5.4).

**Figure 5.4**  
**Unlinked anonymous HIV seroprevalence, 1989-2016**



## HIV molecular surveillance

In 2016, 20.4% of newly-diagnosed, treatment-naive HIV-positive individuals were classified as recent infections using an *in vitro* quantitative enzyme immunoassay carried out by National Public Health Laboratory (NPHL). As in previous years, the proportion of recent infections remained relatively stable over the last four years (Table 5.14). Virological surveillance of HIV strains among these recently-infected individuals revealed that the predominant circulating subtype was CRF01\_AE (64%), followed by subtype B (24%). The overall prevalence of transmitted drug resistance (TDR) to any antiretroviral (ARV) class was 3.7%. Transmitted resistance to nucleoside reverse transcriptase inhibitors (NRTIs), non-nucleoside reverse transcriptase inhibitors (NNRTIs) and protease inhibitors (PIs) were 0.8%, 3.3% and 0.8% respectively.

**Table 5.14**  
**Results for HIV molecular surveillance, 2013-2016**

HIV molecular surveillance	2013	2014	2015	2016
Total number of samples tested	123	118	116	245
Recent infections (%)	17.1	17.8	22.4	20.4
<b>Circulating subtypes (%)</b>				
CRF01_AE	47.6	60.0	61.5	64.0
Subtype B	42.9	40.0	34.6	24.0
<b>Transmitted Drug Resistance</b>				
Any drug class (%)	3.3	3.4	7.0	3.7
NRTI (%)	2.4	1.7	0.9	0.8
NNRTI (%)	0.8	1.7	2.6	3.3
PI (%)	0	0	3.5	0.8

## SEXUALLY TRANSMITTED INFECTIONS

Sexually transmitted infections (STIs) are infections caused by different pathogens (e.g. bacteria, viruses, parasites, fungi) which are spread from person to person primarily through sexual contact. The common and important STIs are caused by *Treponema pallidum* (syphilis), *Neisseria gonorrhoeae*, *Chlamydia trachomatis* (infection of the urethra, cervix, pharynx and rectum), herpes simplex virus – types 1 and 2 (anogenital herpes), human papilloma virus (anogenital warts), *Trichomonas vaginalis* (infection of the urethra and vagina) and human immunodeficiency virus (HIV) infection.

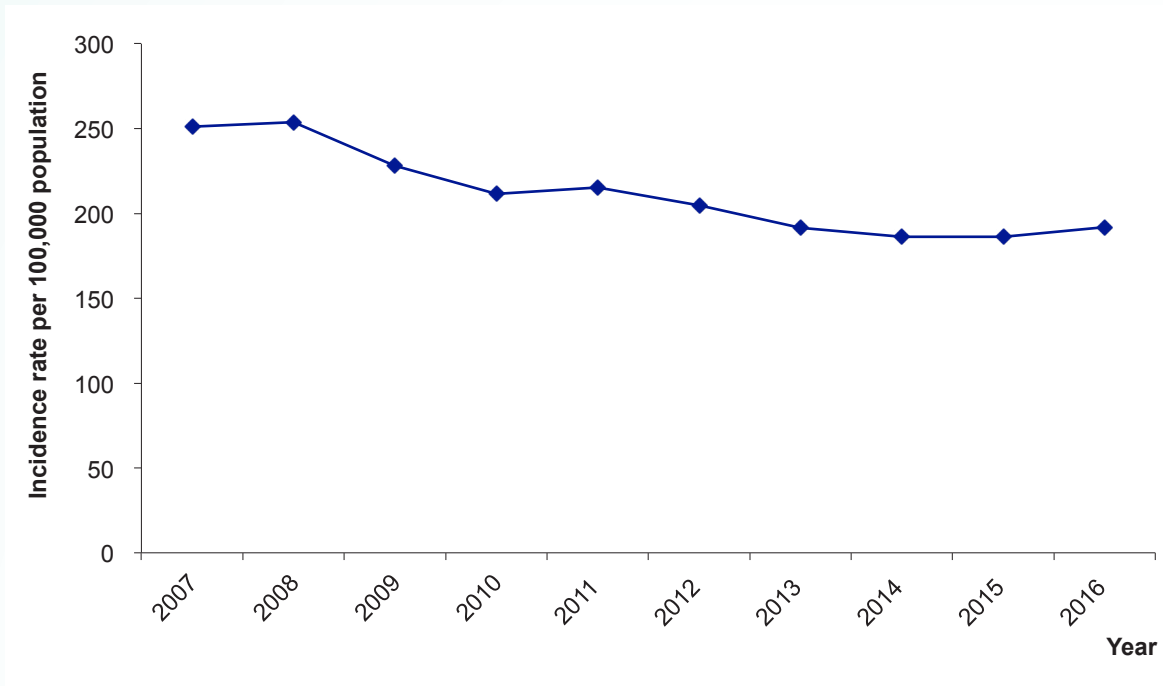
The diagnosis of an STI is a “sentinel” event which indicates unprotected sexual activity and therefore, patients presenting with one STI are at increased risk of acquisition of others. The presence of STIs can increase the risk of acquisition of HIV infection and also promote its transmission. Sexually transmissible pathogens are also implicated in other reproductive system problems such as pelvic inflammatory disease (PID), infertility and ectopic pregnancy.

The DSC Clinic of the National Skin Centre (NSC) is a public clinic for the diagnosis, treatment and control of STIs in Singapore. The DSC runs the National STI Control Programme in Singapore, and its activities include health and public education on STI/HIV, clinic services, disease detection, patient management and research.

### Disease trend

The overall incidence for STIs increased from 186 per 100,000 population in 2015 to 192 per 100,000 population in 2016. (Figure 5.5). The three main bacterial STIs notified in 2016 were chlamydia, gonorrhoea and syphilis.

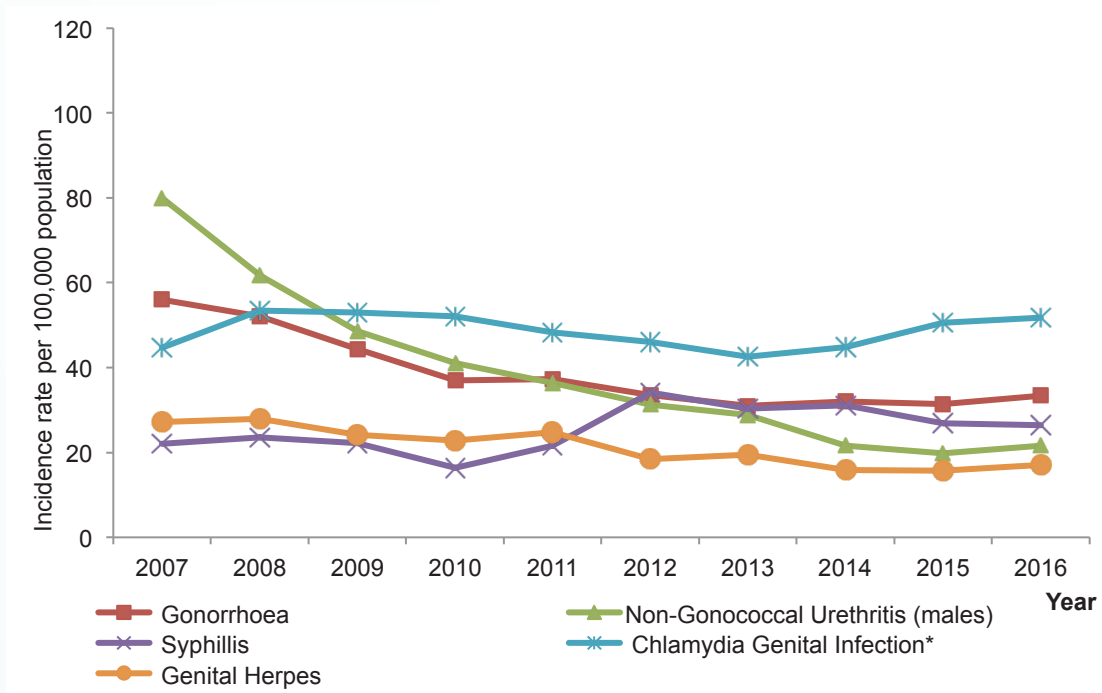
**Figure 5.5**  
**Incidence rates of STIs, 2007-2016**



**Legally notifiable STIs**

STIs which are legally notifiable under the Infectious Diseases Act (IDA) comprise gonorrhoea, non-gonococcal urethritis, syphilis, chlamydia and genital herpes. Since 19 December 2008, the IDA requires medical practitioners to notify all cases of chlamydia genital infection to NSC within 72 hours of diagnosis. The incidence rates of individual legally notifiable STIs are shown in Figure 5.6.

**Figure 5.6**  
**Incidence rates of legally notifiable STIs\*, 2007-2016**



\* Monitoring for chlamydia genital infection started in 1999, and it was made legally notifiable since 19 December 2008.

## Distribution by STIs and gender

Among the five legally notifiable STIs, the overall incidence of chlamydia was the highest, followed by gonorrhoea and syphilis. The incidence of legally notifiable STIs was higher among males than females (Table 5.15).

**Table 5.15**  
Distribution of incidence rates by STIs and gender, 2016

STIs	Incidence rates per 100,000 population*		
	Male	Female	Total
Legally Notifiable STIs			
Chlamydia	62.6	39.9	51.7
Gonorrhoea	53.4	11.7	33.4
Non-Gonococcal Urethritis (NGU)	21.6	NA	
Syphilis	38.5	13.2	26.4
Genital herpes	20.7	13.0	17.0
Other STIs			
Vaginal discharge <sup>^</sup>	NA	16.5	
Candidiasis	3.6	16.5	9.8
Genital warts	32.0	7.3	20.2
Mucopurulent cervicitis (MPC)	NA	18.5	
Chancroid	0	0	0
Others	7.0	4.1	5.6
<b>Total</b>	<b>239.4</b>	<b>140.5</b>	<b>192.0</b>

\*Rates are based on 2016 estimated mid-year population.  
(Source: Singapore Department of Statistics)  
<sup>^</sup>Trichomoniasis, bacterial vaginosis.

## Age-gender distribution

In 2016, the male to female ratio for STIs was 1.7:1. Among females, the highest age-specific incidence of STI was in the 20-24 age group, at 494.1 per 100,000 population. This was a slight decrease from 503.9 per 100,000 in 2015. Among males, the highest age-specific incidence rate was in the 25-29 age group. Similar to 2015, the rate remained highest in the 20-24 age group in 2016 (Table 5.16).

**Table 5.16**  
Age-gender distribution and incidence rate of STIs, 2016

Age group	Male	Female	Total	%	Incidence rate per 100,000 population*		
					Male	Female	Total
0-9	1	1	2	0	0.4	0.4	0.4
10-14	4	11	15	0.1	3.4	9.8	6.5
15-19	186	256	442	4.1	127.2	188.5	156.7
20-24	1,022	955	1,977	18.4	394.8	494.1	429.5
25-29	1,558	1,130	2,688	25.0	441.9	392.1	419.5
30-34	1,169	581	1,750	16.3	342.4	203.5	279.2
35-39	946	321	1,267	11.8	338.8	126.9	238.1
40-44	650	199	849	7.9	259.6	90.5	180.5
45-49	479	125	604	5.6	226.4	67.3	152.0
50-59	611	125	736	6.8	175.4	37.0	107.2
60+	367	70	437	4.1	98.0	16.0	53.7
<b>Total</b>	<b>6,993</b>	<b>3,774</b>	<b>10,767</b>	<b>100</b>	<b>239.4</b>	<b>140.5</b>	<b>192.0</b>

\* Rates are based on 2016 estimated mid-year population.  
(Source: Singapore Department of Statistics)

## Ethnic distribution

Among the three major ethnic groups, Chinese had the highest incidence rate at 197.9 per 100,000 population, followed by Malays and Indians (Table 5.17).

**Table 5.17**  
**Ethnic-gender distribution and incidence rate of STIs among Singapore residents, 2016**

Ethnic group	Male	Female	Total	%	Incidence rate per 100,000 population*		
					Male	Female	Total
Chinese	3,971	1,815	5,786	73.7	278.6	121.2	197.9
Malay	624	381	1,005	12.8	238.6	144.1	191.1
Indian	355	122	477	6.1	194.1	70.1	133.7
Others	378	206	584	7.4	632.3	303.7	457.6
<b>Total</b>	<b>5,328</b>	<b>2,524</b>	<b>7,852</b>	<b>100</b>	<b>276.1</b>	<b>125.9</b>	<b>199.6</b>

\*Rates are based on 2016 estimated mid-year population.  
(Source: Singapore Department of Statistics)

## Chlamydia

Chlamydia is the most common cause of NGU. Since 2006, there have been more cases of NGU tested for *Chlamydia trachomatis*. NGU cases which test positive for *Chlamydia trachomatis* are classified as chlamydia infection instead of NGU, resulting in a decreasing trend in the incidence of NGU and a converse trend in the incidence of chlamydia. The incidence of chlamydia has shown an increase in males and a slight decrease in females in 2016 (62.6 and 39.9 per 100,000 population respectively), compared to 2015 (57.4 and 43.0 per 100,000 population respectively) (Table 5.15).

## Syphilis

The incidence rate of syphilis was 26.4 per 100,000 population in 2016 which was similar to 2015 of 26.8 per 100,000 population

The incidence rate of infectious syphilis was between 2.4 to 5.2 per 100,000 population from 1996 to 2015. In 2016, the incidence rate of infectious syphilis was 6.2 per 100,000 population compared to 3.8 in 2015. There was one case of congenital syphilis reported in 2016.

## Gonorrhoea

The incidence rate of gonorrhoea was 33.4 per 100,000 population in 2016 compared to 31.4 in 2015. There was one case of gonococcal ophthalmia neonatorum reported in 2016.

The percentage of penicillinase-producing *Neisseria gonorrhoeae* (PPNG) detected among gonorrhoea positive cultures screened was 49.4% in 2016, which was an increase from 47.5% in 2015 (Table 5.18).

The percentage of *Neisseria gonorrhoeae* cultures resistant to ciprofloxacin decreased from 86.3% in 2015 to 81.9% in 2016 (Table 5.19).

**Table 5.18**  
**Gonorrhoea positive cultures screened for PPNG, 2007-2016**

Year	No. of gonorrhoea positive cultures	PPNG cases	
		No.	%
2007	1,424	742	52.1
2008	1,423	851	59.8
2009*	646	377	58.4
2010	162	62	38.3
2011	169	89	52.7
2012	76	28	36.8
2013	100	45	45.0
2014	320	138	43.1
2015	160	76	47.5
2016	170	84	49.4

\* There was a change in testing method in 2009, with fewer and selected cases being tested by culture.

**Table 5.19**  
**Gonorrhoea cultures screened for resistance to ciprofloxacin, 2007-2016**

Year	No. of cultures	Ciprofloxacin resistant cases	
		No.	%
2007	160	122	76.3
2008	160	119	74.4
2009	160	127	79.4
2010	160	117	73.1
2011	160	131	81.9
2012	158	117	74.1
2013	160	133	83.1
2014	160	143	89.4
2015	160	138	86.3
2016	160	131	81.9

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