VI
HIV/AIDS, STIs, TUBERCULOSIS & LEPROSY

HUMAN IMMUNODEFICIENCY VIRUS INFECTION AND ACQUIRED IMMUNODEFICIENCY SYNDROME

Human immunodeficiency virus (HIV) belongs to the lentivirus group of the retrovirus family. HIV, the cause of the Acquired Immunodeficiency Syndrome (AIDS), continues to spread. Since the disease first appeared in 1981, almost 75 million people have been infected with the virus and about 36 million have died of AIDS worldwide. Globally, 35.3 million [32.2–38.8 million] people were living with HIV at the end of 2012.

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 a HIV infected individual on treatment has become comparable to someone without HIV infection.

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, the AIDS Business Alliance, 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.

In 2013, a total of 454 Singapore residents were newly reported to have HIV infection, a decrease of 3.2% from 469 cases in 2012 (Table 6.1). This brings the cumulative total number of HIV/AIDS infections among residents since the first case was diagnosed in 1985 to 6,229, of whom 3,108 persons are asymptomatic carriers, 1,450 have or have had AIDS-related illnesses and 1,671 have died.

During 2013, 116 cases of AIDS were reported (Table 6.2), including 109 with AIDS at diagnosis of HIV infection and seven previously diagnosed asymptomatic HIV-infected patients who progressed to AIDS. These 109 cases with AIDS at diagnosis comprised 24% of the newly reported cases. 41% of the newly reported patients presented with late-stage [1] HIV infection.

The notification rate of HIV/AIDS in 2013 was 118.1 per million population, compared to 122.8 per million population in 2012 (Figure 6.1). The AIDS morbidity rate was 30.2 per million population in 2013, compared to 40.9 per million population in 2012. In 2013, 89 deaths in HIV/AIDS patients were reported, giving a mortality rate of 23.1 per million population. Table 6.1

[1] As defined by CD4+ cell count of less than 200 per cu mm or AIDS-defining opportunistic infections or both.

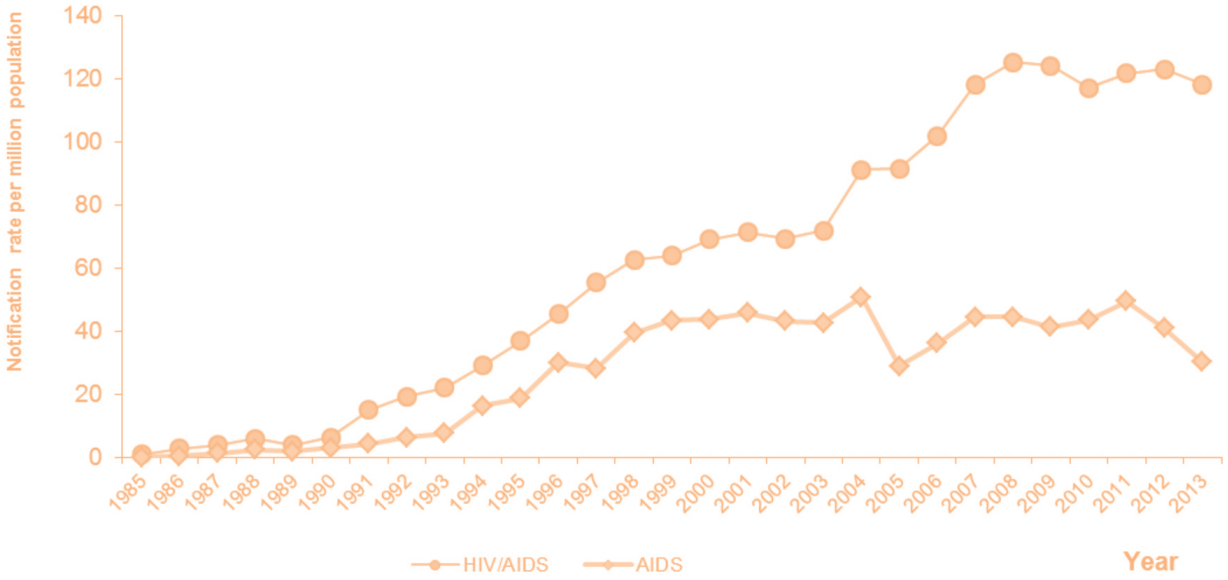
Table 6.1
Distribution of Singapore residents with HIV/AIDS by gender, 1985 – 2013

Year	Male	Female	Total	No. of cases per million population
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
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
Total	**5,654**	**575**	**6,229**	**-**

Table 6.2
Distribution of Singapore residents with AIDS by gender, 1985 – 2013

Year	Male	Female	Total	No. of cases per million population
1985	0	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	13	164	43.5
2011	174	13	187	49.3
2012	145	11	156	40.9
2013	110	6	116	30.2
Total	**2,502**	**204**	**2,706**	**-**

Figure 6.1
Notification rate of HIV/AIDS among Singapore residents, 1985 – 2013



Distribution by age and gender

As in previous years, HIV/AIDS cases were predominantly male with a male to female ratio of 16:1. In 2013, the highest notification rates were observed for both males and females in the 30 - 39 years age group (Table 6.3).

Table 6.3
Age-gender distribution and age-specific notification rates of HIV/AIDS among Singapore residents, 2013

					Notification rate per million population*		
Age	**Male**	**Female**	**Total**	**(%)**	**Male**	**Female**	**Total**
0 - 14	0	0	0	0%	0.0	0.0	0.0
15-19	2	1	3	1%	15.4	8.0	11.8
20-29	86	5	91	20%	333.3	18.9	174.2
30-39	102	8	110	24%	353.3	25.5	182.6
40-49	108	6	114	25%	347.3	18.9	181.3
50-59	86	4	90	20%	288.0	13.5	151.5
60 & above	44	2	46	10%	151.2	6.0	73.4
Total	**428**	**26**	**454**	**100%**	**226.3**	**13.3**	**118.1**

*Rates are based on 2013 mid-year population.
(Source: Singapore Department of Statistics)

Ethnic Distribution

Among the three major ethnic groups, the Malays had the highest HIV notification rate at 183.3 per million population, followed by the Chinese and the Indians (Table 6.4).

Table 6.4
Ethnic-gender distribution and ethnic-specific notification rates of HIV/AIDS among Singapore residents, 2013

					Notification rate per million population*		
Ethnic group	**Male**	**Female**	**Total**	**(%)**	**Male**	**Female**	**Total**
Chinese	310	13	323	71%	222.2	8.9	113.2
Malay	81	13	94	21%	317.4	50.5	183.3
Indian	22		22	5%	121.6	0.0	62.6
Others	15		15	3%	248.9	0.0	118.6
Total	**428**	**26**	**454**	**100%**	**22.6**	**1.3**	**11.8**

*Rates are based on 2013 mid-year population
(Source: Singapore Department of Statistics)

Biographic profile of HIV/AIDS patients

Of the 454 new cases in 2013, 66% were single, while 23% were married, 9% were divorced/separated and 2% were widowed at the time of diagnosis (Table 6.5).

Among the male cases, 68% were single at the point of diagnosis. For the females, however, the majority (54%) were married.

Table 6.5
Distribution of Singapore residents with HIV/AIDS by marital status, 2013

Marital status	**Male**	**Female**	**Total**	**(%)**
Single	292	8	300	66%
Married	92	14	106	23%
Divorced	38	3	41	9%
Widowed	6	1	7	2%
Total	**428**	**26**	**454**	**100%**

Mode of HIV/AIDS transmission

The main mode of HIV transmission was through sexual contact, representing 95% of cases in 2013 (Table 6.6). Heterosexual transmission accounted for 39.9% of all cases in 2013 while homosexual and bisexual transmission accounted for 54.6%. There were four cases infected via intravenous drug use, accounting for 0.9% of the new cases. Two of these were detected as a result of prison screening and the other two were due to HIV-related symptoms.

Table 6.6
Distribution of Singapore residents with HIV/AIDS by mode of transmission, 2013

Mode of Transmission	No.	(%)
Sexual Transmission		
Heterosexual	181	39.9%
Homosexual	210	46.3%
Bisexual	38	8.4%
Intravenous drug use	4	0.9%
Blood Transfusion	0	0.0%
Renal Transplant overseas	0	0.0%
Perinatal (mother to child)	0	0.0%
Uncertain/Others	21	4.6%
Total	**454**	**100.00%**

HIV surveillance programmes

Table 6.7 shows the overall results for the three HIV surveillance programmes in Singapore. The proportion of cases tested positive for HIV within each programme has remained stable over the last four years. In 2013, the prevalence of HIV infection among cases tested in anonymous test sites was highest, at 1.6%, followed by inpatient opt-out testing and antenatal screening, at 0.12% and 0.09% respectively.

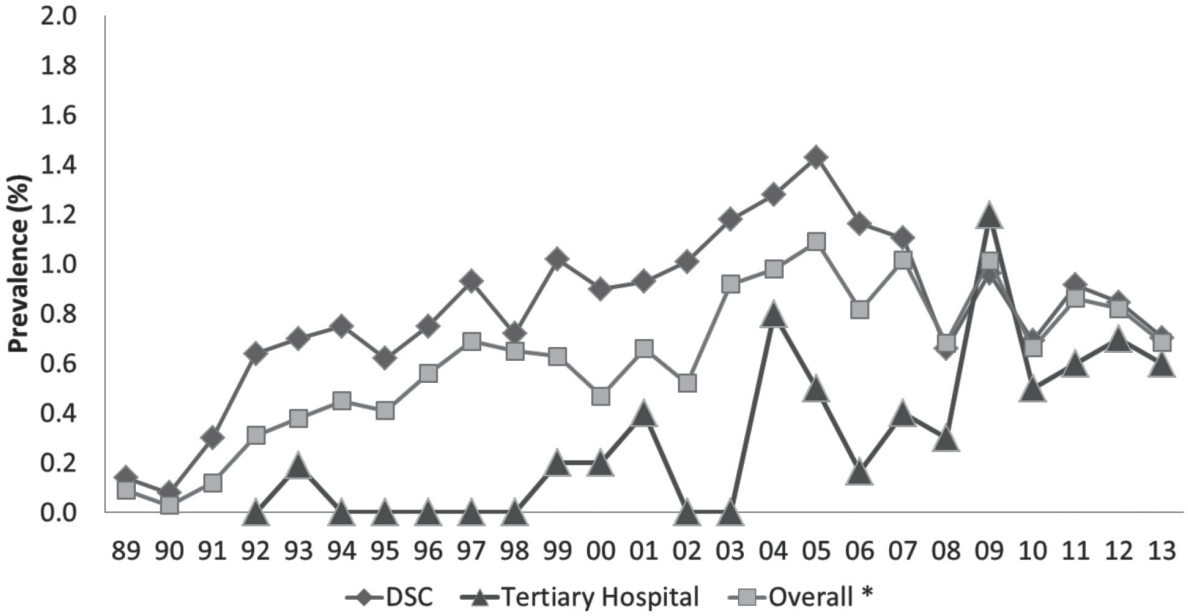
Table 6.7: Results for HIV Surveillance Programmes, 2010 – 2013

Programme		Year			
		2010	2011	2012	2013
Anonymous test sites	Total number of tests done	9,592	9,370	11,243	13,893
test sites	Number tested positive	134	184	173	227
	Percentage tested positive	1.4	2.0	1.5	1.6
Inpatient opt-out testing	Total number of tests done	31,601	35,015	34,515	33,297
	Number tested positive	41	34	39	41
	Prevalence (%)	0.13	0.10	0.11	0.12
Antenatal screening	Total number of tests done	13,915	14,439	14,950	14,877
	Number tested positive	8	11	8	13
	Prevalence (%)	0.06	0.08	0.05	0.09

HIV unlinked anonymous sero-surveillance programme

Two sentinel populations are currently monitored through unlinked anonymous testing (UAT) to monitor HIV seroprevalence. They are patients with sexually transmitted infections (STIs) attending the Department of STI Control (DSC) clinic; and inpatients at one tertiary Restructured Hospital. The HIV seroprevalence among STI attendees peaked in 2005 at 1.4% and decreased to 0.7% in 2013. Among inpatients, there has been an increasing trend in the HIV seroprevalence. In 2013, the seroprevalence was 0.6%. The overall HIV seroprevalence in 2013 was 0.7% (Figure 6.2).

Figure 6.2
Unlinked HIV Seroprevalence, 1989-2013



*Overall includes data from the other surveillance populations

HIV molecular surveillance program

In 2013, the proportion of recently-infected individuals in newly-diagnosed HIV patients was estimated at 17.1% in treatment-naïve patients (n=123). Among these recently-infected patients, the predominant circulating HIV subtype was CRF01_AE (47.6%), followed by subtype B (42.9%). The overall prevalence of transmitted drug resistance (TDR) to any antiretroviral (ARV) class was 3.3% in 2013. Transmitted resistance to nucleoside reverse transcriptase inhibitors (NRTI) and non-nucleoside reverse transcriptase inhibitors (NNRTI) were 2.4% and 0.8% respectively.

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.

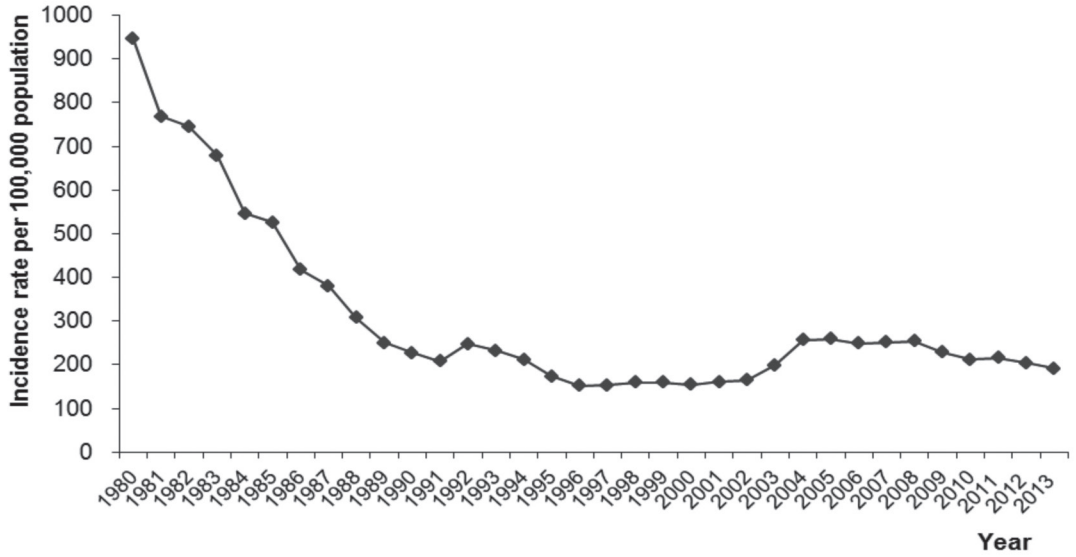
The diagnosis of an STI is a “sentinel” event which indicates unprotected sexual activity and therefore, patients presenting with one STI are at increased risk of acquisition of others. The presence of STIs can increase the risk of acquisition of HIV infection and also promote its transmission. Sexually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

The Department of STI Control (DSC) Clinic of the National Skin Centre (NSC) is a public clinic for the diagnosis, treatment and control of sexually transmitted infections (STI) 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 was 192 per 100,000 population in 2013. The STI incidence rate increased by 6% from 155 per 100,000 population in 2000 to 165 per 100,000 population in 2002, and then increased sharply by 29% from 199 per 100,000 population in 2003 to 257 in 2004 per 100,000 population. The rate dropped to 250 per 100,000 population in 2006, and thereafter remained similar until 2008. The rate then dropped further to 192 per 100,000 population in 2013 (Figure 6.3). The three main bacterial STIs notified in 2013 were chlamydia, gonorrhoea and syphilis.

Figure 6.3
Incidence rate of STIs, 1980 – 2013

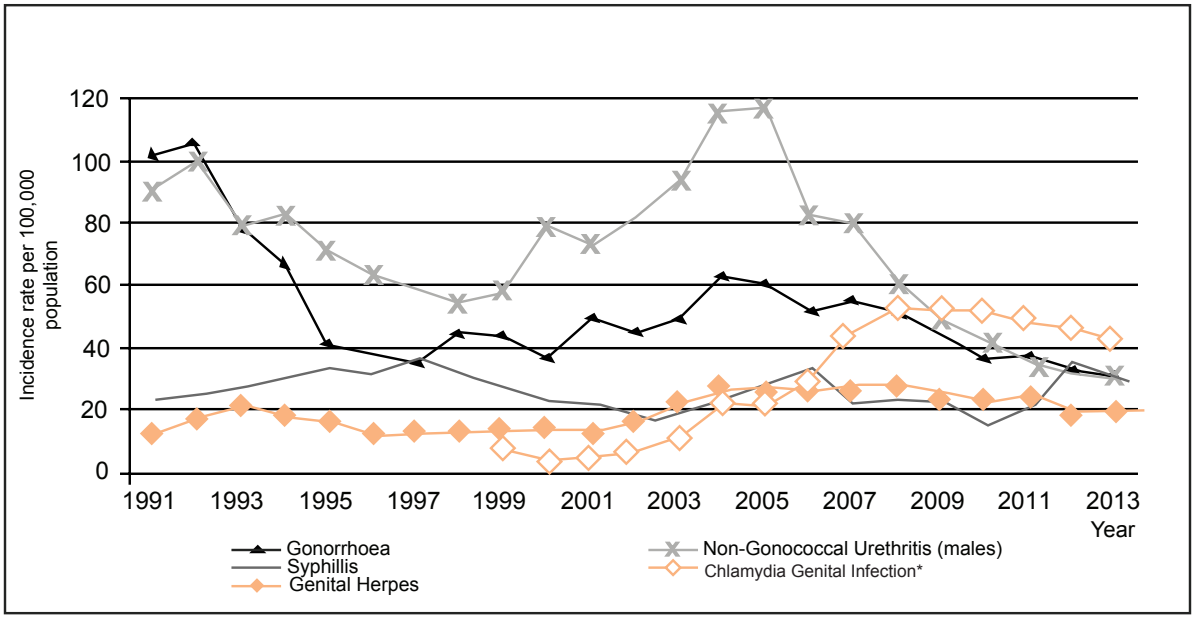


Legally Notifiable STIs

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.

In the past two decades, the incidence of legally notifiable STIs was highest at 201 per 100,000 population in 1992, followed by 197 per 100,000 in 2005 and thereafter it decreased to 129 per 100,000 in 2013. The incidence rates of individual legally notifiable STIs are shown in Figure 6.4.

Figure 6.4
Incidence rate of legally notifiable STIs, 1992 – 2013



* Monitoring for chlamydia genital infection started in 1999, and it was made legally notifiable since 19 Dec 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 6.8).

Table 6.8
Distribution of incidence rates by STIs and gender, 2013

STIs	Incidence rate per 100,000 population*		
	Male	Female	Total
Legally Notifiable STIs			
Chlamydia	51.9	32.1	42.5
Gonorrhoea	49.7	10.4	31.0
Non-Gonococcal Urethritis (NGU) [per 100,000 male population]	28.9	-1	-1
Syphilis	35.4	24.9	30.4
Genital Herpes	23.9	14.7	19.5
Other STIs			
Vaginal discharge (per 100,000 female population)	-2	14.6	-2
Candidiasis	4.0	20.7	12.0
Genital Warts	33.5	6.6	20.7
Mucopurulent cervicitis (MPC) [per 100,000 female population]	-3	17.2	8.2
Chancroid	0.0	0.0	0.0
Others	6.4	4.2	5.4
All types	**233.7**	**145.5**	**191.6**

* Rates are based on 2013 estimated mid-year population.
(Source: Singapore Department of Statistics)

[1] Not applicable, as NGU occurs only in males.
[2] Not applicable, as vaginal discharge occurs only in females.
[3] Not applicable, as MPC occurs only in females.

Distribution by age and gender

In 2013, the male to female ratio for STIs was 1.8:1. As in previous years, the age-specific incidence rate for STIs among females was highest in the age group 20 – 24 years. Among the males, the highest age-specific incidence rate was in the age group 25 - 29 years. The overall rate was highest in the 20 – 24 year age group (Table 6.9).

Table 6.9
Age-gender distribution of STIs incidence rates, 2013

				Incidence rate per 100,000 population*		
Age (Yrs)	**Male**	**Female**	**Total (%)**	**Male**	**Female**	**Total**
0 – 9	0	2	2 (0.0)	0.0	0.9	0.4
10 – 14	1	9	10 (0.1)	0.8	7.5	4.0
15 – 19	126	256	382 (3.7)	80.5	175.7	126.4
20 – 24	977	1,033	2,010 (19.4)	363.8	491.1	419.7
25 – 29	1,385	956	2,341 (22.6)	397.1	337.7	370.5
30 – 34	1,222	575	1,797 (17.4)	384.0	212.3	305.0
35 – 39	836	344	1,180 (11.4)	311.0	147.2	234.8
40 – 44	667	247	914 (8.8)	270.4	119.7	201.8
45 – 49	462	131	593 (5.7)	222.4	72.3	152.4
50 – 54	340	73	413 (4.0)	191.0	43.1	118.8
55 – 59	256	41	297 (2.9)	167.7	26.4	96.4
60+	329	79	408 (3.9)	103.7	21.0	58.8
Total	**6,601**	**3,746**	**10,347 (100)**	**233.7**	**145.5**	**191.6**

* Rates are based on 2013 estimated mid-year population.
(Source: Singapore Department of Statistics)

Ethnic Distribution

Among the three major ethnic groups, the Malays had the highest incidence rate at 213.9 per 100,000 population, followed by the Chinese and the Indians (Table 6.10).

Table 6.10
Ethnic-gender distribution and ethnic-specific notification rates of STIs among Singapore residents, 2013

					Incidence rate per 100,000 population*		
Ethnic group	**Male**	**Female**	**Total**	**(%)**	**Male**	**Female**	**Total**
Chinese	3,448	1,504	4,952	(72.1)	247.1	103.3	173.5
Malay	611	486	1,097	(16.0)	239.4	188.6	213.9
Indian	358	115	473	(6.9)	197.9	67.3	134.5
Others	213	131	344	(5.0)	353.5	197.8	271.9
Total	**4,630**	**2,236**	**6,866**	**(100.0)**	**244.8**	**114.5**	**178.6**

*Rates are based on 2013 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 overall incidence of chlamydia peaked in 2009 at 55 per 100,000 population and decreased to 43 per 100,000 population in 2013 (Figure 6.3). The incidence of chlamydia among males increased sharply from 11 per 100,000 population in 2006 to 59 per 100,000 in 2010 overtaking the incidence among females in 2009. It decreased to 52 per 100,000 population in 2013. The incidence of chlamydia among females increased from 49 per 100,000 population in 2006 to 62 per 100,000 in 2008 before decreasing to 32 per 100,000 population in 2013 (Table 6.8).

Syphilis

The incidence rate of syphilis was 30 per 100,000 population in 2013 which was a 11.8% decrease from 34 per 100,000 population in 2012. From a historical perspective, the incidence rate of syphilis decreased from 45 per 100,000 population in 1980 to 23 per 100,000 population in 1991. From 1992, there was an increase in the incidence rate from 26 per 100,000 population to 36 per 100,000 population in 1997. Subsequently it declined to 18 per 100,000 population in 2002 before rising to 36 per 100,000 population in 2006 and dropping to its lowest point at 16 per 100,000 population in 2010 (Figure 6.3).

The rate of infectious syphilis declined progressively from 18 per 100,000 population in 1986 to 3 per 100,000 population in 1999. It then increased to 5 per 100,000 population in 2004 and remained stable at 4 per 100,000 population to 2009. In 2013, the rate of infectious syphilis was 3 per 100,000 population. There were no cases of congenital syphilis reported in 2013.

Gonorrhoea

The incidence rate of gonorrhoea was 31 per 100,000 population in 2013. Gonorrhoea has been on a decreasing trend since 2004 when the incidence rate was 63 per 100,000 population (Figure 6.3). There were no cases of gonococcal ophthalmia neonatorum reported in 2013.

The percentage of penicillinase-producing Neisseria gonorrhoeae (PPNG) detected among Gonorrhoea positive cultures screened was 45.0% in 2013, which was an increase from 36.8% in 2012 (Table 6.11). The percentage of Neisseria gonorrhoeae cultures resistant to Ciprofloxacin increased from 74.1% in 2012 to 83.1% in 2013 (Table 6.12).

Table 6.11
Gonorrhoea cultures screened for PPNG, 1980 – 2013

Year	No. of Gonorrhoea positive cultures	PPNG cases	
		No.	(%)
1980	8,318	2,462	29.6
1985	3,789	1,316	34.7
1990	2,323	766	33.0
1991	1,894	686	36.2
1992	1,755	622	35.4
1993	1,300	489	37.6
1994	1,046	530	50.7
1995	642	315	49.1
1996	721	383	53.1
1997	722	438	60.7
1998	804	451	56.1
1999	797	413	51.8
2000	651	359	55.1
2001	936	482	51.5
2002	929	462	49.7
2003	200	89	44.5
2004	1,549	699	45.1
2005	1,499	735	49.0
2006	1,347	653	48.5
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

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

Table 6.12
Gonorrhoea cultures screened for resistance to ciprofloxacin, 1998 – 2013

Year	No. of cultures	Ciprofloxacin resistant cases	
		No.	(%)
1998	768	55	7.2
1999	768	131	17.1
2000	635	121	19.1
2001	741	207	27.9
2002	200	93	46.5
2003	200	103	51.5
2004	160	80	50.0
2005	160	95	59.4
2006	160	99	61.9
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

TUBERCULOSIS

Tuberculosis (TB) is a mycobacterial disease that is a major cause of death and disability in many parts of the world especially in developing countries. Initial tuberculous infection usually goes unnoticed and is a condition known as latent TB infection (LTBI). About 10% of immunocompetent adults with LTBI will eventually progress to active disease, and half of them will do so in the first two years following infection. The risk of progression to active disease is increased in immunocompromised persons and children under 5 years of age.

The National TB Control Programme was established in the late 1950s with the setting up of the Tuberculosis Control Unit and a National TB registry. The programme was enhanced with the launch of the Singapore Tuberculosis Elimination Programme (STEP) in 1997. The main aim of STEP is to eliminate TB in Singapore by detecting, diagnosing and treating all infectious TB cases, identifying and treating infected tuberculosis contacts; and preventing the emergence of multidrug-resistant tuberculosis.

Incidence and site of disease among Singapore's total population (i.e. citizens, permanent residents, and long-staying foreigners)

A total of 2,962 cases of TB were notified in 2013. This comprised 1,420 new and 119 relapsed cases among Singapore residents (citizens and PRs) and 1,381 new and 42 relapsed cases among non-residents (long-and short-term pass holders)

A total of 2,028 new cases of TB were notified among Singapore residents (citizens and PRs) and long-staying foreigners in 2013. The incidence rate of TB was 37.6 per 100,000 population in 2013. (Figure 6.5)

The majority (86.3%) of cases had pulmonary TB with or without extra-pulmonary involvement, while the remainder (13.7%) had exclusively extrapulmonary TB (Table 6.13).

Figure 6.5
Incidence rate of tuberculosis among Singapore residents and long-staying foreigners, 2002-2013

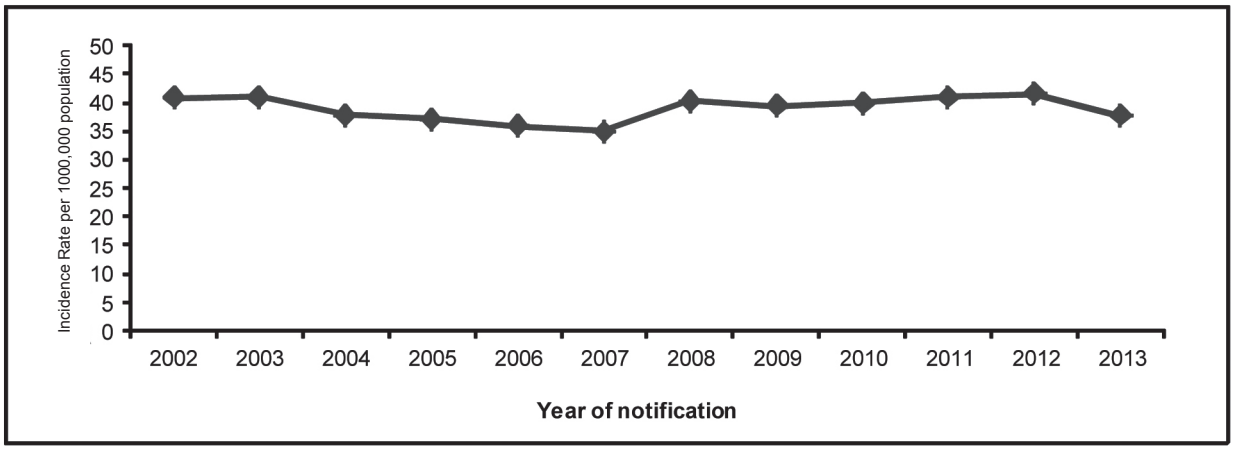


Table 6.13
Distribution of new TB cases by site of disease among Singapore residents and long-staying foreigners, 2002 – 2013

Year	New Cases			Incidence rate per 100,000 population			Index (base 2002)
	Pulmonary[1]	Extra pulmonary	Total	Pulmonary[1]	Extra pulmonary	Total	
2002	1,494	208	1,702	35.8	5.0	40.8	100.0
2003	1,461	223	1,684	35.5	5.4	40.9	100.4
2004	1,346	232	1,578	32.3	5.6	37.9	92.9
2005	1,352	234	1,586	31.7	5.5	37.2	91.2
2006	1,320	261	1,581	30.0	5.9	35.9	88.1
2007	1,349	259	1,608	29.4	5.6	35.0	86.0
2008	1,611	340	1,951	33.3	7.0	40.3	98.9
2009	1,624	342	1,966	32.6	6.9	39.4	96.7
2010	1,727	301	2,028	34.0	5.9	39.9	98.0
2011	1,811	315	2,126	34.9	6.1	41.0	100.6
2012	1,897	306	2,203	35.7	5.8	41.5	101.7
2013	1,750	278	2,028	32.4	5.1	37.6	92.2

[1] Pulmonary TB refers to TB of the lung parenchyma and includes cases that have both pulmonary and extrapulmonary tuberculosis.

Distribution by age and gender

Of the 2,028 new cases notified in 2013, 885 (43.6%) were 50 years old and above, and 1,276 (62.9%) were males. TB continues to be a disease among older males, as shown in the age and gender-specific incidence rates. (Table 6.14)

Table 6.14
Age-gender distribution and incidence rates of reported tuberculosis among Singapore residents and long-staying foreigners, 2013

				Incidence rate per 100,000 population*		
Age (Yrs)	Male	Female	Total (%)	Male	Female	Total
0 – 4	3	2	5 (0.25)	2.6	1.8	2.2
5 – 9	2	1	3 (0.15)	1.7	0.9	1.3
10 – 14	3	1	4 (0.2)	2.4	0.8	1.6
15 – 19	24	21	45 (2.2)	15.3	14.4	14.9
20 – 29	181	234	415 (20.5)	29.3	47.4	37.4
30 – 39	173	181	354 (17.5)	29.5	35.9	32.4
40 – 49	220	97	317 (15.6)	48.4	25.0	37.7
50 – 59	263	62	325 (16.0)	79.5	19.1	49.6
60 – 69	180	60	240 (11.8)	91.4	28.1	58.5
70 – 79	150	47	197 (9.7)	170.1	43.4	100.3
80 +	77	46	123 (6.1)	239.6	84.3	141.9
Total	**1,276**	**752**	**2,028 (100.0)**	**45.2**	**29.2**	**37.6**

* Rates are based on 2013 mid-year population.
(Source: Singapore Department of Statistics)

In 2013, among the 1,750 new pulmonary TB cases in Singapore residents and long-staying foreigners, 1,669 (95.4%) had bacteriological tests done. The proportion found to have demonstrable bacillary disease was 64.9% (Table 6.15)

Table 6.15
Bacillary status of new pulmonary tuberculosis cases among Singapore residents and long-staying foreigners, 2002 – 2013

Year	No. tested for bacillary disease	% of notified pulmonary cases tested	No. of pulmonary cases with bacillary disease	% of pulmonary cases tested positive	Incidence rate per 100,000 population
2002	1,421	95.1	1,001	70.4	24.0
2003	1,395	95.5	1,040	74.6	25.3
2004	1,262	93.8	1,009	80.0	24.2
2005	1,283	94.9	1,084	84.5	25.4
2006	1,268	96.1	1,060	83.6	24.1
2007	1,291	95.7	1,007	78.0	21.9
2008	1,544	95.8	1,177	76.2	24.3
2009	1,548	95.3	1,147	74.1	23.0
2010	1,652	95.7	1,169	70.8	23.0
2011	1,770	97.7	1,259	71.1	24.3
2012	1,816	95.7	1,213	66.8	22.8
2013	1,669	95.4	1,084	64.9	20.1

The table includes only bacteriological investigations (smear and/or cultures) done from three months before to two weeks after the date of notification or date of starting treatment, whichever earlier.

Incidence and site of disease in Singapore Residents (citizens and permanent residents)

The incidence rate of TB was 36.9 per 100,000 population in 2013. From a historical perspective, the incidence rate of TB declined from 307 per 100,000 population in 1960 to 56.3 per 100,000 population in 1987. From 1987 to 1997, the incidence rate of new TB cases among Singapore citizens and permanent residents stagnated around 50-55 per 100,000 population. Following enhanced TB control measures implemented by STEP, the incidence rate declined from 56.9 per 100,000 population in 1998 to a historical low of 35.1 per 100,000 population in 2007. However, in 2008, the incidence rate increased for the first time in ten years to 39.8 per 100,000 population. Between 2009-2012, the incidence rate stagnated at 38.6 to 40.9 per 100,000 population, before decreasing to 36.9 per 100,000 in 2013 (Figure 6.6).

Of the 1,420 new TB cases among Singapore residents notified in 2013, the majority (88.0%) of cases had pulmonary TB with or without extra-pulmonary involvement, while 12.0% had exclusively extrapulmonary TB (Table 6.16). The most common site of extrapulmonary TB was the lymphatic system (123 new cases in 2013) followed by the pleura (110 new cases in 2013). There was no case of tuberculosis meningitis reported among Singapore residents below 15 years of age.

Figure 6.6
Incidence rate of tuberculosis among Singapore residents, 1960 – 1980 and 1987-2013

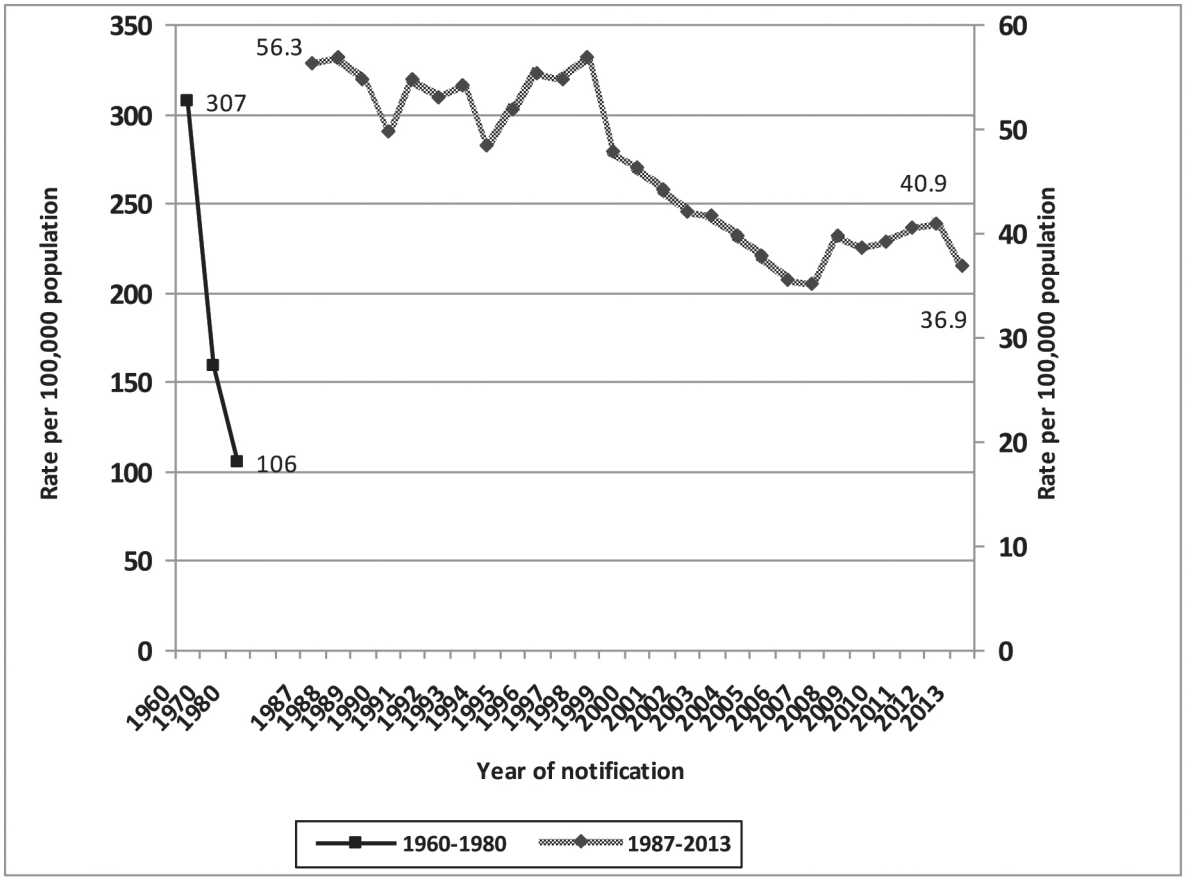


Table 6.16
Distribution of new TB cases by site of disease among Singapore Residents, 1960 – 2013

Year	New Cases			Incidence rate per 100,000 population			Index (base 2002)
	Pulmonary[1]	Extra pulmonary	Total	Pulmonary[1]	Extra pulmonary	Total	
1960	4,985	72	5,057	303	4.0	307.0	100.0
1970	3,135	157	3,292	151	8.0	159.0	51.8
1980	2,253	164	2,417	99	7.0	106.0	34.5
1987	1,346	92	1,438	52.7	3.6	56.3	18.3
1988	1,374	104	1,478	52.9	4.0	56.9	18.5
1989	1,350	102	1,452	51.0	3.9	54.8	17.9
1990	1,243	123	1,366	45.4	4.5	49.9	16.3
1991	1,410	121	1,531	50.5	4.3	54.8	17.9
1992	1,380	130	1,510	48.4	4.6	53.0	17.3
1993	1,471	105	1,576	50.6	3.6	54.3	17.7
1994	1,322	112	1,434	44.7	3.8	48.5	15.8
1995	1,448	116	1,564	48.1	3.8	51.9	16.9
1996	1,591	105	1,696	51.9	3.4	55.3	18.0
1997	1,577	135	1,712	50.5	4.3	54.8	17.9
1998	1,655	155	1,810	52.0	4.9	56.9	18.5
1999	1,405	138	1,543	43.5	4.3	47.8	15.6
2000	1,359	159	1,518	41.5	4.9	46.4	15.1
2001	1,278	196	1,474	38.4	5.9	44.3	14.4
2002	1,271	154	1,425	37.6	4.6	42.1	13.7
2003	1,230	173	1,403	36.5	5.1	41.7	13.6
2004	1,176	184	1,360	34.5	5.4	39.8	13.0
2005	1,142	174	1,316	32.9	5.0	37.9	12.4
2006	1,071	185	1,256	30.4	5.2	35.6	11.6
2007	1,074	182	1,256	30.0	5.1	35.1	11.4
2008	1,208	243	1,451	33.2	6.7	39.8	13.0
2009	1,205	237	1,442	32.3	6.3	38.6	12.6
2010	1,265	213	1,478	33.5	5.6	39.2	12.8
2011	1,309	224	1533	34.5	5.9	40.5	13.2
2012	1,359	201	1,560	35.6	5.3	40.9	13.3
2013	1,249	171	1,420	32.5	4.4	36.9	12.0

[1] Pulmonary TB refers to TB of the lung parenchyma and includes cases that have both pulmonary and extrapulmonary tuberculosis.

Distribution by age and gender

As in previous years, TB in Singapore residents (citizens and PRs) continues to be a disease of older males (Table 6.17). Of the 1420 new cases notified in 2013, 854 (60.1%) were 50 years old and above, and 986 (69.4%) were males. The TB incidence rate among males decreased from 58.7 per 100,000 population in 2012 to 52.1 per 100,000 population in 2013, while that among females remained stable at 22.2 per 100,000 population compared to 23.6 per 100,000 population in 2012.

Table 6.17
Age-gender distribution and incidence rates of reported tuberculosis among Singapore residents, 2013

Age (Yrs)	Male	Female	Total (%)	Incidence rate per 100,000 population*		
				Male	Female	Total
0 – 4	1	0	1 (0.1)	1.1	0.0	0.5
5 – 9	1	1	2 (0.2)	1.0	1.0	1.0
10 – 14	3	1	4 (0.3)	2.6	0.9	1.8
15 – 19	17	19	36 (2.5)	13.1	15.2	14.1
20 – 29	57	64	121(8.5)	22.1	24.2	23.2
30 – 39	87	78	165 (11.6)	30.1	24.9	27.4
40 – 49	169	68	237 (16.7)	54.3	21.4	37.7
50 – 59	247	56	303 (21.3)	82.7	19.0	51.0
60 – 69	178	58	236 (16.6)	98.5	31.0	64.1
70 – 79	149	44	193 (13.6)	186.7	45.6	109.4
80 +	77	45	122 (8.6)	252.5	86.9	148.3
Total	**986**	**434**	**1,420 (100.0)**	**52.1**	**22.2**	**36.9**

* Rates are based on 2013 mid-year population.
(Source: Singapore Department of Statistics)

Ethnic distribution

As in previous years, Malays had the highest TB incidence among the three main ethnic groups. The incidence rate in Malays decreased from 66.1 per 100,000 in 2012 to 57.3 per 100,000 population in 2013. Over the same period, the incidence rate in the Chinese population decreased from 37.6 per 100,000 population to 34.3 per 100,000 population, while that of the Indians was stable at 26.4 per 100,000 population (Table 6.18)

Table 6.18
Ethnic-gender distribution and ethnic-specific incidence rates of reported tuberculosis among Singapore residents, 2013

Ethnic group	Male	Female	Total	Incidence rate per 100,000 population*
Chinese	688	292	980 (69.0)	34.3
Malay	210	84	294 (20.7)	57.3
Indian	66	27	93 (6.6)	26.4
Others	22	31	53 (3.7)	41.9
Total	**986**	**434**	**1,420 (100.0)**	**36.9**

*Rates are based on 2013 mid-year population.
(Source: Singapore Department of Statistics)

Clinical presentation and bacteriological status

In 2013, 1,207 (96.6%) of the 1,249 new pulmonary TB cases in Singapore residents had bacteriological tests done. The proportion found to have demonstrable bacillary disease was 72.8% (Table 6.19).

Table 6.19
Bacillary status of new pulmonary tuberculosis cases among Singapore Residents, 1987 – 2013

Year	No. tested for bacillary disease	% of notified pulmonary cases tested	No. of pulmonary cases with bacillary disease	% of pulmonary cases tested positive	Incidence rate per 100,000 population
1987	1,299	96.5	665	51.2	26.0
1988	1,341	97.6	710	52.9	27.3
1989	1,307	96.8	764	58.5	28.9
1990	1,183	95.2	741	62.6	27.1
1991	1,362	96.6	870	63.9	31.1
1992	1,330	96.4	843	63.4	29.6
1993	1,394	94.8	887	63.6	30.5
1994	1,255	94.9	861	68.6	29.1
1995	1,361	94.0	919	67.5	30.5
1996	1,550	97.4	1,034	66.7	33.7
1997	1,534	97.3	1,001	65.3	32.0
1998	1,617	97.7	1,114	68.9	35.0
1999	1,382	98.4	994	71.9	30.8
2000	1,326	97.6	888	67.0	27.1
2001*	1,218	95.3	878	72.0	26.4
2002	1,250	98.4	903	72.2	26.7
2003	1,204	97.9	911	75.7	27.1
2004	1,107	94.1	892	80.6	26.1
2005	1,092	95.6	933	85.4	26.9
2006	1,034	96.5	885	85.6	25.1
2007	1,036	96.5	844	81.5	23.6
2008	1,177	97.4	952	80.9	26.1
2009	1,164	96.6	937	80.5	25.1
2010	1,236	97.7	951	76.9	25.2
2011	1,276	97.5	977	76.6	25.8
2012	1,321	97.2	981	74.3	25.7
2013	1,207	96.6	879	72.8	22.9

* Starting with 2001, the table includes only bacteriological investigations (smear and/or cultures) done from three months before to two weeks after the date of notification or date of starting treatment, whichever earlier.

Relapsed TB cases

In 2013, there were 119 relapsed TB cases notified among Singapore residents. This accounted for 7.7%of all cases (new & relapse) among Singapore residents (Table 6.20).

Table 6.20
Singapore residents with relapsed tuberculosis by gender, 2009 – 2013

Age (Years)	No. of relapses									
	2009		2010		2011		2012		2013	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
0 – 9	0	1	0	0	0	0	0	0	0	0
10 – 19	0	1	0	0	0	0	2	0	0	3
20 – 29	1	1	2	3	1	4	1	3	0	2
30 – 39	4	2	4	2	1	4	4	5	5	3
40 – 49	14	6	12	5	9	6	11	2	12	3
50 – 59	16	3	16	4	33	11	22	4	20	2
60 – 69	31	3	15	9	22	4	34	3	20	5
70 +	34	8	40	14	52	11	42	3	37	7
Total	**100**	**25**	**89**	**37**	**118**	**40**	**116**	**20**	**94**	**25**
Male & Female	**125**		**126**		**158**		**136**		**119**	

Distribution of TB cases among Singapore residents by country of birth (local vs. foreign-born)

Of the 1,420 new cases notified among residents in 2013, 1,171 (82.5%) were Singapore-born and 248 (17.5%) were foreign-born. Of the 119 relapsed TB cases notified among residents, 108 (90.8%) were Singapore-born and 11 (9.2%) were foreign-born (Table 6.21).

Table 6.21
Distribution of TB cases by age group and country of birth among Singapore Residents, 2012 – 2013

Age (Years)	New cases						Relapsed cases					
	2012			2013			2012			2013		
	S'pore-born	For-eign born	Unk#	S'pore-born	For-eign born	Unk#	S'pore-born	For-eign born	Unk#	S'pore-born	For-eign born	Unk#
0 – 9	2	1	0	2	1	0	0	0	0	0	0	0
10 – 19	47	4	0	40	0	0	1	1	0	3	0	0
20 – 29	112	20	0	103	18	0	3	1	0	1	1	0
30 – 39	128	57	0	102	63	0	4	5	0	6	2	0
40 – 49	216	32	0	196	41	0	13	0	0	15	0	0
50 – 59	312	29	0	277	26	0	25	1	0	21	1	0
60 – 69	249	36	0	200	36	0	35	2	0	25	0	0
70 +	271	44	0	251	63	1	36	8	1	37	7	0
Total	**1,337**	**223**	**0**	**1,171**	**248**	**1**	**117**	**18**	**1**	**108**	**11**	**0**

Unknown country of birth

Tuberculosis – HIV infection in residents

Persons with HIV are known to be particularly susceptible to TB, both from the reactivation of latent infection and from new infection with rapid progression to active disease.

In 2013, 3.1% of the 1420 new cases notified among Singapore residents had prior diagnosis of HIV, similar to 2.7% in 2012. Of the 119 relapsed TB cases notified among Singapore residents in 2013, 6.7% had been previously diagnosed with HIV, compared with 3.7% in 2012. Most of these TB-HIV infections were observed in older age groups and in the male population (Table 6.22). The majority of the TB-HIV infections occurred in Chinese (Table 6.23).

Table 6.22
Age-gender distribution of reported tuberculosis-HIV infection among Singapore residents, 2012 – 2013

Age (Years)	New cases				Relapsed cases			
	2012		2013		2012		2013	
	Male	Female	Male	Female	Male	Female	Male	Female
0 – 9	0	0	0	0	0	0	0	0
10 – 19	0	0	0	0	0	0	0	0
20 – 29	0	0	0	1	0	0	0	0
30 – 39	8	0	4	1	0	0	1	0
40 – 49	11	1	14	1	3	0	3	0
50 – 59	14	1	12	1	0	0	4	0
60 – 69	6	0	8	0	2	0	0	0
70 +	1	0	2	0	0	0	0	0
Total	**40**	**2**	**40**	**4**	**5**	**0**	**8**	**0**
Male & Female	**42**		**44**		**5**		**8**	

Table 6.23
Ethnic-gender distribution of reported tuberculosis-HIV infection among Singapore residents, 2012 – 2013

Ethnic group	New cases				Relapsed cases			
	2012		2013		2012		2013	
	Male	Female	Male	Female	Male	Female	Male	Female
Chinese	34	2	31	2	4	0	6	0
Malay	5	0	5	2	0	0	2	0
Indian	1	0	1	0	0	0	0	0
Others	0	0	3	0	1	0	0	0
Total	**40**	**2**	**40**	**4**	**5**	**0**	**8**	**0**

Tuberculosis in Non-residents

In 2013, there were 1,381 new TB cases notified among non-residents in Singapore. As in previous years, the number of new TB cases notified among short-term pass holders outnumbered long-term pass holders. However in 2013, work permit holders formed the largest group (434 cases), in contrast to the preceding two years when work permit applicants formed the largest group (Table 6.24). As a proportion, long-term pass holders and short-term pass holders contributed 21.7% (Table 6.25) and 27.6% (Table 6.26) of notified new cases in 2013, respectively.

Table 6.24
Distribution of non-residents with new tuberculosis by pass category/status, 2009 – 2013

Pass category / status	No. of new TB cases notified				
	2009	2010	2011	2012	2013
Long-Term Immigration Pass Holders Residing in Singapore					
Work Permit Holders	403	403	442	458	434
Employment Pass Holder	32	41	47	53	52
Other Pass Holders *	89	106	104	132	122
Sub-total	**524**	**550**	**593**	**643**	**608**
Short Stay Foreigners					
Work Permit Applicants	218	329	462	528	389
Visitors **	220	253	237	238	216
Others ***	113	181	207	151	168
Sub-total	**551**	**763**	**906**	**917**	**773**
Total	**1,075**	**1,313**	**1,499**	**1,560**	**1,381**

* Professional pass holder, dependent pass holder, long-term social visit pass holder and student pass holder and S pass holder

** Short term social visitor

*** Professional visit pass applicant, dependent pass applicant, long-term social visit pass applicant, student pass applicant, employment pass applicant, S pass applicant and illegal immigrant

Table 6.25
Distribution of new TB cases by site of disease
Long-term pass holders, 2001 – 2013

Year	No. of new TB cases notified					
	Pulmonary		Extrapulmonary		Total	
	No.	% of total new cases notified	No.	% of total new cases notified	No.	% of total new cases notified
2001	247	11.7	64	3.0	311	14.7
2002	223	11.2	54	2.7	277	13.9
2003	231	11.6	50	2.5	281	14.1
2004	170	8.9	48	2.5	218	11.4
2005	210	10.8	60	3.1	270	13.9
2006	249	12.6	76	3.9	325	16.5
2007	275	13.6	77	3.8	352	17.5
2008	403	16.5	97	4.0	500	20.5
2009	419	16.6	105	4.2	524	20.8
2010	462	16.6	88	3.2	550	19.7
2011	502	16.5	91	3.0	593	19.6
2012	538	17.2	105	3.4	643	20.6
2013	501	17.9	107	3.8	608	21.7

Table 6.26
Distribution of new TB cases by site of disease
Short-term pass holders, 2001 – 2013

Year	No. of new TB cases notified					
	Pulmonary		Extrapulmonary		Total	
	No.	% of total new cases notified	No.	% of total new cases notified	No.	% of total new cases notified
2001	283	13.4	45	2.1	328	15.5
2002	244	12.3	41	2.1	285	14.3
2003	283	14.2	29	1.5	312	15.6
2004	279	14.6	59	3.1	338	17.6
2005	295	15.2	55	2.8	350	18.1
2006	316	16.0	75	3.8	391	19.8
2007	340	16.9	66	3.3	406	20.2
2008	412	16.8	81	3.3	493	20.2
2009	482	19.1	69	2.7	551	21.9
2010	672	24.1	91	3.3	763	27.3
2011	833	27.4	73	2.4	906	29.9
2012	832	26.7	85	2.7	917	29.4
2013	678	24.2	95	3.4	773	27.6

TB drug resistance

In the following, analyses related to TB drug resistance for Singapore residents would be presented separately amongst those who are Singapore-born and foreign-born. Cases with unknown place of births were excluded from the analysis. The data presented is based on the drug susceptibility testing result of mycobacterial cultures taken at baseline (from three months before to two weeks after the date of notification or date of starting treatment, whichever earlier).

Singapore –born residents

The overall incidence of drug resistance among 713 new pulmonary TB cases in whom drug-susceptibility testing was performed was 6.6%: with 5.3% (38 cases) resistant to one drug and 1.3% (9 cases) resistant to more than one drug (Table 6.27). Multi-drug-resistant TB (MDR-TB), i.e. resistance to both rifampicin and isoniazid, was detected in 2 cases (0.3%), while resistance to isoniazid but not rifampicin was detected in 21 cases (2.9 %).

The overall incidence of drug resistance among 61 relapsed pulmonary TB cases with drug susceptibility testing performed was 6.6%: 5.0% (3 cases) were resistant to one drug and 1.6% (1 case) was resistant to more than one drug. There was one MDR-TB case (1.6%) and one case (1.6%) resistant to isoniazid but not rifampicin. No Singapore-born resident with initially pan-sensitive or isoniazid mono-resistant TB developed MDR-TB during treatment in 2013. There was no case of extensively-drug-resistant TB (XDR-TB), i.e. MDRTB with resistance to any fluoroquinolone and second-line injectable agent, among Singapore-born TB cases in 2013

Table 6.27
Mycobacterium tuberculosis drug susceptibility in Singapore-born residents with pulmonary tuberculosis, 2010 – 2013

Sensitivity result of sputum examination *	2010		2011		2012		2013	
	No.	%	No.	%	No.	%	No.	%
New cases								
**Sensitive to: Streptomycin, Isoniazid, Rifampicin	738	95.0	762	94.7	784	92.7	666	93.4
Resistant to:								
Single drug	33	4.2	32	4.0	52	6.1	38	5.3
More than 1 drug	6	0.8	11	1.3	10	1.2	9	1.3
Total examined	**777**	**100.0**	**805**	**100.0**	**846**	**100.0**	**713**	**100.0**
***Resistant to Isoniazid	**12**	**1.5**	**16**	**2.0**	**28**	**3.3**	**21**	**2.9**
Resistant to Rifampicin & Isoniazid	**1**	**0.1**	**3**	**0.4**	**6**	**0.7**	**2**	**0.3**
Relapsed cases								
Sensitive to: Streptomycin, Isoniazid, Rifampicin	58	85.3	78	88.6	70	92.1	57	93.4
Resistant to:								
Single drug	8	11.8	9	10.2	5	6.6	3	5.0
More than 1 drug	2	2.9	1	1.1	1	1.3	1	1.6
Total examined	**68**	**100.0**	**88**	**100.0**	**76**	**100.0**	**61**	**100.0**
Resistant to Isoniazid	**3**	**4.4**	**6**	**6.8**	**3**	**3.9**	**1**	**1.6**
Resistant to Rifampicin & Isoniazid	**1**	**1.5**	**0**	**0.0**	**0**	**0.0**	**¥ 1**	**1.6**

* In the case of dual lesions, the sensitivity result recorded is that of organisms cultured from sputum.
** Sensitive to Isoniazid, Rifampicin,Streptomycin and Ethambutol
*** Any of isoniazid resistance, exclusive of MDR
¥ MDR case was notified as both pulmonary and extra-pulmonary TB, but MDR result was from an extra-pulmonary specimen only

Foreign –born residents

In 2013, the overall incidence of drug resistance among 143 new pulmonary TB cases in whom drug-susceptibility testing was performed was 11.9%, with 8.4% (12 cases) resistant to one drug and 3.5% (5 cases) resistant to more than one drug (Table 6.28). There were no MDR-TB cases. Resistance to isoniazid was 6.9% (10 cases). No drug resistance was detected among the 6 relapsed pulmonary TB cases in foreign-born residents with drug susceptibility testing performed.

Table 6.28
Mycobacterium tuberculosis drug susceptibility in foreign-born residents with pulmonary tuberculosis, 2010 – 2013

Sensitivity result of sputum examination *	2010		2011		2012		2013	
	No.	%	No.	%	No.	%	No.	%
New cases								
**Sensitive to: Streptomycin, Isoniazid, Rifampicin	133	92.4	135	91.8	101	89.4	126	88.1
Resistant to:								
Single drug	7	4.9	5	3.4	7	6.2	12	8.4
More than 1 drug	4	2.8	7	4.8	5	4.4	5	3.5
Total examined	**144**	**100.0**	**147**	**100.0**	**113**	**100.0**	**143**	**100.0**
***Resistant to Isoniazid	**7**	**4.9**	**5**	**3.4**	**7**	**6.2**	**10**	**7.0**
Resistant to Rifampicin & Isoniazid	**1**	**0.7**	**3**	**2.0**	**2**	**1.8**	**0**	**0.0**
Relapsed cases								
Sensitive to: Streptomycin, Isoniazid, Rifampicin	7	77.8	13	86.7	9	90.0	6	100.0
Resistant to:								
Single drug	2	22.2	1	6.6	0	0.0	0	0.0
More than 1 drug	0	0.0	1	6.6	1	10.0	0	0.0
Total examined	**9**	**100.0**	**15**	**100.0**	**10**	**100.0**	**6**	**100.0**
Resistant to Isoniazid	**1**	**11.1**	**1**	**6.6**	**0**	**0.0**	**0**	**0.0**
Resistant to Rifampicin & Isoniazid	**0**	**0.0**	**0**	**0.0**	**1**	**10.0**	**0**	**0.0**

* In the case of dual lesions, the sensitivity result recorded is that of organisms cultured from sputum.
** Sensitive to Isoniazid, Rifampicin,Streptomycin and Ethambutol
*** Any of isoniazid resistance, exclusive of MDR

Non-residents

In 2013, the overall incidence of drug resistance in new pulmonary TB cases among 392 non-residents with drug-susceptibility testing performed was 13.0%, with 8.2% (32 cases) being resistant to one drug and 4.8% (19 cases) resistant to more than one drug (Table 6.29). MDR-TB was detected in 12 cases (3.1%), and resistance to isoniazid but not rifampicin was detected in 27 cases (6.9%).

Among the 20 relapsed pulmonary TB cases with drug susceptibility testing performed, 5.0% (1 case) was resistant to one drug and 20.0% (4 cases) to more than one drug. Four cases (20.0%) were MDR-TB, and 1 case (5.0%) was resistant to isoniazid but not rifampicin.

Table 6.29
Mycobacterium tuberculosis drug susceptibility in non-residents with pulmonary tuberculosis, 2010 – 2013

Sensitivity result of sputum examination *	2010		2011		2012		2013	
	No.	%	No.	%	No.	%	No.	%
New cases								
**Sensitive to: Streptomycin, Isoniazid, Rifampicin	363	84.6	435	84.5	346	83.2	341	87.0
Resistant to:								
Single drug	28	6.5	44	8.5	35	8.4	32	8.2
More than 1 drug	38	8.9	36	6.9	35	8.4	19	4.8
Total examined	**429**	**100.0**	**515**	**100.0**	**416**	**100.0**	**392**	**100.0**
***Resistant to Isoniazid	**42**	**9.8**	**40**	**7.8**	**35**	**8.4**	**27**	**6.9**
Resistant to Rifampicin & Isoniazid	**13**	**3.0**	**13**	**2.5**	**20**	**4.8**	**¥ 12**	**3.1**
Relapsed cases								
Sensitive to: Streptomycin, Isoniazid, Rifampicin	8	53.3	19	65.5	15	78.9	15	75.0
Resistant to:								
Single drug	0	0.0	3	10.3	1	5.3	1	5.0
More than 1 drug	7	46.7	7	24.1	3	15.8	4	20.0
Total examined	**15**	**100.0**	**29**	**100.0**	**19**	**100.0**	**20**	**100.0**
Resistant to Isoniazid	**1**	**6.7**	**3**	**10.3**	**1**	**5.3**	**1**	**5.0**
Resistant to Rifampicin & Isoniazid	**6**	**40.0**	**6**	**20.7**	**3**	**15.8**	**4**	**20.0**

* In the case of dual lesions, the sensitivity result recorded is that of organisms cultured from sputum.
** Sensitive to Isoniazid, Rifampicin,Streptomycin and Ethambutol
*** Any of isoniazid resistance, exclusive of MDR
¥ One MDR case was notified as both pulmonary and extra-pulmonary TB, but MDR result was from an extra-pulmonary specimen only

Tuberculosis mortality

In 2013, there were 46 deaths from tuberculosis among Singapore residents giving a mortality rate of 1.2 cases per 100,000 population (Table 6.30). The majority were males (76.1%) and aged 60 years and above (84.8%).

Table 6.30
Age-gender distribution and age-specific mortality rates of tuberculosis, 2013

Age (Years)	Male	Female	Total (%)	Incidence rate per 100,000 population*
10 – 19	0	0	0 (0.0)	0.0
20 - 29	0	0	0 (0.0)	0.0
30 – 39	0	1	1 (2.2)	0.2
40 – 49	3	0	3 (6.5)	0.5
50 – 59	3	0	3 (6.5)	0.5
60 – 69	5	2	7 (15.2)	1.9
70 +	24	8	32 (69.6)	12.4
Total	**35**	**11**	**46 (100.0)**	**1.2**

LEPROSY

Leprosy is a chronic bacterial disease of the skin, peripheral nerves and (in lepromatous patients) the upper airway by *Mycobacterium leprae*. The manifestations of the disease vary in a continuous spectrum between the two polar forms, lepromatous and tuberculoid leprosy.

In the past, leprosy was regarded as a highly contagious, mutilating and incurable disease and this led to a lot of social stigma associated with the disease and the people afflicted with it. Before effective treatment for leprosy was available, patients were segregated in leprosariums to prevent the spread of leprosy to the community. Modern treatment for leprosy was introduced in 1941 when dapsone and its derivatives were used. With effective chemotherapy, leprosy is curable today and patients are now treated in the general health services alongside other diseases. Currently, the Cutaneous Infections Unit of the National Skin Centre undertakes the treatment of leprosy and is responsible for its control in Singapore. The incidence rate of leprosy among Singapore residents has declined over the past five decades, from 21.3 per 100,000 population in 1960 to 0.1 per 100,000 population in 2013 (Figure 6.7). In 2013, a total of four Singapore residents with leprosy were notified (Table 6.31).

Figure 6.7
Incidence rate of leprosy among Singapore residents, 1960 – 2013

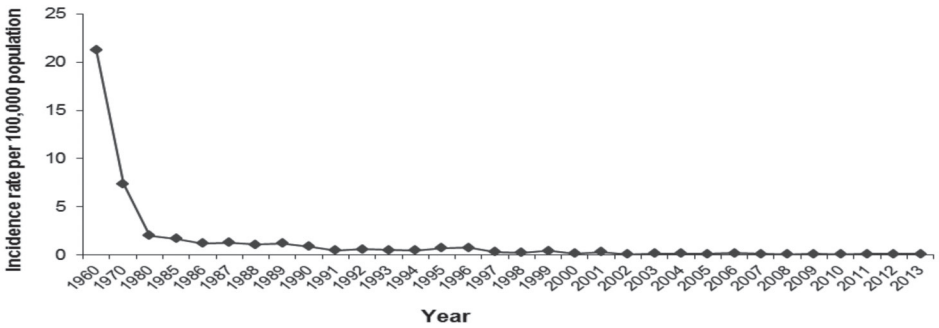


Table 6.31
Age-gender distribution and age-specific incidence rates of reported leprosy among Singapore residents, 2013

Age (Years)	Male	Female	Total (%)	Incidence rate per 100,000 population*
0 – 9	0	0	(0.0)	0
10 – 19	0	0	(0.0)	0
20 – 29	0	0	(0.0)	0
30 – 39	0	0	(0.0)	0
40 – 49	1	1	(50.0)	0.3
50 – 59	0	0	(0.0)	0
60 – 69	1	0	(0.25)	0.3
70 +	0	1	(0.25)	0.4
Total	**2**	**2**	**4 (100.0)**	**0.1**

* Rates are based on 2013 estimated mid-year population.
(Source: Singapore Department of Statistics)

Clinical presentation

Leprosy patients were classified into lepromatous, borderline lepromatous, borderline tuberculoid, tuberculoid and neuroleprosy types. Among the four residents, two had lepromatous and two had borderline lepromatous leprosy (Table 6.32).

Table 6.32
Clinical presentation in Singapore residents with leprosy, 2013

Type of leprosy	No. of cases
Lepromatous	2
Borderline Lepromatous	2
Borderline Tuberculoid	0
Tuberculoid	0
Neuroleprosy	0
All types	**4**

Leprosy in non-residents

The contribution of non-residents to the total number of cases has fluctuated over the years. In 2013, there were three non-residents notified with leprosy, accounting for 43% of the total cases (Table 6.33).

Table 6.33
Distribution of non-residents with leprosy by gender, 1980 – 2013

Year	No. of cases			% of total cases notified
	Male	Female	Total	
1980	14	7	21	32
1985	10	6	16	28
1986	7	2	9	23
1987	5	6	11	25
1988	4	6	10	26
1989	8	10	18	37
1990	7	5	12	33
1991	6	3	9	41
1992	15	9	24	59
1993	5	4	9	38
1994	8	5	13	48
1995	7	4	11	33
1996	8	2	10	43
1997	9	4	13	57
1998	10	2	12	63
1999	5	3	8	36
2000	9	4	13	72
2001	1	2	3	21
2002	7	1	8	73
2003	5	1	6	54
2004	4	4	8	57
2005	6	3	9	69
2006	3	2	5	42
2007	6	2	8	67
2008	4	3	7	70
2009	3	1	4	50
2010	6	2	8	73
2011	3	4	7	64
2012	7	3	10	71
2013	2	1	3	43