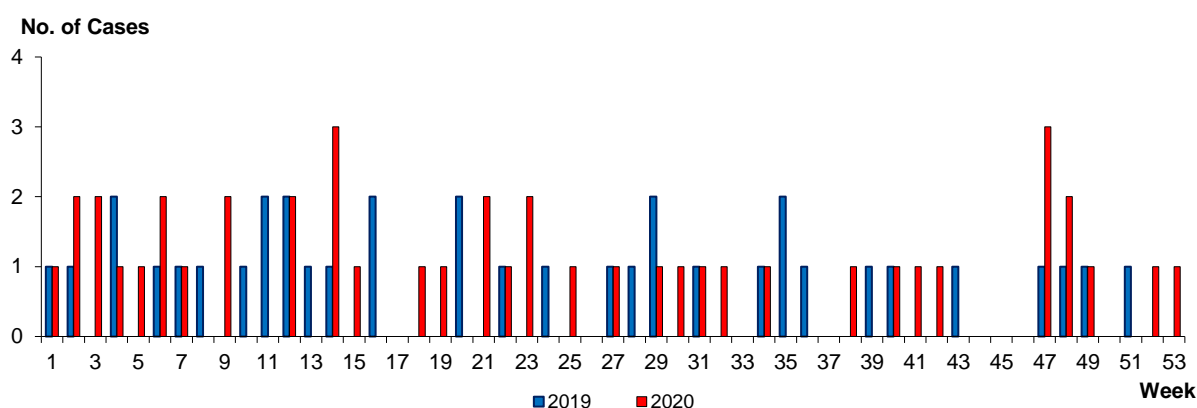


HEPATITIS B

Hepatitis B virus (HBV) 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 44 cases of acute hepatitis B were reported in 2020, compared to 36 cases reported in 2019 (Figure 5.1). All 36 cases in 2019 were serologically confirmed with the presence of hepatitis B surface antigen (HBsAg) or nucleic acid, and anti-HBc IgM antibody which is associated with acute clinical presentation. Of the 44 cases in 2020, 40 were associated with acute clinical presentation and serologically confirmed with the presence of HBsAg or nucleic acid, and anti-HBc IgM antibody. There were four seroconversion cases with a documented negative HBsAg result followed within six months by a positive test.

Figure 5.1
Weekly distribution of reported acute hepatitis B cases, 2019-2020



The resident incidence rate was highest in the 25-34 years age group and in the 35-44 years age group in 2019 and 2020, respectively. The male to female ratio among cases was 5:1 in 2019 and 6.3:1 in 2020 (Tables 5.1 and 5.2). Among the three major ethnic groups, Indians had the highest incidence rate in 2019 while in 2020 Malays had the highest incidence rate (Tables 5.3 and 5.4). The majority of the cases were local cases (77.8% in 2019) and (93.2% in 2020) (Table 5.5).

Table 5.1
Age-sex distribution and age-specific resident incidence rate of reported acute hepatitis B cases[^], 2019

Age group	Male	Female	Total	%	Resident incidence rate per 100,000 population*
0-4	0	0	0	0	0.0
5-14	0	0	0	0	0.0
15-24	0	0	0	0	0.0
25-34	11	4	15	41.7	2.6
35-44	10	1	11	30.6	1.8
45-54	8	1	9	25	1.5
55-64	1	0	1	2.8	0.2
65+	0	0	0	0	0.0
Total	30	6	36	100	-

[^] Excluded tourists and foreigners seeking medical treatment in Singapore.

*Rates are based on 2019 estimated mid-year population.

(Source: Singapore Department of Statistics)

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Table 5.2
Age-sex distribution and age-specific resident incidence rate of reported acute hepatitis B cases[^], 2020

Age group	Male	Female	Total	%	Resident incidence rate per 100,000 population*
0-4	0	0	0	0	0
5-14	0	0	0	0	0
15-24	1	1	2	4.5	0.4
25-34	10	1	11	25	1.9
35-44	11	3	14	31.8	2.3
45-54	11	0	11	25	1.8
55-64	3	0	3	6.8	0.5
65+	2	1	3	6.8	0.5
Total	38	6	44	100	-

[^] Excluded tourists and foreigners seeking medical treatment in Singapore.

*Rates are based on 2020 estimated mid-year population.

(Source: Singapore Department of Statistics)

Table 5.3
Ethnic-sex distribution and ethnic-specific incidence rate of reported acute hepatitis B cases[^], 2019

	Male	Female	Total	%	Incidence rate per 100,000 population*
Singapore residents					
Chinese	9	2	11	30.6	0.4
Malay	2	0	2	5.6	0.4
Indian	4	0	4	11.1	1.1
Others	0	0	0	0.0	0.0
Foreign residents	15	4	19	52.8	1.1
Total	30	6	36	100	0.6

[^] Excluded tourists and foreigners seeking medical treatment in Singapore.

*Rates are based on 2019 estimated mid-year population.

(Source: Singapore Department of Statistics)

Table 5.4
Ethnic-sex distribution and ethnic-specific incidence rate of reported acute hepatitis B cases[^], 2020

	Male	Female	Total	%	Incidence rate per 100,000 population*
Singapore residents					
Chinese	11	2	13	29.5	0.4
Malay	4	0	4	9.1	0.7
Indian	1	0	1	2.3	0.3
Others	4	0	4	9.1	3.1
Foreign residents	18	4	22	50.0	1.3
Total	38	6	44	100	0.8

[^] Excluded tourists and foreigners seeking medical treatment in Singapore.

*Rates are based on 2020 estimated mid-year population.

(Source: Singapore Department of Statistics)

Table 5.5
Total number of notifications[^] received for reported acute hepatitis B cases, 2016-2020

Age Group	2016		2017		2018		2019		2020	
	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	3	0	2	1	1	0	0	0	2	0
25-34	13	0	8	0	8	6	11	4	10	1
35-44	14	2	11	3	18	2	8	3	14	0
45-54	5	2	8	0	7	1	9	0	10	1
55-64	5	0	1	0	5	1	0	1	3	0
65+	2	0	4	0	2	0	0	0	2	1
Total	42	4	34	4	41	10	28	8	41	3

[^]Excluded tourists and foreigners seeking medical treatment in Singapore.

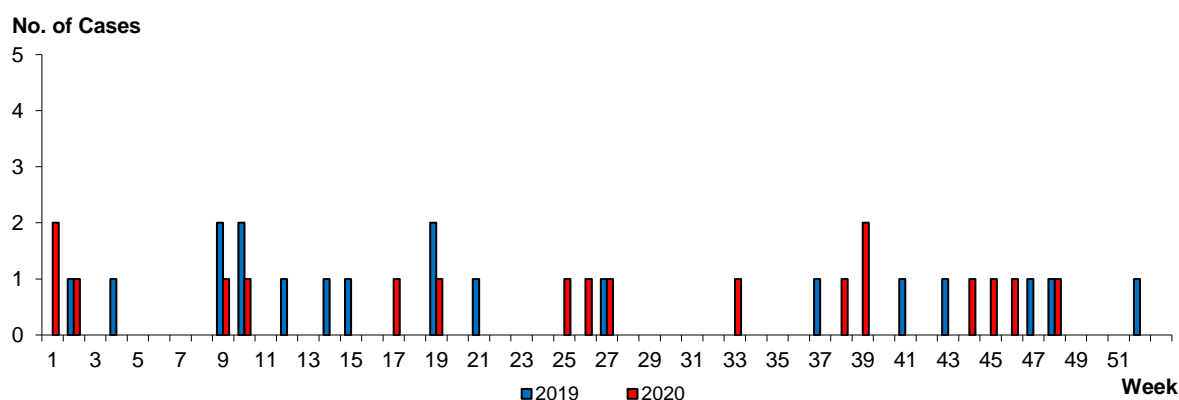
A total of 18,255 and 18,838 blood samples were screened at the KK Women's and Children's Hospital for HBsAg and HBeAg in 2019 and 2020, respectively. Of the 18,255 samples in 2019, 248 (1.4%) were HBsAg positive and 65 (0.4%) were HBeAg positive, while of the 18,838 samples in 2020, 204 (1.1%) were HBsAg positive and 35 (0.2%) 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 infectious, and HCV is most efficiently transmitted by direct percutaneous exposure to infected blood or intravenous drug use. Treatment using direct-acting antivirals (DAAs) is effective but costly.

A total of 18 cases of acute hepatitis C were reported in 2020, compared to 19 cases reported in 2019 (Figure 5.2).

Figure 5.2
Weekly distribution of reported acute hepatitis C cases, 2019-2020



The resident incidence rate was highest in the 45-54 years age group and the 25-34 years age group in 2019 and 2020, respectively. An overall male to female ratio among cases was 18:1 in 2019 and 5:1 in 2020 (Tables 5.6 and 5.7). Among the three major ethnic groups, Malays had the highest incidence rate in both 2019 and 2020 (Tables 5.8 and 5.9). All cases were local cases in 2019 while there was one imported case in 2020 (Table 5.10).

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Table 5.6
Age-sex distribution and age-specific resident incidence rate of reported acute hepatitis C cases[^], 2019

Age group	Male	Female	Total	%	Resident incidence rate per 100,000 population*
0-4	0	0	0	0	0.0
5-14	0	0	0	0	0.0
15-24	0	1	1	5.3	0.2
25-34	4	0	4	21.1	0.7
35-44	5	0	5	26.3	0.8
45-54	6	0	6	31.6	1.0
55-64	2	0	2	10.5	0.3
65+	1	0	1	5.3	0.2
Total	18	1	19	100	-

[^] Excluded tourists and foreigners seeking medical treatment in Singapore.

*Rates are based on 2019 estimated mid-year population.

(Source: Singapore Department of Statistics)

Table 5.7
Age-sex distribution and age-specific resident incidence rate of reported acute hepatitis C cases[^], 2020

Age group	Male	Female	Total	%	Resident incidence rate per 100,000 population*
0-4	0	0	0	0.0	0.0
5-14	0	0	0	0.0	0.0
15-24	1	0	1	5.6	0.2
25-34	6	2	8	44.4	1.4
35-44	6	0	6	33.3	1.0
45-54	1	0	1	5.6	0.2
55-64	1	1	2	11.1	0.3
65+	0	0	0	0.0	0.0
Total	15	3	18	100	-

[^] Excluded tourists and foreigners seeking medical treatment in Singapore.

*Rates are based on 2020 estimated mid-year population.

(Source: Singapore Department of Statistics)

Table 5.8
Ethnic-sex distribution and ethnic-specific incidence rate of reported acute hepatitis C cases[^], 2019

	Male	Female	Cases	%	Incidence rate per 100,000 population*
Singapore residents					
Chinese	10	0	10	52.6	0.3
Malay	7	1	8	42.1	1.5
Indian	1	0	1	5.3	0.3
Others	0	0	0	0.0	0.0
Foreign residents	0	0	0	0.0	0.0
Total	18	1	19	100	0.3

[^] Excluded tourists and foreigners seeking medical treatment in Singapore.

*Rates are based on 2019 estimated mid-year population.

(Source: Singapore Department of Statistics)

Table 5.9
Ethnic-sex distribution and ethnic-specific incidence rate of reported acute hepatitis C cases[^], 2020

	Male	Female	Cases	%	Incidence rate per 100,000 population*
Singapore residents					
Chinese	7	0	7	38.9	0.2
Malay	2	3	5	27.8	0.9
Indian	3	0	3	16.7	0.8
Others	1	0	1	5.6	0.8
Foreign residents	2	0	2	11.1	0.1
Total	15	3	18	100	0.3

[^] Excluded tourists and foreigners seeking medical treatment in Singapore.

*Rates are based on 2020 estimated mid-year population.

(Source: Singapore Department of Statistics)

Table 5.10
Total number of notifications[^] received for reported acute hepatitis C cases, 2016-2020

Age Group	2016		2017		2018		2019		2020	
	Local	Imported	Local	Imported	Local	Imported	Local	Imported	Local	Imported
0-4	1	0	0	0	0	0	0	0	0	0
5-14	0	0	0	0	0	0	0	0	0	0
15-24	2	0	2	0	0	0	1	0	1	0
25-34	2	1	3	0	0	0	4	0	7	1
35-44	6	0	5	0	7	0	5	0	6	0
45-54	4	0	7	0	2	0	6	0	1	0
55-64	5	0	3	0	2	0	2	0	2	0
65+	2	0	2	0	1	0	1	0	0	0
Total	22	1	22	0	12	0	19	0	17	1

[^]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. The UNAIDS Global HIV and AIDS Update for 2021 estimated 1.5 million new HIV infections and 37.7 million people living with HIV globally at the end of 2020.

HIV can be transmitted from person to person through unprotected sexual intercourse, the use of contaminated needles including the sharing of needles among intravenous drug users, transfusion of infected blood or blood products, mucosal contact with infected body fluids, 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, where a person's immune system is severely damaged and vulnerable to opportunistic infections. Previously, individuals infected with HIV could progress to AIDS in eight to ten years. However, since the introduction of anti-retroviral therapy in the mid-1990s, the life expectancy of a person living with HIV who is 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 Health Promotion Board, National Centre for Infectious Diseases

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(NCID), National Skin Centre, 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 multi-sectoral approach to the prevention and control of HIV infection and AIDS in Singapore.

A total of 261 cases of new HIV infections were reported among Singapore residents in 2020, compared to 323 cases reported in 2019 (Table 5.11). This brings the cumulative number of HIV/AIDS infections among residents since the first diagnosed case in 1985 to 8,879 in 2020. Of these cases, 2,146 were reported to have died. In 2019 and 2020, the percentage of newly reported patients who presented with late-stage¹ HIV infection were similar at 52% and 53%, respectively.

The notification rate of HIV/AIDS in 2020 was 6.5 per 100,000 population, compared to 8.0 per 100,000 population in 2019 (Table 5.11). There were 63 and 49 deaths in HIV/AIDS patients in 2019 and 2020 respectively, giving a mortality rate of 1.6 per 100,000 population in 2019 and 1.2 per 100,000 population in 2020.

Table 5.11
Distribution of Singapore residents with HIV/AIDS by sex, 1985-2020

Year	Male	Female	Total	No. of cases per 100,000* population
1985	2	0	2	0.1
1986	6	1	7	0.3
1987	10	0	10	0.4
1988	15	0	15	0.6
1989	9	1	10	0.4
1990	17	0	17	0.6
1991	39	3	42	1.5
1992	49	6	55	1.9
1993	58	6	64	2.2
1994	76	10	86	2.9
1995	102	9	111	3.7
1996	123	16	139	4.5
1997	157	16	173	5.5
1998	167	32	199	6.3
1999	171	35	206	6.4
2000	193	33	226	6.9
2001	204	33	237	7.1
2002	206	28	234	6.9
2003	212	30	242	7.2
2004	290	21	311	9.1
2005	287	30	317	9.1
2006	327	32	359	10.2
2007	392	31	423	11.8
2008	426	30	456	12.5
2009	418	45	463	12.4
2010	403	38	441	11.7
2011	430	31	461	12.2
2012	437	32	469	12.3
2013	428	26	454	11.8
2014	422	34	456	11.8
2015	423	32	455	11.7
2016	380	28	408	10.4
2017	408	26	434	10.9
2018	290	23	313	7.8
2019	308	15	323	8.0

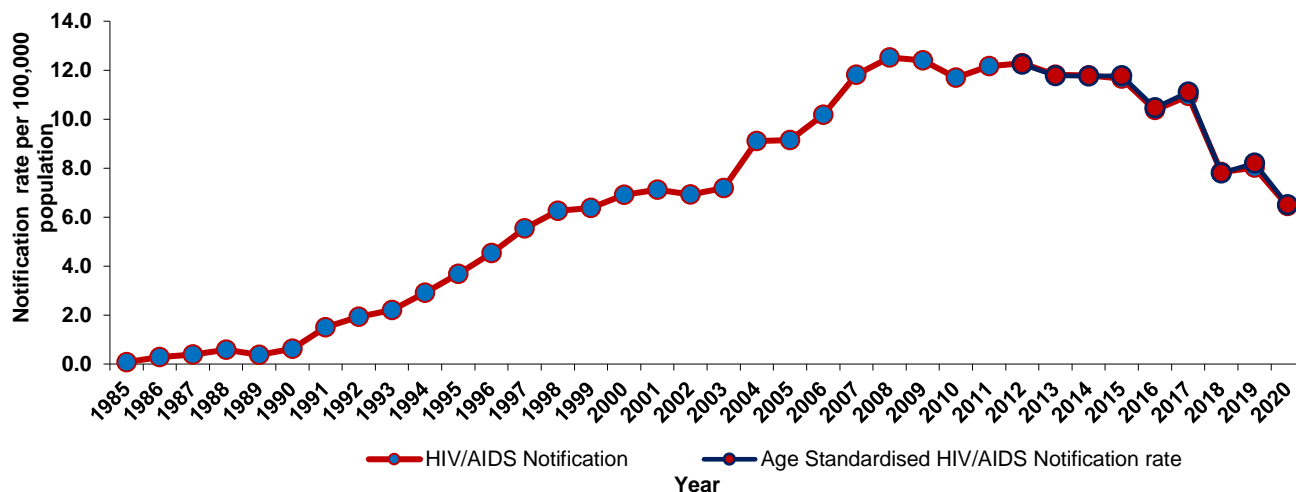
¹Defined by CD4+ cell count of less than 200 per cu mm OR AIDS-defining opportunistic infections OR both.

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2020	241	20	261	6.5
Total	8,126	753	8,879	-

*Prior to 2017, the notification rate was reported per million population instead of per 100,000.

Figure 5.3
Notification rate of HIV/AIDS in Singapore residents, 1985-2020



Distribution by age and sex

As with previous years, newly diagnosed HIV/AIDS patients were predominantly male in 2019 and 2020. The male to female ratio was 20.5:1 in 2019 and 12.1:1 in 2020 (which is comparable to the ratio of 13:1 in 2018). In both 2019 and 2020, the highest notification rate was observed in the 30-39 year age group (Tables 5.12 and 5.13). The notification rate per 100,000 population for this age group was 13.6 in 2019 and 11.7 in 2020.

Table 5.12
Age-sex distribution and age-specific notification rate of HIV/AIDS in Singapore residents, 2019

Age group	Male	Female	Total	%	Notification rate per 100,000 population*		
					Male	Female	Total
0-14	0	0	0	0.0	0.0	0.0	0.0
15-19	9	0	9	2.8	7.9	0.0	4.1
20-29	49	1	50	15.5	18.2	0.4	9.3
30-39	77	4	81	25.1	27.3	1.3	13.6
40-49	77	4	81	25.1	26.1	1.3	13.2
50-59	62	4	66	20.4	20.5	1.3	10.8
60 & above	34	2	36	11.1	8.4	0.4	4.2
Total	308	15	323	100	-	-	-
Crude rate					15.6	0.7	8.0
Age-standardised rate					16.0	0.7	8.2

*Rates are based on 2019 estimated mid-year population and standardised population for age-standardised rate using 2010 mid-year population.

(Source: Singapore Department of Statistics)

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Table 5.13
Age-sex distribution and age-specific notification rate of HIV/AIDS in Singapore residents, 2020

Age group	Male	Female	Total	%	Notification rate per 100,000 population*		
					Male	Female	Total
0-14	0	0	0	0.0	0.0	0.0	0.0
15-19	5	1	6	2.3	4.6	0.9	2.8
20-29	34	1	35	13.4	12.7	0.4	6.6
30-39	65	5	70	26.8	22.9	1.6	11.7
40-49	49	3	52	19.9	16.6	0.9	8.5
50-59	52	7	59	22.6	17.4	2.3	9.8
60 & above	36	3	39	14.9	8.5	0.6	4.3
Total	241	20	261	100	-	-	-
Crude rate					12.2	1.0	6.5
Age-standardised rate					12.3	1.0	6.5

*Rates are based on 2020 estimated mid-year population and standardised population for age-standardised rate using 2010 mid-year population.

(Source: Singapore Department of Statistics)

Ethnic distribution

Among the major ethnic groups in Singapore, Malays had the highest HIV notification rate for both 2019 and 2020 (Tables 5.14 and 5.15). The notification rate per 100,000 population for this ethnic group were 17.0 in 2019 and 11.9 in 2020 respectively.

Table 5.14
Ethnic-sex distribution and ethnic-specific notification rate of HIV/AIDS in Singapore residents, 2019

Ethnic group	Male	Female	Total	%	Notification rate per 100,000 population*		
					Male	Female	Total
Chinese	189	8	197	61.0	13.0	0.5	6.6
Malay	88	4	92	28.5	32.7	1.5	17.0
Indian	20	0	20	6.2	10.8	0.0	5.5
Others	11	3	14	4.3	18.5	4.3	10.8
Total	308	15	323	100.0	15.6	0.7	8.0

*Rates are based on 2019 estimated mid-year population.

(Source: Singapore Department of Statistics)

Table 5.15
Ethnic-sex distribution and ethnic-specific notification rate of HIV/AIDS in Singapore residents, 2020

Ethnic group	Male	Female	Total	%	Notification rate per 100,000 population*		
					Male	Female	Total
Chinese	161	11	172	65.9	11.0	0.7	5.7
Malay	61	4	65	24.9	22.5	1.5	11.9
Indian	12	3	15	5.7	6.5	1.7	4.1
Others	7	2	9	3.4	11.8	2.8	6.9
Total	241	20	261	100	12.2	1.0	6.5

*Rates are based on 2020 estimated mid-year population.

(Source: Singapore Department of Statistics)

Mode of HIV/AIDS transmission

In both 2019 and 2020, HIV transmission occurred predominantly through sexual intercourse (Table 5.16). The percentage of heterosexual transmission among new cases was 39.6% in 2019 and 36.8% in 2020. The percentage of cases that occurred in men who have sex with men, including men who

engage in bisexual activity was 57.8% in 2019 and 58.6% in 2020.

Table 5.16
Distribution of Singapore residents with HIV/AIDS by mode of transmission, 2019 and 2020

Mode of transmission	2019		2020	
	No. of cases	%	No. of cases	%
Sexual Transmission				
Heterosexual	128	39.6	96	36.8
Homosexual	161	49.8	125	47.9
Bisexual	26	8.0	28	10.7
Intravenous drug use	1	0.3	3	1.1
Blood Transfusion	0	0	0	0
Renal Transplant overseas	0	0	0	0
Perinatal (mother to child)	0	0	0	0
Uncertain/Others	7	2.2	9	3.4
Total	323	100	261	100

Mode of detection

The percentage of newly reported cases detected through the course of medical care decreased slightly from 53.9% in 2019 to 51.7% in 2020. The percentage of newly reported cases detected through routine programmatic HIV screening was 23.2% in 2019 and 24.1% in 2020 while 16.1% and 16.5% were detected through self-initiated HIV screening in 2019 and 2020 respectively (Table 5.17).

Table 5.17
Distribution of Singapore residents with HIV/AIDS by mode of detection, 2019 and 2020

Mode of detection	2019		2020	
	No. of cases	%	No. of cases	%
Medical care*	174	53.9	135	51.7
Routine programmatic HIV screening [^]	75	23.2	63	24.1
Voluntary	52	16.1	43	16.5
Others/Uncertain	22	6.8	20	7.7
Total	323	100	261	100

* 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

2019

Of the 323 newly reported HIV cases in 2019, 313 cases (excluding 10 who had died or were overseas) were identified for contact tracing, of whom 311 cases (99.4%) were interviewed. The remaining two cases were uncontactable.

Of the 72 spouses (excluding spouses who died or divorced) identified for notification under the spousal notification programme, 71 (98.6%) were successfully notified. The remaining spouse was uncontactable.

A total of 208 sexual contacts (inclusive of both spousal and non-spousal contacts) were identified through contact tracing interviews. Of these, 59.6% (124 contacts) were successfully contacted, notified of their exposure to HIV, and advised to undergo HIV testing. 90 of the notified contacts reported that they had undergone testing for HIV with 12 of them testing positive for HIV.

2020

Of the 261 newly reported HIV cases in 2020, 246 cases (excluding 15 who had died) were identified for contact tracing, of whom 244 cases (99.8%) were interviewed.

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Of the 57 spouses (excluding spouses who died, divorced or were overseas) identified for notification under the spousal notification programme, 56 (98.2%) were notified. The remaining spouse was uncontactable.

A total of 218 sexual contacts (inclusive of both spousal and non-spousal contacts) were identified through contact tracing interviews. Of these, 49.5% (108 contacts) were successfully contacted, notified of their exposure to HIV, and advised to undergo HIV testing. 70 of the notified contacts reported that they had undergone testing for HIV with 16 of them testing positive for HIV.

HIV surveillance programmes

Table 5.18 shows the results for three HIV surveillance programmes in Singapore. For the Anonymous Test Sites, the proportion testing positive was 0.64% in 2019 and 0.51% in 2020. For inpatient voluntary opt-out testing, the proportion of those tested who were HIV-positive was 0.23% in 2019 and 0.29% in 2020. For antenatal screening, the proportion of women who were HIV-positive was 0.02% in 2019 and 0.03% in 2020.

Table 5.18
Results for HIV surveillance programmes, 2016-2020

Programme		2016	2017	2018	2019	2020
Anonymous test sites	Total number of tests done	17,781	17,363	16,539	16,906	8,791
	Number tested positive ¹	179	182	112	109	45
	Proportion positive (%)	1.01	1.05	0.68	0.64	0.51
Inpatient voluntary opt-out testing*	Total number of tests done	29,309	23,897	18,231	13,325	13,162
	Number tested positive ²	59	58	65	30	38
	Proportion positive (%)	0.20	0.24	0.36	0.23	0.29
Antenatal screening*	Total number screened	38,855	36,768	35,649	36,318	34,736
	Number of HIV positive ³	10	14	22	9	11
	Proportion positive (%)	0.03	0.04	0.06	0.02	0.03

¹ Based only on screening test results at the Anonymous Test Sites only.

² Upon screening followed by confirmatory assays for HIV positive status.

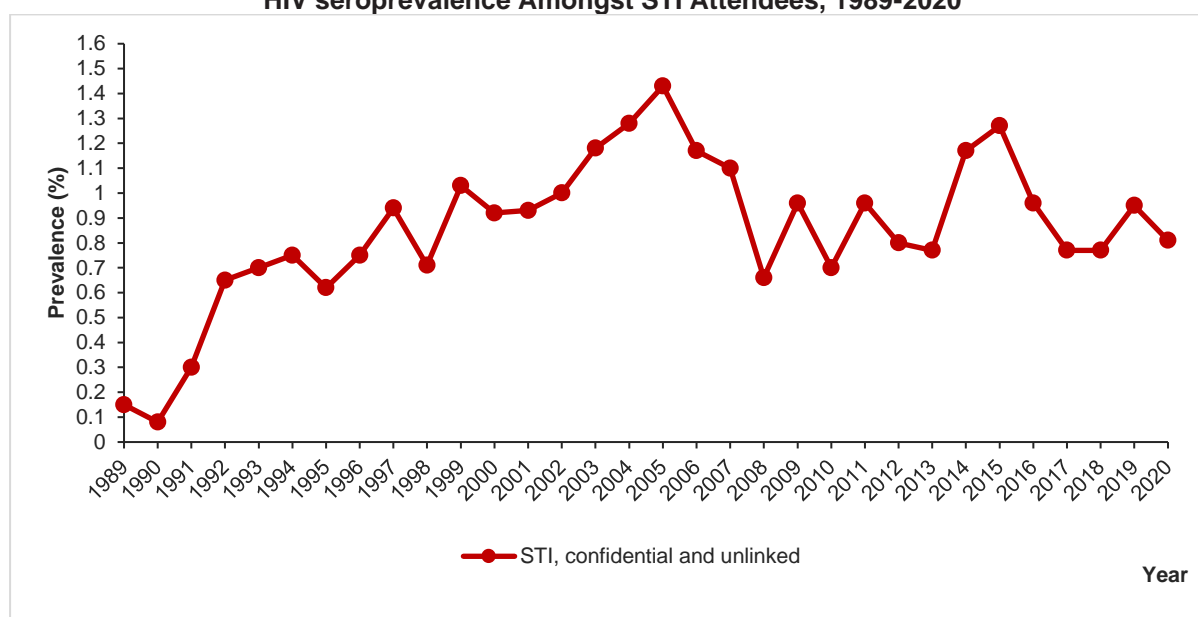
³ Number of HIV-positive includes women reported to be HIV-positive prior to pregnancy and those confirmed to be HIV-positive during that pregnancy.

* Figures revised after a data review by the National Public Health and Epidemiology Unit of National Centre for Infectious Diseases in 2019 – 2020.

HIV seroprevalence in patients with sexually transmitted infections (STIs)

HIV seroprevalence in patients with sexually transmitted infections (STIs) who are seen at the Department of STI Control (DSC) clinic is monitored by a combination of unlinked anonymous testing and voluntary confidential testing for HIV. The HIV seroprevalence among STI attendees at DSC decreased from 0.95% in 2019 to 0.81% in 2020 (Figure 5.4).

Figure 5.4
HIV seroprevalence Amongst STI Attendees, 1989-2020



HIV molecular surveillance

The virological surveillance of HIV strains in newly-diagnosed, treatment-naïve HIV-positive individuals is performed on plasma specimens obtained from public hospitals using a limiting antigen avidity enzyme immunoassay by the National Public Health Laboratory (NPHL). 20.6% of 126 samples and 19.8% of 116 samples tested in 2019 and 2020 respectively, were classified as recent infections (Table 5.19). Among these recently infected individuals, the predominant circulating subtype was CRF01_AE (76.9% in 2019; 69.6% in 2020), followed by subtype B (11.5% in 2019; 21.7% in 2020). CRF01_AE has been the predominant subtype observed in recently infected cases since 2013.

Among the 126 and 116 newly diagnosed, treatment-naïve HIV-positive cases in 2019 and 2020 respectively, the overall prevalence of transmitted drug resistance (TDR) to any antiretroviral drug class was 7.1% in 2019 and 6.0% in 2020. TDR to non-nucleoside reverse transcriptase inhibitors (NNRTIs), nucleoside reverse transcriptase inhibitors (NRTIs) and protease inhibitors (PIs) were 7.1%, 1.6% and 1.6% respectively in 2019, and 6.0%, 0.9% and 0.9% respectively in 2020 (Table 5.19). The most common TDR mutations conferring resistance to NNRTIs were K103N, followed by K101EP and Y181C.

Table 5.19
Results for HIV molecular surveillance programme, 2016-2020

HIV molecular surveillance	2016	2017	2018	2019	2020
Total number of samples tested	245	160	130	126	116
Recent infections (%)	20.4	23.8	16.9	20.6	19.8
Circulating subtypes (%)					
CRF01_AE	64.0	52.6	63.6	76.9	69.6
Subtype B	24.0	34.2	27.3	11.5	21.7
Transmitted Drug Resistance (%)					
Any drug class	3.7	3.1	3.8	7.1	6.0
NRTI	0.8	1.3	0.8	1.6	0.9
NNRTI	3.3	1.9	2.3	7.1	6.0
PI	0.8	1.3	0.8	1.6	0.9

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 and cancers), *Trichomonas vaginalis* (infection of the urethra and vagina) and Human Immunodeficiency Virus (HIV).

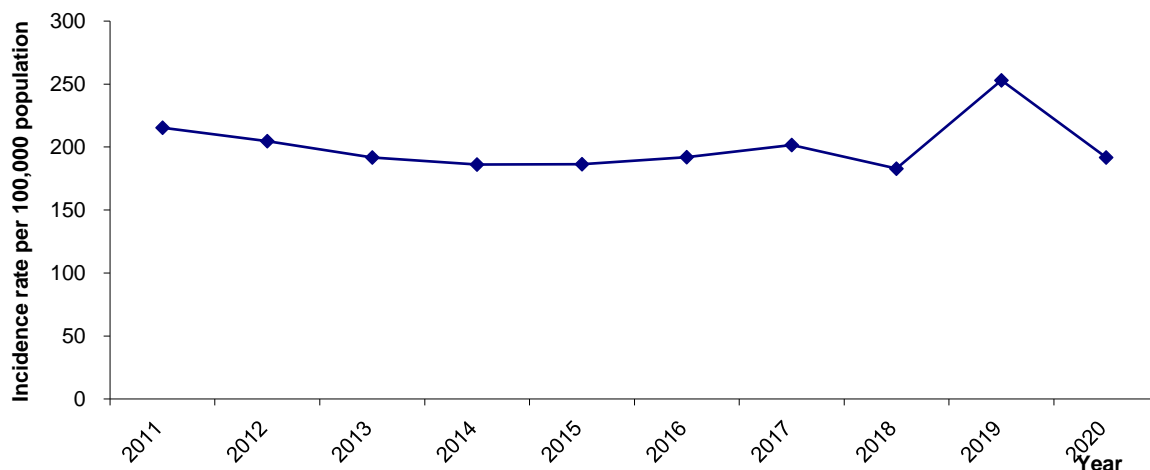
STIs are also surrogate markers for unprotected sexual activity. Patients presenting with one STI are at increased risk of harbouring another STI. The presence of STIs can increase the risk of contracting, as well as transmitting HIV infection. Sexually transmissible pathogens are also implicated in other reproductive system problems such as pelvic inflammatory disease (PID), infertility and ectopic pregnancy.

The Department of STI Control (DSC) Clinic of the National Skin Centre (NSC) is a specialist outpatient 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 decreased from 253 per 100,000 population in 2019 to 191.8 per 100,000 population in 2020 (Figure 5.6).

Figure 5.6
Incidence rate of STIs, 2011-2020*



* Due to the changes in processing and reporting, 2019 and 2020 data may not have excluded duplicated notifications. The process will be strengthened over the next few years to minimise duplicated notifications.

Legally notifiable STIs

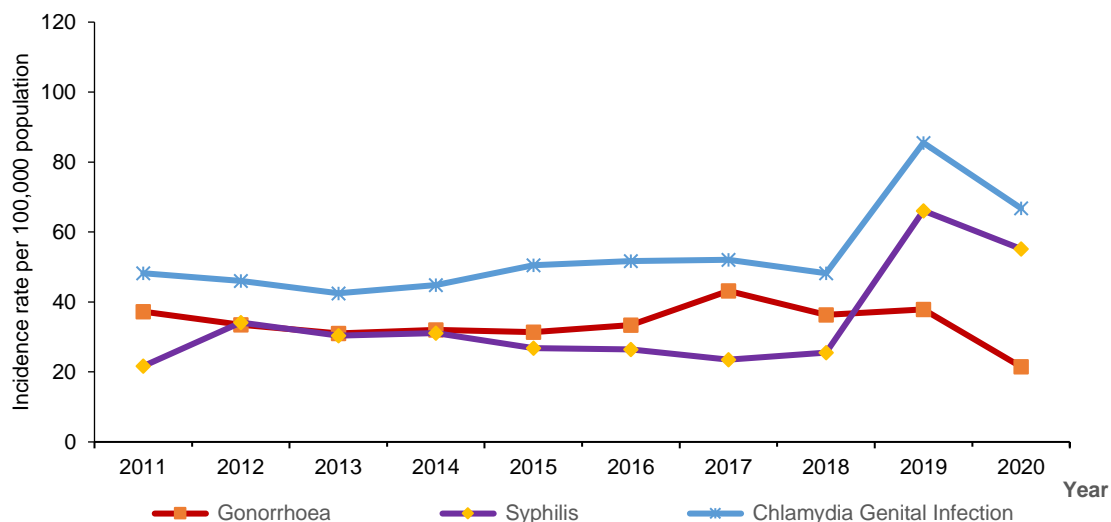
STIs which are currently legally notifiable under the Infectious Diseases Act (IDA) comprise of gonorrhoea, syphilis, and chlamydia. Genital Herpes and Non-Gonococcal Urethritis (NGU) ceased to be legally notifiable with effect from 31 January 2019. The incidence rate of each of the legally notifiable STIs are shown in Table 5.20 and Figure 5.7. In 2019 and 2020, among the three legally notifiable STIs, the incidence of chlamydia was the highest, followed by syphilis and gonorrhoea. The incidence rate of all the three STIs decreased in 2020 when compared to 2019. Among the notified syphilis cases, the incidence rate of infectious syphilis decreased from 8.6 per 100,000 population in 2019 to 5.1 in 2020; and there were no cases of congenital syphilis in 2019 and two cases in 2020. No gonococcal

ophthalmia neonatorum cases were reported in 2019 and 2020.

Table 5.20
Incidence rate of legally notifiable STIs, 2016-2020

Legally notifiable STIs	Incidence rate per 100,000 population				
	2016	2017	2018	2019	2020
Chlamydia	51.7	52.0	48.2	85.5	66.8
Gonorrhoea	33.4	43.2	36.4	37.9	21.5
Syphilis	26.4	23.6	25.6	66.1	55.1

Figure 5.7
Incidence rate of legally notifiable STIs, 2011-2020



Distribution by sex and ethnicity

Due to changes in processing of the notifications, to ascertain the sex and ethnic distribution of cases with STIs, cases seen at the DSC clinic which manages the majority of the STIs reported locally, are used as a proxy. The incidence of legally notifiable STIs was higher among males than females (Table 5.21). Among the three major ethnic groups, Chinese had the highest incidence rates in 2019 and 2020 followed by Malays and Indians (Tables 5.22 and 5.23).

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Table 5.21
Distribution of incidence rate by STIs and sex, 2019 and 2020
Incidence rate per 100,000 population*

STIs	2019			2020		
	Male	Female	Total	Male	Female	Total
Legally Notifiable STIs						
Chlamydia	48.1	24.4	36.6	33.7	15.6	26.9
Gonorrhoea	28.0	6.4	17.5	20.9	2.3	11.8
Syphilis	22.6	8.0	15.5	16.2	5.9	11.2
Other STIs						
Non-Gonococcal Urethritis (NGU)	22.7	NA	NA	13.9	NA	NA
Genital herpes	12.2	4.4	8.4	9.5	4.2	6.9
Vaginal discharge [^]	NA	14.3	NA	NA	9.2	NA
Candidiasis	3.0	14.8	8.7	2.3	11.5	6.8
Genital warts	26.1	6.0	16.3	25.5	4.5	15.3
Mucopurulent cervicitis (MPC)	NA	11.7	NA	NA	9.0	NA
Chancroid	0	0	0	0	0	0
Others	6.4	3.0	4.7	4.7	2.1	3.4
Total	169.2	93.0	132.1	130.7	64.4	98.4

*Rates are based on cases notified by DSC Clinic and 2019 estimated mid-year population.

(Source: Singapore Department of Statistics)

[^]Trichomoniasis, bacterial vaginosis.

Table 5.22
Ethnic-sex distribution and ethnic-specific incidence rate of STIs among Singapore residents, 2019

Ethnic group	Male	Female	Total	%	Incidence rate per 100,000 population*		
					Male	Female	Total
Chinese	2,989	1,329	4,318	75.1	205.3	86.4	144.2
Malay	463	254	717	12.5	172.2	93.4	132.6
Indian	236	107	343	6.0	127.3	60.4	94.6
Others	233	135	368	6.4	392.3	193.7	285.1
Total	3,921	1,825	5,746	100	199.1	88.7	142.7

*Rates are based on cases notified by DSC Clinic and 2019 estimated mid-year population.

(Source: Singapore Department of Statistics)

Table 5.23
Ethnic-sex distribution and ethnic-specific incidence rate of STIs among Singapore residents, 2020

Ethnic group	Male	Female	Total	%	Incidence rate per 100,000 population*		
					Male	Female	Total
Chinese	2,368	1,037	3,405	74.9	162.0	67.1	113.2
Malay	360	162	522	11.5	132.7	59.1	95.7
Indian	206	60	266	5.8	111.0	34.0	73.4
Others	213	143	356	7.8	359.1	203.3	274.5
Total	3,147	1,402	4,549	100	159.1	67.8	112.5

*Rates are based on cases notified by DSC Clinic and 2020 estimated mid-year population.

(Source: Singapore Department of Statistics)

Gonorrhoea susceptibility

The percentage of gonorrhoea cultures with decreased susceptibility to ceftriaxone decreased from 9.19% in 2019 to 7.33% in 2020. (Table 5.24). There was one resistant case detected in 2019 and nil

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cases detected in 2020.

The percentage of gonorrhoea cultures resistant to ciprofloxacin was stable at 81.1% in 2019 and 81.9% in 2020. (Table 5.25).

Table 5.24
Susceptibility of gonorrhoea cultures to ceftriaxone, 2011-2020*

Year	No. of gonorrhoea cultures	Decreased Susceptibility (%)	Susceptible (%)	Resistant (%)
2011	160	6.9	93.1	0
2012	148	14.2	85.8	0
2013	160	14.4	85.6	0
2014	160	9.4	90.6	0
2015	160	7.5	92.5	0
2016	160	6.2	93.8	0
2017	239	5.4	94.6	0
2018	294	4.8	94.9	0.3
2019	381	9.2	90.3	0.5
2020	232	7.3	92.7	0

* Prior to 2017, the percentage of penicillinase-producing *Neisseria gonorrhoeae* (PPNG) detected among gonorrhoea positive cultures screened was reported. As penicillin is no longer used in the treatment of gonorrhoea with effect from 2017, susceptibility of gonorrhoea to ceftriaxone is reported instead.

Table 5.25
Gonorrhoea cultures screened for resistance to ciprofloxacin, 2011-2020

Year	No. of cultures	Ciprofloxacin resistant cases	
		No. of cases	(%)
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
2017	239	209	87.5
2018	294	246	83.7
2019	381	309	81.1
2020	232	190	81.9