

Changing Patterns of HIV Epidemic in 30 Years in East Asia

S. Pilar Suguimoto · Teeranee Techasrivichien · Patou Masika Musumari ·
Christina El-saaidi · Bhekumusa Wellington Lukhele · Masako Ono-Kihara ·
Masahiro Kihara

Published online: 25 March 2014
© Springer Science+Business Media New York 2014

Abstract The HIV epidemic in East Asia started relatively late compared to the rest of the world. All countries or areas, except for North Korea, had reported HIV and AIDS cases, with China being the major contributor to the epidemic. Though initially driven by injecting drug use in China, East Asia did not experience an explosive spread. Strong commitment in China and early harm reduction programs in Taiwan managed to reduce transmission substantially among injecting drug users. In contrast to China and Taiwan, injection drug use has accounted just a little, if not at all, for the spread of HIV in other East Asian countries. However, following a global trend, sexual contact has become a major route of infection across the region. While much progress has been achieved in this region, with the epidemic among other key populations relatively stable, the emerging epidemic through sex between men is a growing concern. Recent estimates suggest that HIV prevalence among men who have sex with men (MSM) has reached 6.3 % in China, 7.5 % in Mongolia, and ranges

between 8.1 %-10.7 % in Taiwan and between 2.7 %- 6.5 % in South Korea. In Japan, 74 % of male HIV cases were among MSM in 2012, while Hong Kong has witnessed a sharp increase of HIV cases among MSM since 2004. There is urgent need to address issues of discrimination and stigma toward homosexuality, and to strengthen the strategies to reach and care for this population.

Keywords East Asia · Japan · China · Taiwan · Hong Kong · South Korea · Mongolia · HIV · AIDS · HIV testing · MSM · Epidemiology · Global epidemic

Introduction

Despite the tremendous progress in the global response to the HIV epidemic, we have not yet been able to fully control the spread of HIV infection [1]. Since the start of the epidemic over 30 years ago, around 75 million have become infected with HIV and nearly 36 million have died of AIDS. The HIV epidemic has become one of the greatest pandemics in modern times with disastrous socioeconomic and demographic consequences [2]. The unprecedented scale of multisectoral approach and coordinated global efforts to respond to this epidemic can serve as a model of response to other global health threats such as chronic diseases [2].

HIV was introduced much later in East Asia than in the rest of the world, but the pattern of spread differed from that described in other regions [3]. According to the latest UNAIDS estimates, there were 35.3 million people worldwide living with HIV infection in 2012, of whom 880,000 resided in East Asia [1]. Unlike the global downward trend, the number of estimated newly infections among all ages and among children increased 19 % and 50 %, respectively, in East Asia since 2001. Similarly, the estimated number of AIDS-related deaths increased from 18,000 in 2001 to 41,000 in

S. P. Suguimoto (✉) · T. Techasrivichien · P. M. Musumari ·
C. El-saaidi · B. W. Lukhele · M. Ono-Kihara · M. Kihara
Department of Global Health and Socio-epidemiology, Kyoto
University School of Public Health, Yoshida Konoe-cho, Sakyo-ku,
Kyoto 606-8501, Japan
e-mail: suguimoto.pilar.2w@kyoto-u.ac.jp

T. Techasrivichien
e-mail: teeranee.t@gmail.com

P. M. Musumari
e-mail: patoumus@yahoo.fr

C. El-saaidi
e-mail: globalchrisi@gmail.com

B. W. Lukhele
e-mail: bhekie.l@gmail.com

M. Ono-Kihara
e-mail: kihara.masako.2u@kyoto-u.ac.jp

M. Kihara
e-mail: kihara.masahiro.4n@kyoto-u.ac.jp

2012. The estimated HIV prevalence in East Asia is still low (0.1 %) compared to other regions, notably sub-Saharan Africa (4.7 %), North America (0.5 %), or neighboring countries in South and Southeast Asia (0.3 %) [1]. However, given the large population in China (1.3 billion, 2012) [4], even low prevalence translates into large numbers of people affected. Since China is the hardest hit in this region, not surprisingly the HIV epidemic of other countries or areas in East Asia is usually overlooked when referring to Asia at large. Therefore, we would like to describe the trends or patterns of the HIV epidemics over the last 30 years in People's Republic of China (China), Taiwan, Japan, Republic of Korea (South Korea), Hong Kong, and Mongolia.

China

China is by far the largest country in East Asia and most populous in the world [4]. Although the national estimated prevalence of HIV infection remains low at 0.058 % [5], China alone accounts for 89 % of the estimated people living with HIV (PLHIV) in East Asia [1]. It was estimated that by the end of 2011 there were 780,000 PLHIV, of whom 154,000 were living with AIDS. Although, the annual incidence of HIV infection has remained stable at a low level in recent years, the patterns of transmission have evolved over time [5, 6•]. HIV prevalence varies greatly among different sub-populations and shows clear regional disparities [6•]; six out of 31 provinces reported 75.8 % of the cumulative national total of HIV/AIDS cases [5].

China's HIV epidemic began in rural areas and then spread to urban areas. The first case of AIDS was reported in 1985 in a tourist from the United States [7]. The following years other isolated cases were reported in foreigners and Chinese traveling overseas and hemophiliac patients infected through imported contaminated blood products [8]. The first outbreak of HIV infection, however, was reported in 1989 among injecting drug users (IDUs) in Yunnan Province close to the so-called "Golden Triangle", an opium producing area of South East Asia. From there, HIV spread steadily along major drug trafficking routes and from IDUs into the general population through sexual contact [9]. As it rapidly spread among injecting drug users (IDUs), HIV also spread among female sex workers (FSWs). Subsequent sexual transmission to their male clients and other sexual partners led to further spread of HIV.

Around the mid-1990s a second major outbreak of HIV infection occurred among commercial blood/plasma donors in rural communities in the east-central provinces due to unhygienic practices [10, 11]. As soon as the problem became apparent in the early 2000s, the Chinese government took strong action to prevent further spread closing blood collection stations, issuing new regulations, conducting mass HIV screenings, and providing free treatment (National Free Antiretroviral Treatment Program) [12]. There are no accurate data

reported on the number of people infected, but in 2005 the Ministry of Health and UNAIDS/WHO estimated it to be 55,000 [13, 14]. Former commercial blood/plasma donors were primarily poor farmers with almost no IDU or commercial sex work in their communities. A recent study revealed that the HIV epidemic in former plasma donors was not widespread but rather centered in Henan Province and surrounded provinces [11]. By 2004, 43 % of the cumulative reported HIV cases were IDUs and 26.8 % former commercial plasma donors [15].

As the HIV epidemic among IDUs has fallen (less so in China's southwest region), HIV incidence has stabilized since 2005 [6•] probably because of significant progress toward implementing and enhancing harm-reduction programs countrywide [6•, 16]. The proportion of newly reported HIV cases who acquired the infection through IDU has decreased from 34.1 % in 2006 to 16.9 % in 2011 (Table 2) [17]. In contrast, the proportion of new HIV cases resulting from sexual transmission increased from 33.1 % in 2006 to 76.3 % in 2011, during which time cases of MSM increased from 2.5 % to 13.7 % [17]. The HIV epidemic is rapidly expanding among MSM (Fig. 1). A national epidemiological survey including over 47,000 MSM was conducted between 2008 and 2009 in 61 major cities of China [18•]. This survey reported an overall HIV prevalence of 4.9 %, with the highest HIV prevalence of 13.2 % in the southwest region. More recent estimates suggest that HIV prevalence among MSM has reached 6.3 % in 2012, up from 5.7 % in 2010 and 2 % in 2007 [17, 19]. HIV incidence among MSM has tripled from 0.39 in 2000 to 0.98 per 100 person-years in 2010 nationwide, especially rapidly in large cities such as Shanghai, Beijing, Tianjin, Chongqing, and Chengdu [6•]. In addition, previous studies have reported high prevalence of syphilis among MSM, ranging from 9.5 % to 17.5 % [18•, 20, 21], inconsistent condom use with male partners, multiple sexual partnerships including bisexual behaviors, low testing rates, and prevalent stigma and discrimination [18•, 20, 22, 23, 24•]. These data suggest the increasing potential of HIV infection spreading into the broader population [6•].

Despite increasing heterosexual HIV transmission in China, the national HIV prevalence among FSWs has decreased from 0.46 % in 2000 to 0.26 % in 2011 [6•, 19], remaining low except for southwest China where it was 1.57 % in 2010 [6•]. Similarly, HIV prevalence among sexually transmitted infection (STI) clinic attendees and pregnant women have been maintained at a low level [5]. Recent studies suggest that non-commercial heterosexual contact in the general population may play an important role [25, 26]. The prevalence of multiple sexual partnerships among adult women increased from 8.1 % in 2000 to 29.6 % in 2006 [26]. Other factors that may contribute to further expansion are the high prevalence of syphilis among different populations, characteristics of commercial sex work (e.g., migrants, highly mobile, engaged for

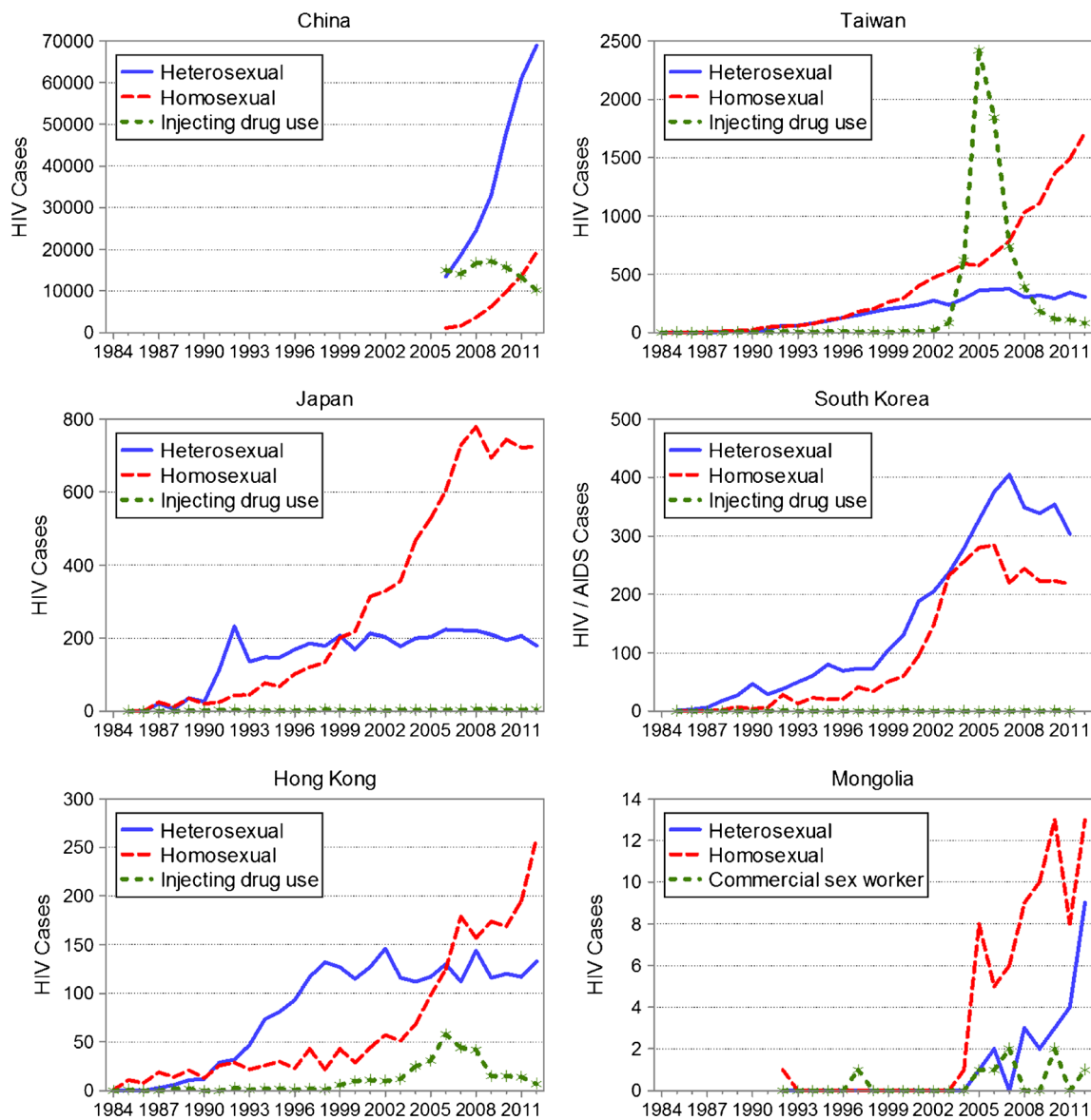


Fig. 1 Changing trend of the annual number of HIV cases by main routes of transmission in China¹, Taiwan, Japan, South Korea², Hong Kong and Mongolia (1984 – 2012) ¹Annual number of HIV cases for 1984 to 2005 were not available ²Data for 2012 could not be included

short time), and low condom use [27, 28]. Moreover, in provinces with high HIV prevalence among IDUs HIV prevalence is also high among FSWs and MSM, suggesting interactions between these groups [6•].

Since the beginning of the twenty-first century China has taken bold steps to control the HIV epidemic and has made great progress [29]. However, many challenges still remain particularly addressing the needs of Chinese MSM [6•, 29, 30].

Taiwan

The first AIDS case in Taiwan was identified in 1984 in an American in transit [31]. In the 1980s, similar to what happened in Japan and Hong Kong but on a smaller scale, at least

53 Taiwanese hemophiliacs were infected with HIV through contaminated blood products from the United States, 37 of them had died [31–34]. The government banned the use of unheated blood products in 1985 and no more HIV cases among hemophiliacs have been reported since 1997 [35]. By 2012, a total of 25,081 people had been reported as infected with HIV (24,239 Taiwanese and 842 foreigners), of whom 9828 had developed AIDS (9725 Taiwanese and 103 foreigners) (Table 1) [36]. Of Taiwanese nationals infected with HIV in 2012, the male-to-female ratio was 30:1 [37]. Despite international growing advocacy to remove “HIV-related restrictions on entry, stay and residency” for PLHIV, Taiwan still keeps its policy to deport foreigners on the grounds of HIV status [38].

Table 1 Annual reported number of HIV and AIDS cases in China, Taiwan, Japan, South Korea, Hong Kong, and Mongolia (1984 - 2012)

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
HIV															
China	-	5	1	9	7	171	299	216	261	274	531	1567	2649	3343	3306
Taiwan	9	14	9	12	21	37	31	78	123	132	160	221	267	341	388
Japan ³	-	0	0	55	23	80	66	200	442	277	298	277	376	397	422
South Korea ⁴	-	1	3	9	22	37	52	46	81	69	89	108	104	125	129
Hong Kong ⁵	7	46	20	33	28	38	34	60	71	79	104	122	134	181	189
Mongolia ⁶	-	-	-	-	-	-	-	-	1	0	0	0	0	1	0
AIDS															
China ¹	-	1	0	2	0	0	2	3	5	23	29	52	38	126	136
Taiwan ²	0	0	1	1	2	8	5	13	23	35	64	97	156	136	153
Japan	-	6	5	14	14	21	31	38	51	86	136	169	234	250	231
South Korea ⁴	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hong Kong ⁵	0	3	0	6	7	17	13	14	14	19	37	44	71	64	63
Mongolia ⁶	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Cumulative
HIV															
China	4677	5201	8219	9732	21,691	47,606	40,711	44,070	48,161	60,081	68,249	82,437	92,940	101,328	647,742
Taiwan	471	527	652	767	860	1520	3380	2918	1930	1740	1643	1796	1968	2224	24,239
Japan ³	530	462	621	614	640	780	832	952	1082	1126	1021	1075	1056	1002	14,706
South Korea ⁴	186	219	327	397	533	610	680	749	740	797	768	773	888	868	9410
Hong Kong ⁵	213	183	213	260	229	268	313	373	414	435	396	389	438	513	5783
Mongolia ⁶	0	0	0	0	0	1	10	8	8	13	12	18	12	23	107
AIDS															
China ¹	230	233	714	1028	6120	12,652	7550	7909	10,742	14,509	20,056	34,188	39,183	41,929	197,460
Taiwan ²	181	180	167	181	235	264	588	787	1070	894	1007	1101	1096	1280	9725
Japan	301	329	332	308	336	385	367	406	418	431	431	469	473	447	6719
South Korea ⁴	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hong Kong ⁵	61	67	60	53	56	49	64	73	79	96	76	79	82	86	1353
Mongolia ⁶	-	-	1	0	1	0	0	1	3	0	1	3	5	4	19

¹ The number of AIDS cases includes individuals newly diagnosed with AIDS and individuals previously reported as HIV cases that progressed to AIDS

² The number of newly reported AIDS cases may include HIV cases reported in previous years. Taiwanese cases only

³ Cases of HIV infection through contaminated imported blood products are excluded from official statistics in Japan (1439 people by 2012). All nationalities

⁴ Official statistics do not distinguish AIDS cases and HIV cases. South Korean cases only

⁵ All nationalities

⁶ Mongolian cases only

Sources:

UNAIDS China (personal communication)

Centers for Disease Control Taiwan

National Institute of Infectious Diseases (Japan)

Korea Centers for Disease Control and Prevention

Hong Kong Special Administrative Region Government (GovHK)

UNAIDS Mongolia (personal communication)

The HIV epidemic in Taiwan is concentrated in high-risk populations. HIV prevalence among drug users was estimated to be 6.9 %; much higher among IDUs compared to non-IDUs (25.5 % vs. 0.5 %) [39]. Among MSM, HIV prevalence varies between 8.1-10.7 % [40, 41]. However, the predominant

mode of HIV transmission has changed over time (Fig. 1). Until 2003, sexual transmission accounted for the largest proportion of new infections, predominantly sex between men which accounted for 61.5 % that year [35]. In the following year the epidemic started to increase exponentially

with the major route of infection shifting from unprotected sex to sharing needles and solvents to dilute heroin [42]. In 2005, the number of new HIV infections peaked at 3380, a 122 % increase over the previous year [37]. The total number of HIV cases attributable to IDU grew from 173 (3 % of all cases) until 2003 to 3215 (32 %) by 2005, a 19-fold increase in two years. Molecular epidemiological studies revealed that the HIV strain responsible for this outbreak may have originated in Yunnan Province, China [43, 44]. In response, the government took swift measures in 2005, which included harm-reduction programs such as needle and syringe exchange program (NSEP) and substitution treatment. After the introduction of these programs, all newly reported cases attributable to IDU fell from a high of 72 % in 2005 to only 3.6 % in 2012 [37]. Even though the HIV epidemic among IDUs is largely controlled, a survey in 2008 found that only 21 % of IDUs in methadone maintenance treatment programs were using condoms always/frequently in the last 6 months and almost all (93 %) were infected with hepatitis C virus (HCV) [45]. In Taiwan, co-infection of HIV/HCV among IDUs has received increased attention. The prevalence of HCV infection among HIV-infected IDUs increased from 65.5 % before 2002 to 98.6 % in 2006 [46]. A multicenter cohort study in the Asia Pacific region revealed that patients co-infected with HIV/HBV or HIV/HCV had significantly worse survival rates compared to HIV-infected patients [47]. Thus, the importance of preventing HCV infection among IDU population cannot be underestimated in harm reduction programs.

Since 2008, the epidemic took a turn and the spread of HIV among MSM has re-emerged as a major threat. The proportion of new HIV cases attributed to sex between men increased from 23.3 % in 2006, 59.3 % in 2008 to 77.2 % in 2012 [35]. Bathhouses are reported as the most common venue for unprotected sex [48]. HIV incidence among MSM in gay bathhouses increased from 7.8 % in 2004 to 15 % in 2007 [40]. Over the same period, the prevalence of active syphilis among this population remained high but stable, from 31.8 % to 23.0 %. Of concern is that one fourth of attendees reported unprotected anal sex (UAS) at the last visit to the bathhouse. A recent online survey revealed that 72.4 % of MSM used the Internet as a main way to seek sexual partners, of these, 73.9 % had sex with partners they found online [41]. However, prevention programs targeting MSM are not implemented effectively in Taiwan because homosexuality is highly stigmatized and many MSM do not “come out” [31].

An increasing concern is young people who are becoming infected. Those aged 20–29 represent the highest number of total HIV cases, accounting for 40 % through 2012 [34]. According to a study among college students, only 48.5 % know that HIV can be spread through infected semen [49]. Regarding other risk populations, no updated information was available in English.

Japan

Japan has East Asia's second largest population after China, with 127 million [4]. The first officially reported case of AIDS was in 1985, a homosexual Japanese man who had been living in New York. However, the first outbreak of the epidemic occurred among approximately 2000 recipients of contaminated blood products from the United States (most of them hemophiliacs) [33]. Until the mid-1990s they accounted for approximately 55 % of HIV and AIDS cases [50]. After the introduction of heat-treated blood products in 1985, the proportion of infections through this route declined amid a gradual increase in cases due to sexual contact. Prostitution is illegal in Japan, but the adult entertainment industry is well-established nonetheless. In the early 1990s many women from other Asian countries arrived in Japan as commercial sex workers (CSWs). A peak in the number of foreign women infected with HIV, most of them infected outside Japan, was observed between 1991 and 1994, but fell markedly thereafter [50]. Currently, the male-to-female ratio is 16:1 and 12:1 for HIV and AIDS cases respectively, with the epidemic among women and non-Japanese contained at a low level.

As of the end of 2012, 14,706 HIV and 6719 AIDS cases were reported to the national HIV/AIDS surveillance system (Table 1) [51]. Though the prevalence of HIV in the general population still remains very low (0.018 %) [52], the HIV epidemic has been disproportionately concentrated in a particular subpopulation, men who have sex with men (MSM). In a preliminary study the cumulative number of reported HIV/AIDS cases infected through sex between men through 2008 was estimated to be 8.82 per 1000 of estimated MSM population aged 20 to 59; 68 times greater than non-MSM [53]. However, in large cities such as Tokyo and Nagoya, HIV prevalence among MSM who visited free HIV testing sites has been calculated to be 5.7 % and 4.5 %, respectively [54]. The number of newly reported HIV cases of MSM more than doubled from 314 in 2001 to 724 in 2012 (Fig. 1). In 2012, 74 % (683/920) of Japanese male HIV cases were through this route, of which 67 % (460/683) were aged 20 to 39 [55]. Since the peak in 2008, the number of Japanese MSM HIV cases in this age group has been declining. However, it is of great concern that teenage cases are on the rise since 2005 [55]. Evidence suggests that high proportions of MSM engage in risky behaviors such as UAS, illicit drug use, and sex with multiple partners [56, 57]. Without new interventions it has been projected that HIV prevalence among MSM could reach 10.4 % in 2040 [58••].

The number of AIDS cases reported in Japan is considerably lower than in other industrialized countries. However, newly reported AIDS cases (without prior diagnosis of HIV infection) continue to increase since the beginning of the epidemic, especially the cases of homosexual contact, contrary to other developed countries, where a clear downward

trend has been observed since the introduction of antiretroviral therapy (ART) in the mid-1990s [59]. Despite availability of ART, social awareness and public perception about HIV infection remain extremely low [60] as well as the number of people who use the free HIV testing service at public health centers in Japan [55]. Thus, systematic efforts and strategy to raise awareness and improve access to HIV testing should be strongly encouraged, particularly among MSM population.

Regarding other routes of transmission, infection through injecting drug use (IDU) is very limited, representing 0.4 % and 0.7 % of the HIV and AIDS cases through 2012. Finally, transmission from mother to child accounts for only 0.2 % and 0.3 % of the HIV and AIDS cases in the same period [55].

South Korea

Since the first case in 1985, the number of HIV-infected South Koreans reported through 2012 was 9410, of whom 7788 were currently living with HIV (Table 1) [61]. Available statistics do not distinguish cases of HIV infection from cases with AIDS. As of 2011, the Korean Centers for Disease Control and Prevention estimated the HIV prevalence rate to be 14.1 per 100,000 population [62]. Other studies estimated the HIV prevalence in hospitals to be 1.3 per 10,000 individuals (2008) [63] and in public health centers to be 4.4 per 10,000 individuals (2009) [64]. Although HIV prevalence is very low, the number of newly reported HIV cases increased sharply since 2000, from 219 to 868 in 2012 [62].

The main route of transmission since the beginning of the HIV epidemic has been sexual contact, mostly affecting the male population (93.1 % of cumulative cases) [61]. Even though, the male-to-female ratio of newly reported cases decreased from 17:1 in 2007 to 14:1 in 2012 [61], a recent study projected a widening to 19:1 by 2017 [65]. Heterosexual and homosexual contact accounted for 34.2 % and 24.6 % of newly reported HIV cases among South Koreans in 2011 (Table 2) [66]. However, it is reasonable to speculate that the rate of homosexual transmission may be much higher given the high gender imbalance and low prevalence among women and FSWs [67, 68]. Data from the Korea HIV/AIDS Cohort indicated homosexual contact was a major transmission route of recently identified infected individuals [69]. Latest studies among MSM found the prevalence of HIV ranged between 2.7 % and 6.5 % [70, 71]. In addition, high prevalence of self-reported STIs in the last year (10.7 %) and current syphilis (20.4 %) were found in this population. Over 50 % of MSM reported being drunk while having sex, having bisexual relationships, multiple sexual partners, and inconsistent condom use with male and female partners [71, 72]. Therefore, MSM may serve as a bridge for the transmission of HIV to the population at large.

Transmission through IDU is rare in Korea. Until 2012, there were only four HIV/AIDS cases due to IDU, all among

men. Some authors speculate this could be due to the low prevalence of illicit drug use, and sterile needles and syringes being available over the counter [68]. However, a recent study found high prevalence of hepatitis B, C, and ever-sharing injecting equipment among IDUs [73]. CSWs and migrant workers constitute other vulnerable groups. CSW is illegal and there is no official report on the number of CSWs infected with HIV [68]. However, studies have shown very low prevalence in this population [67, 68]. As of 2012, there had been 1042 foreigners infected with HIV (71 % male), the majority from Asia and Africa [66]. Foreigners account for only 3 % of the total population, but represent 10 % of the cumulative HIV/AIDS cases. Also, among HIV test-takers in public health centers, foreigners showed a higher HIV prevalence than Koreans (6.8 vs 4.2 per 10,000 HIV-tested individuals) [64].

In recent years, greater attention has been placed on the need to promote timely testing [74, 75, 76]. The proportion of late presenters has increased since 1999 after abolition of a government policy of mass mandatory screening [75]. Despite the significant improvement of survival since the introduction of HAART there was a high risk of early mortality in the period 2002–2011 probably due to late diagnosis and late presentation to care [74, 75].

Finally, similar to other countries in Asia, homosexuality is heavily stigmatized in South Korea and many do not “come out” [77]. Also, unsafe sex behaviors even with high risk partners [78], misconceptions about HIV transmission, and negative attitudes toward PLHIV are still prevalent [79]. Thus, it is necessary to monitor and implement appropriate strategies to prevent further spread of the epidemic in South Korea.

Hong Kong

Hong Kong is a Special Administrative Region of China since 1997. With a population of 7.2 million and the vast majority being ethnic Chinese, Hong Kong is one of the most densely populated areas in the world [4]. In contrast to mainland China, HIV epidemic has remained at a relatively low level, both among the general and high risk populations. HIV prevalence among blood donors, STI clinic attendees, pregnant women, and methadone clinic patients was 0.001 %, 0.172 %, 0.01 %, and 0.489 %, respectively in 2009 [80]. Since the first HIV case was reported in 1984, a total of 5783 HIV cases (3500 Chinese and 1725 foreigners) and 1353 AIDS cases (980 Chinese and 287 foreigners) have been reported through 2012 (Table 1) [81]. The number of new HIV reports hit a record high of 513 cases in 2012, a 17 % increase from the previous year, of which 50.7 % were through homosexual or bisexual contact. The male-to-female ratio increased from 2.6:1 in 2010 to 3.5:1 in 2012, further increasing male predominance. Overall, young male adult Chinese are the group that is most affected [82].

Table 2 Newly reported HIV and AIDS cases by route of transmission in China, Taiwan, Japan, South Korea, Hong Kong, and Mongolia

	China ¹ (2011)	Taiwan ² (2012)	Japan ³ (2012)	South Korea ⁴ (2011)	Hong Kong ³ (2012)	Mongolia ⁵ (2012)
HIV						
Heterosexual	62.6 %	13.7 %	28.8 %	34.2 %	24.6 %	39.1 %
Homosexual/Bisexual	13.7 %	77.2 %	55.2 %	24.5 %	49.5 %	56.6 %
Injecting drug use	16.9 %	3.6 %	0.4 %	0.0 %	1.4 %	0.0 %
Transfusion /Blood products	3.3 %	-	2.4% ^a	0.0 %	0.2 %	0.0 %
Mother-to child	1.2 %	0.04 %	0.2 %	0.0 %	0.2 %	0.0 %
Others	-	-	-	-	-	4.3% ^b
Unknown	2.2 %	5.4 %	12.9 %	41.2 %	24.2 %	0.0 %
AIDS						
Heterosexual	-	16.6 %	37.2 %	-	45.3 %	50.0 %
Homosexual/Bisexual	-	60.7 %	36.2 %	-	44.2 %	50.0 %
Injecting drug use	-	19.1 %	0.7 %	-	2.3 %	0.0 %
Transfusion /Blood products	-	0.2 %	3.1 %	-	0.0 %	0.0 %
Mother-to child	-	0.0 %	0.3 %	-	0.0 %	0.0 %
Others	-	-	-	-	-	0.0 %
Unknown	-	3.4 %	22.5 %	-	8.1 %	0.0 %

¹ No information was available regarding routes of transmission for AIDS cases. Chinese cases only

² Taiwanese cases only

³ All nationalities

⁴ HIV and AIDS cases. South Korean cases only

⁵ Mongolian cases only

^a Includes infections through blood transfusion, and presumed multiple infection routes

^b Commercial sex work

Sources:

2012 China AIDS Response Progress Report

Statistics of Communicable Diseases and Surveillance Report, December 2013 (Taiwan)

National Institute of Infectious Diseases (Japan)

Analysis of HIV/AIDS notifications in Korea, 2011 (Korea CDC)

Factsheet: HIV/AIDS Situation in Hong Kong [2012] (Centre for Health Protection)

UNAIDS Mongolia (personal communication)

Sixty four hemophilia patients were the first sub-group to be infected through contaminated blood. They were infected prior to 1985, before a safe heat treated alternative and test for HIV became available [32]. Subsequently, most infections have been from sexual contact, with infections through IDU less common. Over the years, sexual transmission has remained the predominant route of infection. In the 1980s the largest percentage of new infections was through sex between men. In 1987, 57.6 % of the new cases were attributable to homosexual or bisexual contact, whereas only 9.1 % were thought to be from heterosexual contact. Then, in the 1990s until mid-2000s the situation reversed and heterosexual transmission surpassed that of homosexual or bisexual contact. In 2000, 62.8 % of new HIV infections were reported to be through heterosexual contact compared to 15.8 % through

homosexual or bisexual contact. However, the situation has reversed again since 2004 when a sharp increase in the HIV cases of MSM became apparent, while heterosexual transmission remained relatively stable [62] (Fig. 1). It is also plausible that there are surveillance differences over time that may underreport MSM activity if interviewing is less probing, i.e., some men may report heterosexual risk when male-to-male sexual activity is the true risk factor.

Similar to other parts of the world, MSM in Hong Kong are seeking sex partners through the Internet [83]. Over half of MSM recently diagnosed with HIV infection found sex partners through the Internet in the year prior to their infection [83]. Another study revealed a high proportion of MSM in Hong Kong seeking cross-border sex and having UAS with multiple types and number of male sex partners in Shenzhen,

China where high prevalence of HIV and syphilis was reported among MSM [84]. In the last six months, 62.1 % of MSM in Hong Kong had had sex with male CSWs, 84.6 % with male non-regular partners, and 31.3 % with male regular partners in Shenzhen [84]. Prevalence of UAS with these types of partners was 29.8 %, 27.9 %, and 78.7 %, respectively. Prior to 2005 there were only two non-governmental organizations which ran condom distribution and outreach testing programs for MSM in saunas and bars [85]. MSM have been identified as the pressing priority for action in the five year AIDS Strategies from the Advisory Council on AIDS.

Unlike the remarkable spread of HIV among IDUs in mainland China and Taiwan, the HIV epidemic among drug users in Hong Kong remained low. Before the start of the HIV epidemic, methadone maintenance treatment (1976) and the STI clinic services of the Department of Health (1970s) were widely accessible in Hong Kong [86]. Both programs provided preventive interventions, free condoms, and treatment for drug users and patients with STIs. It has been argued that they played key roles in protecting people at elevated risk for contracting HIV [86, 87]. Also, the prevalence of HIV among methadone clinic attendees remained at a consistently low level of 0.2–0.5 % from 2004 to 2010 [88]. HIV infection among IDUs has contributed to only 1.4 % (7/513) of all cases in 2012, a marked decrease from 58 cases in 2006. Nevertheless, the potential risk of an upsurge among this population cannot be disregarded as significant proportions engage in unsafe behaviors [89, 90].

HIV prevalence among FSWs was low, 0.2 % between 2005 and 2007 [91]. However, cross-border (from Hong Kong to mainland China) FSW is common [92]. With increasing population mobility and growing HIV epidemics in neighboring countries, sub-populations with elevated risk of infection need to be closely monitored.

Mongolia

Mongolia is a landlocked country located in Northeast Asia, bordered by the Russian Federation (Russia) to the north and China to the south, two countries with rapidly expanding HIV epidemics. With a small population of 2.8 million, more than 1 million are registered residents of Ulaanbaatar city, the capital and largest city [4]. Mongolia has the smallest HIV epidemic in the region, prevalence in the general population is less than 0.1 % [1, 93] despite high prevalence of other STIs among different population groups [94–96]. Between 1992 and 2004 only five cases of HIV were reported [97], two of whom were AIDS cases (personal communication with UNAIDS Mongolia) (Table 1). However, the number of HIV and AIDS cases has been increasing sharply in recent years. A total of 126 cases were reported by the end of 2012, more than 60 % of them within the last 4 years and 91 % of cases identified in

Ulaanbaatar [97]. According to official statistics 17 died by the end of 2012 [97]. The sharp increase in HIV cases could be a response to an increasing incidence of HIV and improved HIV surveillance system [97–100]. Epidemic estimates (by Spectrum) show that at the end of 2013, the number of PLHIV stood at 655. Of these, 73.3 % were MSM (personal communication with UNAIDS Mongolia).

To date, all cases for which route of transmission is known have been attributed to sexual contact, predominantly MSM (Fig. 1). Until 2011, 80 % of HIV cases were males, 82.5 % of them MSM [93]. This is probably an underestimation given that data on sexual orientation was not collected until 2007. Among the female cases, 52 % were CSWs. There are no reported cases of HIV transmission related to blood or vertical transmission. Unlike the neighboring countries of Russia and China, no cases have been found among IDUs in Mongolia [93, 101].

A series of second generation surveillance surveys (SGSS) have been the main source of information in Mongolia over the past decade. MSM and FSWs are currently the population most at risk. The prevalence among MSM during the 2005, 2007, 2009, and 2011 SGSS was 0.0 %, 0.85 %, 1.80 %, and 7.5 %, respectively [98–100]. The sharp increase in HIV prevalence has been argued to be an artifact possibly due to changes in the cases included for estimations (only new HIV cases vs. new and previously identified cases), sampling strategies (convenience vs. response driven sampling [RDS]), sample sizes (88 in 2005 compared to 200 in 2011), and improvements in surveillance [93, 102•]. However, 7.5 % HIV prevalence rate found in the last round of SGSS may be comparable to 6.3 % self-reported HIV prevalence observed during a survey among MSM in Ulaanbaatar in 2011 using RDS [103•]. There is evidence suggesting risky behaviors among MSM [95, 102•, 103•, 104]. Furthermore, low HIV-related knowledge regarding the risks associated with same-sex practices, low exposure to prevention programs (33.6 %), and high misconception about HIV transmission have been reported [102•, 103•]. It should also be noted that there is very limited research on MSM done to date (no data available from outside the capital city) [105], high levels of discrimination, including violence, and low societal acceptance of MSM [106].

Even though previous SGSS did not find HIV infection among FSWs, overall prevalence of syphilis in this population was consistently high ranging from 17.4 % in 2005 to 27.8 % in 2011. High risk sexual behaviors are still common among FSWs and many have misconceptions about HIV transmission [102•]. The illegal character of sex work coupled with high rates of poverty and unemployment may lead increasing numbers of women into sex work for survival [107]. Little is known about other vulnerable groups such as, IDUs, mobile populations, and clients of FSWs. Low impact behavioral interventions should be considered since they can achieve

considerable reductions of HIV and STI risk in such a low resource setting [108•].

Conclusion

Although the HIV epidemic reached East Asia relatively late, it expanded region wide driven by the epidemic in China. Because of the timely and effective measures, great progress has been achieved in the control of the HIV epidemic. However, in most of the countries or areas of the region the greatest concern is the growing epidemic among MSM population that has been neglected for many years. Large-scale prevention needs to be tailored to this subpopulation with careful monitoring and evaluation, addressing appropriately the issues of discrimination and stigmatization. Governments need to have strong commitments because the potential consequences of inaction are huge and could have disastrous implications.

Acknowledgments This study was supported by a grant from the Ministry of Health, Labour and Welfare in Japan. We greatly appreciate the help of Altanchimeg Deleghoimbol at UNAIDS Mongolia, Sergelen Munkhbaatar at Mongolia Ministry of Health, and Jin Young Ahn at Yonsei University College of Medicine in South Korea for facilitating us with national data and/or country reports. Finally, our appreciation goes to Bishal Gyawali at the University of Southern Denmark for his assistance in the early stages of this review.

Compliance with Ethics Guidelines

Conflict of Interest S. Pilar Suguimoto, Teeranee Techasrivichien, Patou Masika Musumari, Christina El-saaidi, Bhekumusa Wellington Lukhele, Masako Ono-Kihara, and Masahiro Kihara declare that they have no conflict of interest

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

References

Papers of particular interest, published recently, have been highlighted as:

- Of importance
- Of major importance

1. UNAIDS: *Global report: UNAIDS report on the global AIDS Epidemic 2013*. Switzerland; 2013.
2. Piot P, Quinn TC. Response to the AIDS pandemic—a global health model. *N Engl J Med*. 2013;368(23):2210–8.
3. Quinn TC. Global burden of the HIV pandemic. *Lancet*. 1996;348(9020):99–106.
4. Central Intelligence Agency: *The World Factbook 2013-14* [<https://www.cia.gov/library/publications/the-world-factbook/index.html>] (Last accessed: January 19th, 2014).
5. Ministry of Health of the People's Republic of China, UNAIDS, WHO: *2011 Estimates for the HIV/AIDS epidemic in China*; 2011.

6. Zhang L, Chow EP, Jing J, Zhuang X, Li X, He M, et al. HIV prevalence in China: integration of surveillance data and a systematic review. *Lancet Infect Dis*. 2013;13(11):955–63. *The authors analyzed the HIV prevalence trends between 1990 and 2012. They collected data from more than 1800 sentinel sites across all Chinese provinces and did a systematic review of 821 independent published studies. Their study showed that HIV prevalence among MSM is increasing at an alarming rate across all regions, suggesting that sex between men has become the main route of transmission.*
7. Wu Z, Sullivan S. China. In: Yamamoto T, Itoh S, editors. *Fighting a Rising Tide: The Response to AIDS in East Asia*, Wu Z, Sullivan S. Tokyo: Japan Center for International Exchange; 2006. p. 76–95.
8. Zhang KJ, Ma SJ. Epidemiology of HIV in China. *BMJ*. 2002;324(7341):803–4.
9. Xiao Y, Kristensen S, Sun J, Lu L, Vermund SH. Expansion of HIV/AIDS in China: Lessons from Yunnan Province. *Soc Sci Med*. 2007;64(3):665–75.
10. Wu Z, Liu Z, Detels R. HIV-1 infection in commercial plasma donors in China. *Lancet*. 1995;346(8966):61–2.
11. Dou Z, Chen RY, Wang Z, Ji G, Peng G, Qiao X, et al. HIV-infected former plasma donors in rural Central China: from infection to survival outcomes, 1985–2008. *PLoS One*. 2010;5(10):e13737.
12. Sheng L, Cao WK. HIV/AIDS epidemiology and prevention in China. *Chin Med J (Engl)*. 2008;121(13):1230–6.
13. Wu Z, Sun X, Sullivan SG, Detels R. HIV Testing in China. *Science*. 2006;312(5779):1475–6.
14. Ministry of Health of the People's Republic of China, UNAIDS, WHO: *2005 Update on the HIV/AIDS Epidemic and Response in China*. Beijing; 2006.
15. He N, Detels R. The HIV epidemic in China: history, response, and challenge. *Cell Res*. 2005;15(11–12):825–32.
16. Sullivan SG, Wu Z. Rapid scale up of harm reduction in China. *Int J Drug Pol*. 2007;18(2):118–28.
17. Ministry of Health of the People's Republic of China: *2012 China AIDS Response Progress Report*; 2012.
18. Wu Z, Xu J, Liu E, Mao Y, Xiao Y, Sun X, et al. HIV and Syphilis Prevalence Among Men Who Have Sex With Men: A Cross-Sectional Survey of 61 Cities in China. *Clin Infect Dis*. 2013;57(2):298–309. *This study is a rigorous epidemiologic work on more than 47,000 MSM; probably the largest study to date on HIV and syphilis prevalence among MSM. The authors found high prevalence of HIV and syphilis with similar risk factors but distinct geographical distribution, attributed by the authors to diverse transmission dynamics.*
19. UNAIDS: HIV in China: Facts and Figures [<http://www.unaids.org.cn/en/index/page.asp?id=197&class=2&classname=China+Epidemic+%26+Response>] (Last accessed: January 10th, 2013).
20. Zhong F, Lin P, Xu H, Wang Y, Wang M, He Q, et al. Possible increase in HIV and syphilis prevalence among men who have sex with men in Guangzhou, China: results from a respondent-driven sampling survey. *AIDS Behav*. 2011;15(5):1058–66.
21. Chow EP, Wilson DP, Zhang L. HIV and syphilis co-infection increasing among men who have sex with men in China: a systematic review and meta-analysis. *PLoS One*. 2011;6(8):e22768.
22. Chow EP, Jing J, Feng Y, Min D, Zhang J, Wilson DP, et al. Pattern of HIV testing and multiple sexual partnerships among men who have sex with men in China. *BMC Infect Dis*. 2013;13(1):549.
23. Feng Y, Wu Z, Detels R. Evolution of men who have sex with men community and experienced stigma among men who have sex with men in Chengdu, China. *J Acquir Immune Defic Syndr*. 2010;53 Suppl 1:S98–103.

24. Chow EP, Wilson DP, Zhang L. What is the potential for bisexual men in China to act as a bridge of HIV transmission to the female population? Behavioural evidence from a systematic review and meta-analysis. *BMC Infect Dis.* 2011;11:242. *This study provides a comprehensive analysis of the bisexual characteristics of Chinese MSM during 2001 to 2010. Bisexual behavior among MSM is common in China to conceal their homosexuality and conform to Chinese social norms.*
25. Yang Z, Su J, Peng X, Wu N. A Decline in HIV and Syphilis Epidemics in Chinese Female Sex Workers (2000-2011): A Systematic Review and Meta-Analysis. *PLoS One.* 2013;8(12):e82451.
26. Yingying H, Smith K, Suiming P. Changes and correlates in multiple sexual partnerships among Chinese adult women—population-based surveys in 2000 and 2006. *AIDS Care.* 2011;23 Suppl 1:96–104.
27. Liu J, Huang Y, Wang J, Guo N, Li J, Dong X, et al. The increasing prevalence of serologic markers for syphilis among Chinese blood donors in 2008 through 2010 during a syphilis epidemic. *Transfusion (Paris).* 2012;52(8):1741–9.
28. Qian HZ, Vermund SH, Wang N. Risk of HIV/AIDS in China: subpopulations of special importance. *Sex Transm Infect.* 2005;81(6):442–7.
29. Wu Z, Sullivan SG, Wang Y, Rotheram-Borus MJ, Detels R. Evolution of China's response to HIV/AIDS. *Lancet.* 2007;369(9562):679–90.
30. Lau JT, Lin C, Hao C, Wu X, Gu J. Public health challenges of the emerging HIV epidemic among men who have sex with men in China. *Public Health.* 2011;125(5):260–5.
31. Centers for Disease Control R.O.C. (Taiwan): HIV/AIDS [<http://www.cdc.gov.tw/english/page.aspx?treeid=e79c7a9e1e9b1cdf&nowtreeid=6bb9113c9e323e98>] (Last accessed: December 25, 2013).
32. Study Group on HIV Infection of Haemophiliacs: *Report of the study group on HIV infection of haemophiliacs through blood products in Hong Kong.* Hong Kong; 1993.
33. Feldman EA. HIV and Blood in Japan: Transforming Private Conflict into Public Scandal. In: Feldman EA, editor. *Blood Feuds: AIDS, Blood, and the Politics of Medical Disaster.* New York: Oxford University Press; 1999.
34. Centers for Disease Control R.O.C. (Taiwan): HIV/AIDS (1984 - 2012/12/31) [<http://www.cdc.gov.tw/english/info.aspx?treeid=00ED75D6C887BB27&nowtreeid=334C2073091C8677&tid=EA2CB016562D29C9>] (Last accessed: January 17th, 2014).
35. Centers for Disease Control R.O.C. (Taiwan): Annual reported number of cases of HIV among Taiwanese by risk factor [<http://www.cdc.gov.tw/professional/downloadfile.aspx?fid=909C64F271CE1554>] (Last accessed: January 19th, 2014).
36. Centers for Disease Control Ministry of Health and Welfare R.O.C. (Taiwan): *Statistics of Communicable Diseases and Surveillance Report.* Taipei; 2013.
37. Centers for Disease Control Ministry of Health and Welfare R.O.C. (Taiwan): *Annual Report.* Taipei; 2013.
38. UNAIDS: Welcome (not) [<http://www.unaids.org/en/resources/infographics/20120514travel/>] (Last accessed: January 18th, 2014).
39. Chu FY, Chiang SC, Su FH, Chang YY, Cheng SH. Prevalence of human immunodeficiency virus and its association with hepatitis B, C, and D virus infections among incarcerated male substance abusers in Taiwan. *J Med Virol.* 2009;81(6):973–8.
40. Ko N-Y, Lee H-C, Hung C-C, Tseng F-C, Chang J-L, Lee N-Y, et al. Trends of HIV and Sexually Transmitted Infections, Estimated HIV Incidence, and Risky Sexual Behaviors Among Gay Bathhouse Attendees in Taiwan: 2004–2008. *AIDS Behav.* 2011;15(2):292–7. *The paper identifies increasing HIV prevalence in MSM attending bathhouses in Taiwan from 2004-2007. Revealing that behavior is extremely risky, approximately 20%-30% of UAS and MSP and 80% of unprotected oral sex in the last visit to bathhouse. Recreational drug use may lead them to the perpetuating risk behaviors. Interventions at bath house are urgently needed.*
41. Ko N-Y, Koe S, Lee H-C, Yen C-F, Ko W-C, Hsu S-T. Online Sex-Seeking, Substance Use, and Risky Behaviors in Taiwan: Results from the 2010 Asia Internet MSM Sex Survey. *Arch Sex Behav.* 2012;41(5):1273–82.
42. Lin HH, Shih YL, Liu YC, Lee SS, Huang CK, Chen YL, et al. An epidemic of HIV type I CRF07_BC infection among injection drug users in Taiwan. *J Acquir Immune Defic Syndr.* 2006;42(2):248–55.
43. Lin Y-T, Lan Y-C, Chen Y-J, Huang Y-H, Lee C-M, Liu T-T, et al. Molecular Epidemiology of HIV-1 Infection and Full-Length Genomic Analysis of Circulating Recombinant Form 07_BC Strains from Injection Drug Users in Taiwan. *J Infect Dis.* 2007;195(9):1283–93.
44. Chen Y-MA, Lan Y-C, Lai S-F, Yang J-Y, Tsai S-F, SH-S K. HIV-1 CRF07_BC infections, injecting drug users, Taiwan [letter]. *Emerg Infect Dis* 2006.
45. Lee TS, Shen HC, Wu WH, Huang CW, Yen MY, Wang BE, et al. Clinical characteristics and risk behavior as a function of HIV status among heroin users enrolled in methadone treatment in northern Taiwan. *Subst Abuse Treat Prev Policy.* 2011;6:6.
46. Liu JY, Lin HH, Liu YC, Lee SS, Chen YL, Hung CC, et al. Extremely high prevalence and genetic diversity of hepatitis C virus infection among HIV-infected injection drug users in Taiwan. *Clin Infect Dis.* 2008;46(11):1761–8.
47. Chen Y-MA, Chen Y-H, Lin Y-T, Lim P-L, Yunihastuti E, Kiertiburanakul S, Merati T, Chaiwarith R, Phanuphak P, Li P-C et al: Hepatitis B (HBV) and hepatitis C (HCV) co-infection: long term immunological, virological and survival outcomes following cART. In: *7th International AIDS Society Conference on HIV Pathogenesis, Treatment and Prevention.* Kuala Lumpur; 2013.
48. Ko NY, Lee HC, Chang JL, Lee NY, Chang CM, Lee MP, et al. Prevalence of human immunodeficiency virus and sexually transmitted infections and risky sexual behaviors among men visiting gay bathhouses in taiwan. *Sex Transm Dis.* 2006;33(8):467–73.
49. Tung WC, Ding K, Farmer S. Knowledge, attitudes, and behaviors related to HIV and AIDS among college students in Taiwan. *J Assoc Nurses AIDS Care.* 2008;19(5):397–408.
50. Kihara M, Ono-Kihara M, Feldman MD, Ichikawa S, Hashimoto S, Eboshida A, et al. HIV/AIDS surveillance in Japan, 1984-2000. *J Acquir Immune Defic Syndr.* 2003;32 Suppl 1:S55–62.
51. Study Group on HIV/AIDS Epidemiology and Intervention: *Surveillance and preventive activities for HIV/AIDS infection among high risk populations and monitoring of local and global epidemiologic trends of HIV/AIDS.* Japan; 2013.
52. Japan Foundation for AIDS Prevention: Japan: HIV/AIDS update. *ICAAP11, Bangkok, Thailand, November 18-22 2013.*
53. Ichikawa S, Kaneko N, Koerner J, Shiono S, Shingae A, Ito T. Survey investigating homosexual behaviour among adult males used to estimate the prevalence of HIV and AIDS among men who have sex with men in Japan. *Sex Health.* 2011;8(1):123–4.
54. Kojima H: The Viewpoint of a Specialist from an Outsourced HIV Counseling and Testing Service. In: *22nd Japanese Society for AIDS Research.* Osaka, Japan; 2008.
55. Ministry of Health Labour and Welfare (MHLW): *Annual Report of the National AIDS Surveillance Committee for year 2012.* Tokyo; 2013.
56. Hidaka Y, Ichikawa S, Koyano J, Urao M, Yasuo T, Kimura H, et al. Substance use and sexual behaviours of Japanese men who have sex with men: a nationwide internet survey conducted in Japan. *BMC Public Health.* 2006;6:239.
57. Nishijima T, Gatanaga H, Komatsu H, Takano M, Ogane M, Ikeda K, et al. High Prevalence of Illicit Drug Use in Men Who Have

- Sex with Men with HIV-1 Infection in Japan. *PLoS One*. 2013;8(12):e81960.
58. Gilmour S, Li J, Shibuya K. Projecting HIV transmission in Japan. *PLoS One*. 2012;7(8):e43473. *This study highlights the need for new strategies to reach the MSM population. It points out gaps in the current knowledge about the key risk behaviors among this population and provides some recommendations.*
 59. Palella FJ, Delaney KM, Moorman AC, Loveless MO, Fuhrer J, Satten GA, et al. Declining Morbidity and Mortality among Patients with Advanced Human Immunodeficiency Virus Infection. *N Engl J Med*. 1998;338(13):853–60.
 60. Itoh S. Japan. In: Yamamoto T, Itoh S, editors. *Fighting a Rising Tide: The Response to AIDS in East Asia*. Tokyo: Japan Center for International Exchange (JCIE); 2006. p. 119–55.
 61. Korea Centers for Disease Control and Prevention: *Annual Report on the Notified HIV/AIDS in Korea*; 2013.
 62. Korea Centers for Disease Control and Prevention: *HIV/AIDS Control in the Republic of Korea*. Seoul; 2011.
 63. Lee JH, Hong KJ, Wang JS, Kim SS, Kee MK. Estimation of hospital-based HIV seroprevalence as a nationwide scale by novel method; 2002-2008 in Korea. *BMC Public Health*. 2010;10:739.
 64. Kee MK, Lee JH, Whang J, Kim SS. Ten-year trends in HIV prevalence among visitors to public health centers under the National HIV Surveillance System in Korea, 2000 to 2009. *BMC Public Health*. 2012;12:831. *Large study (HIV/AIDS Cohort 2006) in Korea showing low HIV prevalence among high risk groups attending public health centers. Also, showed that HIV prevalence among "anonymous testers" was highest highlighting the importance to ascertain the characteristics of people choosing to take voluntary testing.*
 65. Yu H-K, Kim N-Y, Kim SS, Chu C, Kee M-K. Forecasting the Number of Human Immunodeficiency Virus Infections in the Korean Population Using the Autoregressive Integrated Moving Average Model. *Osong Public Health Res Perspect*. 2013;4(6): 358–62.
 66. Korea Centers for Disease Control and Prevention: *2011 Annual Report on the Notified HIV/AIDS in Korea*; 2012.
 67. Kweon S-S, Shin M-H, Song H-J, Jeon D-Y, Choi J-S. Seroprevalence and Risk Factors for Hepatitis C Virus Infection Among Female Commercial Sex Workers in South Korea Who are not Intravenous Drug Users. *Am J Trop Med Hyg*. 2006;74(6):1117–21.
 68. Surin S. Republic of Korea. In: Yamamoto T, Itoh S, editors. *Fighting a Rising Tide: The Reponse to AIDS in East Asia*. Tokyo: Japan Center for International Exchange; 2006. p. 156–71.
 69. Lee J-H, Kim SH, Wang J-S, Sung KM, Kim SS, Kee M-K. Epidemiological and Immunological Characteristics at the Time of HIV Diagnosis for HIV/AIDS Cohort Registrants Representative of HIV-Infected Populations in Korea. *Osong Public Health Res Perspect*. 2012;3(2):100–6.
 70. Sohn A, Cho B. Knowledge, Attitudes, and Sexual Behaviors in HIV/AIDS and Predictors Affecting Condom Use among Men Who Have Sex with Men in South Korea. *Osong Public Health Res Perspect*. 2012;3(3):156–64.
 71. Jung M, Lee J, Kwon DS, Park B-J. Comparison of Sexual Risky Factors of Men Who Have Sex With Men and Sex-buying Men as Groups Vulnerable to Sexually Transmitted Diseases. *J Prev Med Public Health*. 2012;45(3):156–63.
 72. Sohn A, Park S. HIV/AIDS Knowledge, Stigmatizing Attitudes, and Related Behaviors and Factors that Affect Stigmatizing Attitudes against HIV/AIDS among Korean Adolescents. *Osong Public Health Res Perspect*. 2012;3(1):24–30.
 73. Min JA, Yoon Y, Lee HJ, Choi J, Kwon M, Kim K, et al. Prevalence and associated clinical characteristics of hepatitis B, C, and HIV infections among injecting drug users in Korea. *J Med Virol*. 2013;85(4):575–82.
 74. Lee SH, Kim KH, Lee SG, Chen DH, Jung DS, Moon CS, et al. Trends of mortality and cause of death among HIV-infected patients in Korea, 1990-2011. *J Korean Med Sci*. 2013;28(1):67–73. *This study revealed that a high proportion of patients are presenting late to care thus having early mortality. In a time when antiretroviral treatment is available, this study underlines the importance for early testing and diagnosing to get appropriate care.*
 75. Choe PG, Park WB, Song JS, Kim NH, Park JY, Song KH, et al. Late presentation of HIV disease and its associated factors among newly diagnosed patients before and after abolition of a government policy of mass mandatory screening. *J Infect*. 2011;63(1):60–5.
 76. Kee MK, Lee JH, Kim EJ, Lee J, Nam JG, Yoo BH, et al. Improvement in survival among HIV-infected individuals in the Republic of Korea: need for an early HIV diagnosis. *BMC Infect Dis*. 2009;9:128.
 77. Kim YG, Hahn SJ. Homosexuality in ancient and modern Korea. *Cult Health Sex*. 2006;8(1):59–65.
 78. Sohn A, Chun SS. Gender differences in sexual behavior and condom-related behaviours and attitudes among Korean youths. *Asia Pac J Public Health*. 2007;19(2):45–52.
 79. Sohn A, Park S. Changes in Human Immunodeficiency Virus-related Knowledge and Stigmatizing Attitudes among Korean Adolescents from 2006 to 2011. *Osong Public Health Res Perspect*. 2012;3(2):107–12.
 80. Hong Kong Advisory Council on AIDS: *Annual Report August 2009 - July 2010*; 2011.
 81. Special Preventive Programme Centre for Health Protection: *HIV Surveillance Report: 2011 Update*. Kowloon, Hong Kong; December 2012.
 82. Special Preventive Programme Centre for Health Protection: *Factsheet on HIV/AIDS Situation in Hong Kong*. Kowloon, Hong Kong; 2012.
 83. Lee SS, Tam DK, Mak DW, Wong K. Use of the Internet for sex partnership in men who have sex with men before HIV infection. *Public Health*. 2011;125:433–5.
 84. Lau JF, Cai W, Tsui H, Cheng J, Chen L, Choi K, et al. Prevalence and Correlates of Unprotected Anal Intercourse Among Hong Kong Men Who Have Sex with Men Traveling to Shenzhen. *China. AIDS Behav*. 2013;17(4):1395–405.
 85. Ho R, Wong K: Programme manager's viewpoint: Hong Kong (China) experience in combating the HIV epidemic among men who have sex with men. *HIV/AIDS Prevention and Care Newsletter* 2010:3-5.
 86. Chan MK, Lee S. Can the low prevalence in Hong Kong be maintained? *AIDS Educ Prev*. 2004;16(A):18–26.
 87. Lee SS. The contribution of methadone maintenance treatment to HIV prevention - The case of Hong Kong. In: *International Conference on Tackling Drug Abuse - Conference Proceedings*. Hong Kong: Narcotics Division; 2005. p. 191–205.
 88. Special Preventive Programme Centre for Health Protection: *Factsheet HIV/AIDS Situation in Hong Kong*. Kowloon, Hong Kong; 2010.
 89. Li H, Goggins W, Lee SS: Multilevel analysis of HIV related risk behaviors among heroin users in a low prevalence community. *BMC Public Health* 2009, 9(137).
 90. Lee KC, Lim WW, Lee SS. High prevalence of HCV in a cohort of injectors on methadone substitution treatment. *J Clin Virol*. 2008;41(4):297–300.
 91. Wong WCW, Yim YL, Lynn H. Sexually Transmitted Infections Among Female Sex Workers in Hong Kong: The Role of Migration Status. *J Travel Med*. 2011;18(1):1–7.
 92. Lau JT, Tsui HY. Behavioral surveillance surveys of the male clients of female sex workers in Hong Kong: results of three population-based surveys. *Sex Transm Dis*. 2003;30(8):620–8.
 93. Government of Mongolia: *AIDS reponse progress reporting*. Mongolia; 2012.

94. Tserenpuntsag B, Ouynbileg L, Nelson K, McNutt LA. Prevalence of infectious diseases among Mongolian blood donors. *J Infect Dev Ctries*. 2008;2(1):73–5.
95. Davaalkham J, Unenchimeg P, Baigalmaa C, Oyunbileg B, Tsuchiya K, Hachiya A, et al. High-risk status of HIV-1 infection in the very low epidemic country, Mongolia, 2007. *Int J STD AIDS*. 2009;20(6):391–4.
96. Amindavaa O, Kristensen S, Pak CY, Khalzan D, Chultemsuren B, Randall AS, et al. Sexually transmitted infections among pregnant women attending antenatal clinics in Mongolia: potential impact on the Mongolian HIV epidemic. *Int J STD AIDS*. 2005;16(2):153–7.
97. National Center for Communicable Diseases (NCCD): HIV/AIDS cases overview [http://www.nccd.gov.mn/index.php?option=com_content&view=article&id=386:2013-11-29-05-29-40&catid=21:2011-09-01-03-24-23&Itemid=42] (Last accessed: January 19th, 2014).
98. Mongolia Ministry of Health: *Second Generation HIV/STI Surveillance Report*. Mongolia; 2005.
99. Mongolia Ministry of Health: *Second Generation HIV/STI Surveillance Report*. Mongolia; 2007.
100. Mongolia Ministry of Health: *Second Generation HIV/STI Surveillance Report*. Mongolia; 2009.
101. Mongolia National Committee on HIV and AIDS: *UNGASS Country Progress Report: Mongolia*; 2010.
- 102.●● Mongolia Ministry of Health: *Second Generation HIV/STI Surveillance Survey*. Mongolia; 2011. *This is a major source of information regarding the HIV epidemic in Mongolia since limited research has been published in English.*
- 103.● Yasin F, Deleghoimbol A, Jamiyanjamts N, Sovd T, Mason K, Baral S. A cross-sectional evaluation of correlates of HIV testing practices among men who have sex with men (MSM) in Mongolia. *AIDS Behav*. 2013;17(4):1378–85. *This study used a rigorous methodology and provided data on HIV prevalence, patterns and associations of HIV testing, and HIV related knowledge among MSM.*
104. Mathers B, Wodak A, Shakeshaft A, Merghati Khoei E, Dolan K: *A rapid assessment and response to HIV and drug use in Mongolia*. Sydney; 2009.
105. National Committee on HIV/AIDS: *Mongolian National Strategic Plan on HIV, AIDS and STIs, 2010-2015*. Ulaanbaatar; 2010.
106. Yasin F, Deleghoimbol A, Jamiyanjamts N, Mason K, Baral S: A cross-sectional assessment of HIV risk status and human rights abuses among men who have sex with men (MSM) in Mongolia [Poster]. *XIX International AIDS Conference, July 22-27 Washington DC, USA 2012*.
107. Tsai LC, Witte SS, Aira T, Riedel M, Hwang HG, Ssewamala F: “There is no other option; we have to feed our families...who else would do it?”: The financial lives of women engaging in sex work in Ulaanbaatar. Mongolia. *Glob J Health Sci*. 2013;5(5):41–50.
- 108.● Witte SS, Altantsetseg B, Aira T, Riedel M, Chen J, Potocnik K, et al. Reducing sexual HIV/STI risk and harmful alcohol use among female sex workers in Mongolia: a randomized clinical trial. *AIDS Behav*. 2011;15(8):1785–94. *This study shows that even low impact interventions can achieve reductions of HIV and STI risk among FSW. Feasible and positively endorsed interventions are particularly important in low resourced settings.*