clinic attendance in similar magnitudes as in the original unmatched analysis with statistical significance except for the age at first sexual intercourse and unprotected vaginal and/or oral sex with casual partners that were associated at the *p*-value level of between 0.1- 0.2.

DISCUSSION

This is the first study to evaluate the sexual-behavior profile of Japanese, non-SW females attending STI clinics utilizing the data sets collected in 1999. Using population-based controls, rather than hospital-based controls that bring a risk of over-controlling [9], our study shows that female STI clinic attendees are more likely to be younger, unmarried, have unprotected vaginal sex with regular partners in the previous year, and have multiple sex partners in the previous year. They also tended to have their first experience of sexual intercourse at a younger age and have more unprotected vaginal and/or oral sex with casual partners. These results however cannot be immediately translated into the risks for STI infection because the results may be confounded by attendees with non-STI infections such as vulvaginal candidasis, bacterial vaginosis or urinary tract infection. Confounding of such cases may well be why our study found unprotected sex with a regular partner was generally high among our subjects. However, this is unlikely to be the case because identical sexual behavioral patterns were identified between female attendees with a current diagnosis of STI and those before diagnosis, and between those with and without a past history of STI diagnosis. It is, therefore, likely that these sexual behaviors are predictive of STI infection among young women in Japan and could have contributed to the STI epidemic in women which Japan witnessed during the 1990s.

Case-control or cross-sectional studies that assess the possible STI infection risk of women using population-based controls are limited. These include a British study that compared females who attended STI clinics in the previous year (n=250) with those who did not (n=9584) among the probability samples of the general population using the data set of the British National Surveys of Sexual Attitudes and Lifestyles (NATSAL) conducted in 1990 [10]. Another British study, using the 2000 NATSAL samples, also compared females who had STIs in the previous five years (n=416) with those who had not (n=5459) [11]. In the U.S., two population-based studies were performed in North Carolina; one study compared black women with a lifetime history of gonococcal infection (n=27) with women without such histories (n=120) [12]; and the other study compared women in a low-income neighborhood with herpes simplex type 2 infections (n=534) with those who had no such infection (n=1101) [13]. In China, a national population-based study was conducted in 1999-2000 comparing women testing positive for chlamydia (n=41) with negative controls (n=1194) [14]. Finally, in Slovenia, a national population-based study was performed in 2000 that compared women with a lifetime history of STI infection (n=41) and those without (n=737) [15]. Although there are other studies that attempt to assess the correlates of STI infection in females, they either do not include the results of multivariate analysis for women or lack information on sample size [9, 16, 17].

The results of our study are consistent with all of the studies cited above, indicating that multiple

partnerships is a strong correlate with STI infection or STI clinic attendance, though the time frame of the question and the stratification of multiple partners varies between the studies. While our study and the China study adopted the previous one year as the time frame for the questions on sexual behaviors, lifetime or the previous five years were used in other studies. Similarly, while the number of partners was used as a dichotomous variable of one or more in our study, it was used as a dichotomous variable with different categorization, a continuous variable or polychotomous variables in other studies. Our findings that STI clinic attendees are more likely to be unmarried or experienced sex at an earlier age are also consistent with the results of some of these studies in STI patients or STI clinic attendees [9, 10, 12].

Our study, however, differs importantly from other studies in analytic strategy. Though types of partners, types of sex or condom use are usually introduced as separate variables in analysis, we structured the questions so that we could construct dichotomous variables that represent the presence or absence of unprotected sex in each type of sex (vaginal, oral or anal) with each type of partner (regular, casual or paid). This enabled us to more accurately evaluate the potential risk of sexual behaviors for STI infection, especially the sexual behavior with regular partners that has not been adequately addressed because regular partnerships are usually used as a reference for other types of partnerships. Our analysis clearly showed that unprotected vaginal sex with a regular partner is an independent correlate of STI clinic attendance or STI infection. About 60% of female STI clinic attendees in our study experienced sex only with regular partners in the previous year, suggesting that not only multiple partnerships or unprotected sex with casual partners, but also unprotected sex with regular partners may pose a risk of STI infection for young women in Japan. It may be important to note the difference in the type of regular partnership between STI clinic attendees and controls. While 78% of the regular partners for controls were husbands, 77% of the regular partners of STI clinic attendees were boyfriends, who may be potentially short-term, which is consistent with the increased number of partnerships for STI clinic attendees.

The risk of sexual transmission through a regular partnership has been suggested in a number of studies on STIs or HIV [18-21]. These studies are, however, either case studies or cross-sectional studies that only show the proportion of people who are monogamous or have only a regular partner. To our knowledge, our study is the first to quantitatively assess the possible risk of unprotected sex with regular partners among women. The China study introduced variables that represent the level of income or socialization of the male steady partner and showed that women with chlamydial infection are more likely to have steady partners with higher incomes and displaying frequent socialization [14]. Since 98% of women having chlamydial infection had only a steady partner, it was suggested that infection from a steady partner is the single most important risk factor for STI infection for women in China. In view of the importance of the prevention of STI among women, more evidence on the risk of regular partnerships should be accumulated.

It is interesting to interpret the findings of the present study in relation to those of our previous study that analyzed the demographic and sexual behavioral risk profile of male STI clinic attendees using the same data sets and adopting the same analytic strategy [5]. That study showed that male STI clinic attendees are

more likely to be unmarried, have multiple partnerships in the previous year, have unprotected vaginal sex with regular partners, have unprotected vaginal and/or oral sex with casual partners, and unprotected vaginal and oral sex with paid partners in the previous year. These findings, together with the results of the present study, suggest that Japanese women may be at risk of STI infection not only through casual or multiple partnerships but also potentially through regular partnerships with men who have frequent genital and/or oral sexual contact with paid or casual partners. Japanese women, especially unmarried women, may be at a greater risk of STI infection from male partners who buy sex than women in other developed countries because it was shown in our previous study [5] that the proportion of men who paid women for sex was 62.0% of male STI patients and 10.5% of probability male controls, while it is only a few percent among the general male population in other developed countries [22-24].

The results of the present study should be interpreted with caution. Although the case-control design utilized here is pertinent for rare diseases such as STIs, the analytic value may be compromised compared with cross-sectional studies utilizing a representative sample with nested cases and controls. In the present study, STI cases were sampled from private clinics. This is because over 90% of medical institutions in Japan are privately operated and because almost all Japanese people are covered by medical insurance programs, which are applied equally to both private and public institutions. Though selection bias should be considered, important characteristics of the female STI clinic attendees in the current study are shared with the 16 women with STIs in the previous year who were excluded from the control group. Like the STI clinic attendees in the current study, these women were, though to a lesser extent, more likely to have had experienced sex earlier, had unprotected vaginal or oral sex with regular partners or with casual partners and had multiple sex partners in the previous year than the women who had no history of STI infection in the previous year. Among control subjects, although the response rate for our survey (73.7%) was similar to other general population sexual behavior surveys [24-27], our samples were more likely to be married and better educated compared to the census population as described in the Methods section. Since marital status, but not education level, was strongly associated with sexual behavior, this could have affected the results of the bivariate comparison. It is, however, unlikely to have affected the results of multivariate analysis because results were adjusted for both education level and marital status. The control group could have also been biased in that the highly sexually-active subpopulation may have avoided the survey. However, our experience with a nationwide survey of students from 30 universities in 1999 using a similar questionnaire showed little association between the answers to the questions related to sexual behaviors and response rates, which ranged between 16.4-100% [28]. It is also possible that other unmeasured factors could have confounded the results, although in an attempt to avoid this four demographic and four district variables were included in the analysis. Finally, limitations in the results also exists in the fact that our data are 10 years old, making the extrapolation of the findings into the current STI epidemic among women difficult. The present study, however, remains valid because it aimed to analyze the possible background of the STI epidemic among women during the 1990s and this is the only data set available in Japan for this purpose.

Despite the possible limitations, the results of this study are important in showing the possible STI risk

profile of non-SW females in Japan for the first time. Together with the results of male STI clinic attendees in our previous analyses, the present results suggest that the epidemic of STIs in young men and women which Japan has experienced since the mid-1990s may have been driven by the sexual network that has expanded among the younger population, linking sex workers and casual and regular partners, and increased in intensity due to multiple partnerships and the prevalent practice of oral sex. These finding should be translated into prevention programs. Of particular importance will be the education campaign to inform the public of the possible risk contained in regular partnerships for both men and women that has been long neglected. Reducing unprotected sex with sex workers by men that may bring STIs into casual and regular partnerships is also important.

Finally, in view of the rapid cultural globalization, the message from the present study may extend to other Asian countries experiencing similar changes in the sexual norms and behavior of young people [29, 30].

CONCLUSION

In a case-control design using population-based controls, our study described demographic and behavioral characteristics of non-sex worker (SW) females attending STI clinics. The results suggested that not only casual sex or multiple partnerships, but also unprotected vaginal sex with regular partners are predictive of STI infection among the non-SW, female population in Japan. HIV/STI prevention programs should focus on both the risk of frequent casual partnerships and the possible risk from regular partnerships that has been long-neglected.

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Table 1. Demographic profile of Japanese non-sex worker female STI clinic attendees compared with population-based female controls

Characteristic	STI* clinic attendees (n=145)		Population-based controls (n=956)		
	n	%	n	%	*p* value†
Age at survey					<0.001§
18-19	19	13.1	18	1.9	
20-29	96	66.2	225	23.5	
30-39	26	17.9	353	36.9	
40-50	4	2.8	360	37.7	
Missing	0	0	0	0	
Mean(SD*)	25.0(5.9)		36.1(8.7)		
Median	23		36		
Employment					<0.001
Self-employed	7	4.8	86	9.0	
Management	0	0	6	0.6	
Employee	88	60.7	467	48.8	
Unemployed, full time student	40	27.6	57	6.0	
Housewife	5	3.4	326	34.1	
Missing	5	3.4	14	1.5	
Marital status					<0.001
Married	21	14.5	746	78.0	
Not married	123	84.8	201	21.0	
Missing	1	0.7	9	0.9	
Education level					0.43
High school or below	66	45.5	471	49.3	
College/university or above	79	54.5	482	50.4	
Missing	0	0	3	0.3	
HIV/STI-related knowledge score¶					<0.001§
Mean(SD)	11.9(3.0)		9.6(3.6)		
Median	12		10		

* STI, sexually transmitted infection; SD, standard deviation

†*p* values for chi-square test unless otherwise noted

¶Score for HIV/STI-related knowledge is the total number of 18 questions answered correctly.

§*P* values for Student's *t*-test

Table 2. Sexual behavior profile of Japanese non-sex worker female STI clinic attendees compared with population-based female controls

Characteristic	STI* clinic attendees (n=145)		Population-based controls (n=956)		
	n	%	n	%	*p* value†
Age at first sexual intercourse (years)					<0.001
<19					
19 or older	105	72.4	244	25.5	
Missing	38	26.2	641	67.1	
Mean(SD*)	2	1.4	71	7.4	
Median	17.6(2.7)		20.5(3.3)		
	17		20		
No. of partners (previous year)					<0.001
1	56	38.6	871	91.1	
2 or 3	33	22.8	65	6.8	
4 or more	30	20.7	12	1.3	
Missing	26	17.9	8	0.8	
Type of sex partner (previous year)					
Regular partner					0.011
Yes	139	95.9	942	98.5	
No	6	4.1	10	1.0	
Missing	0	0	4	0.4	
Casual Partner					<0.001
Yes	58	40.0	35	3.7	
No	86	59.3	908	95.0	
Missing	1	0.7	13	1.4	
Sex with regular partners (previous year)					
Had unprotected vaginal sex					
Yes					<0.001
No	119	82.1	622	65.1	
Missing	17	11.7	268	28.0	
Had unprotected oral sex	9	6.2	66	6.9	
Yes					<0.001
No	122	84.1	524	54.8	
Missing	18	12.4	375	39.2	
Had unprotected anal sex	5	3.4	57	6.0	
Yes					0.31
No	10	6.9	42	4.4	
Missing	130	89.7	851	89.0	

	5	3.4	63	6.6	
Sex with casual partners (previous year)					
Had unprotected vaginal sex					
Yes					<0.001
No	44	30.3	20	2.1	
Missing	94	64.8	922	96.4	
Had unprotected oral sex	7	4.8	14	1.5	
Yes					<0.001
No	40	27.6	17	1.8	
Missing	97	66.9	925	96.8	
Had unprotected anal sex	8	5.5	14	1.5	
Yes					1.00
No	0	0	1	0.1	
Missing	138	95.2	941	98.4	
	7	4.8	14	1.5	

* STI, sexually transmitted disease; SD, standard deviation

†*p* values for chi-square test unless otherwise mentioned

Table 3. Bivariate and multivariate analyses on the demographic and sex behavioral correlates of STI infection among non-sex worker Japanese women.

Characteristic	Crude odds ratio	95%CI*	Adjusted odds ratio†	95%CI
Socio-demographic factors				
Age (years)	0.83	0.80-0.86	0.94	0.89-0.99
Occupation				
Unemployed, full time student or housewife	0.69	0.47-1.01	0.61	0.30-1.25
Others				
	1.00		1.00	
Education				
High school education or less	0.86	0.60-1.21	0.76	0.39-1.48
University education or above	1.00		1.00	
Marital status				
Unmarried	21.74	13.34-35.40	4.11	1.73-9.77
Married	1.00		1.00	
Behavioral factors				
First sexual experience (years)				
≦18	7.26	4.87-10.82	1.77	0.89-3.54
≧19	1.00		1.00	
Number of sexual partners (previous year)				
≧2	12.72	8.29-19.54	3.09	1.42-6.71
1	1.00		1.00	
Sex with regular partners (previous year)				
Had unprotected vaginal sex				
Yes	3.02	1.78-5.11	3.59	1.49-8.64
No	1.00		1.00	
Had unprotected oral sex				
Yes	4.85	2.91-8.10	1.34	0.57-3.18
No	1.00		1.00	
Had unprotected anal sex				
Yes	1.56	0.76-3.18	0.83	0.23-2.95
No	1.00		1.00	
Sex with casual partners (previous year)				
Had unprotected vaginal and/or oral sex				
Yes	23.16	13.51-39.68	2.08	0.75-5.71
No	1.00		1.00	

* CI, confidence interval

†Odds ratio was adjusted by multiple logistic regression analysis for districts (Hokkaido/Tohoku, Kanto-Koshinetsu, Chubu/Kinki, Chugoku/Kyushu)

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国内外の HIV 感染症の流行動向及びリスク関連情報の戦略的収集と統合的分析に関する研究
（平成 21-23 年度総合報告書）

MSM における HIV 流行の推計・予測に関する研究
Estimation and projection of HIV epidemic among men who have sex with men in Japan: A mathematical modeling framework

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ABSTRACT

Our research group developed a population-based compartmental model for better understanding of the HIV epidemiology among men who have sex with other men (MSM) in Japan. This model has been updated based on the new surveillance data, and new HIV sero-prevalence data from MSM community in Japan. The model has been fitted to three concurrent lines of data among MSM in Japan including 1) HIV prevalence as measured by point-prevalence surveys, 2) number of newly diagnosed HIV cases per year, and 3) number of newly diagnosed AIDS cases per year. The model has also been subject to extensive and ongoing sensitivity analyses considering several parameters including condom use rate among Japanese MSM, behavioral risk reduction upon HIV diagnosis, behavioral risk reduction upon AIDS diagnosis, fraction of HIV test repeaters and the coverage of HIV testing among MSM in Japan.

The model which relies on the existing data on HIV infection and related risk characteristics among MSM in Japan predicts that by the end of 2009, the prevalence of HIV infection could be on average 6.8% among Japanese MSM living in Japan. HIV prevalence among MSM will continue to increase as more infected persons enter treatment and survive for a long period of time. It is predicted that prevalence will exceed 10% around the year 2020. However, the incidence rate of the infection that is estimated to be around 1.0 per person-year by the end of 2009 is likely to stabilize in the next few years. The model also predicts that with current high HIV testing rate of about 50%, we can expect that about 780 HIV infections be detected among Japanese MSM in 2009. There have been more than 10,000 HIV infections among MSM since the discovery of the epidemic in the early eighties. Further analyses and predictions are to be continued in 2010.

INTRODUCTION

Japan with a population of about 128 million has been considered having a low HIV prevalence for many years; however, recent surveillance data show an increasing number of people have been diagnosed with HIV or AIDS. Since 1985, 10788 cases of HIV infection and 5024 cases of AIDS have been reported to the Ministry of Health, Labour and Welfare. Among both reported cases of HIV and AIDS, more than 75% are Japanese nationals and the remaining are from other states especially from East Asian countries. The trend of the number of reported HIV cases is increasing in the recent years; more than a third of them have been diagnosed and reported in the past 4 years. While this increasing trend of reported HIV and AIDS cases could be due to increased availability of HIV testing services, there is little doubt about an ongoing HIV epidemic in Japan.

The HIV epidemic in Japan has been particularly concentrated among men who have sex with other men (MSM). According to the surveillance report, 50% (5404/10788) of all reported HIV cases and 61% (5400/8815) of male reported cases in Japan were among MSM.

In order to estimate and project prevalence and incidence of HIV infection among MSM in Japan, we used a population-based compartmental model, both in deterministic and stochastic forms. We parameterized the model using available data some of which, such as diagnosis rate of HIV/AIDS cases and detailed sexual behavior attributes, are not known satisfactorily. We used HIV surveillance data, demographic measures, the available evidence on the HIV prevalence among Japanese MSM living in Japan and their related risk characteristics, in addition to our best judgment based on the experience studying the HIV epidemic in Japan.

The available information on the HIV prevalence among MSM in Japan are derived mainly from HIV testing centers and HIV testing sites running throughout the country. In a recent review, it was reported recent HIV prevalence of 4.5% and 5.7% among MSM in Nagoya and Tokyo, respectively. The report concludes that while annual figures indicate yearly fluctuations, there is an overall pattern of gradual increase in the prevalence of HIV among MSM in Japan (21).

Our syntheses on the available evidence of HIV sero-prevalence among MSM in Japan also shows that the prevalence increases gradually from 1.8% in 1993 to higher than 5% in 2008 (Table 1).

Table 1. Average prevalence of HIV infection among Japanese MSM based on the available serological measurements from 1993 to 2008.

Year	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08
HIV prevalence	1.8	2.9	1.9	3.5	3.4	2.9	2.8	3.2	3.5	3.2	3.4	3.2	5.0	4.5	3.9	5.7

Fitted epidemiologic measures

We fit our model to three kinds of measured data:

1) The updated HIV prevalence as measured in point-prevalence surveys at testing locations or during testing events.
2) The updated number of newly diagnosed HIV cases every year.
3) The updated number of newly diagnosed AIDS cases every year.

Fitting parameters

We use the following parameters as our fitting parameters:

1) The size of the active MSM population.
2) The behavioral fitting parameter $b(i)$ that corrects for sexual network effects [7-9], informational limitations of ego-centric sexual behavior data, and non-random biases in sexual behavior reporting [10]. Since the model is mainly sensitive to the risk behavior in the higher risk groups as HIV prevalence is still a low level, We fix the $b(i)$ for $i = 1,2,3,4,5$ at 0.30, and use $b(i)$ for $i = 6,7,8,9,10$ as the fitting parameters yielding fitted values in the range of 0.23 to 0.70 for these parameters.

Model parameters and basic assumptions

HIV pathogenesis is described by the three stages of acute, latent, and AIDS. The relative risks of transmission per coital act per HIV stage are extracted from the measurements of Wawer *et al.* [14] by collapsing the sub-strata in their classification of incident, prevalent, and late stages into the three stages of acute, latent, and late [15]. The transmission probability per anal sex act per HIV stage is assumed to be five fold higher than that of heterosexual sex consistent with measurements of this probability [16].

HIV pathogenesis for undiagnosed HIV sero-positives is described by the three stages of acute, latent, and AIDS whose durations are assumed to be 2.5 months (acute), 10 years (latent), and 1 year (AIDS), respectively. These values are based on the transmission probability classification in Wawer *et al.* [14] and recent reassessment of HIV natural history by the UNAIDS Reference Group on Estimates, Modeling and Projections [17]. For the diagnosed population, HIV pathogenesis is described by the three stages of acute, latent, and

RESULTS

We generated a set of preliminary and tentative predictions concerning the nature of HIV epidemiology among MSM in Japan. The updated model predicts that by the end of 2009, the prevalence of HIV infection could be on average 6.8% among Japanese MSM living in Japan. HIV prevalence among MSM will continue to increase as more infected persons enter treatment and survive for a long period of time. It

is predicted that prevalence will exceed 10% around the year 2020. However, the incidence rate of the infection that is estimated to be around 1.0 per person-year by the end of 2009 is likely to stabilize in the next few years (Figure 1).

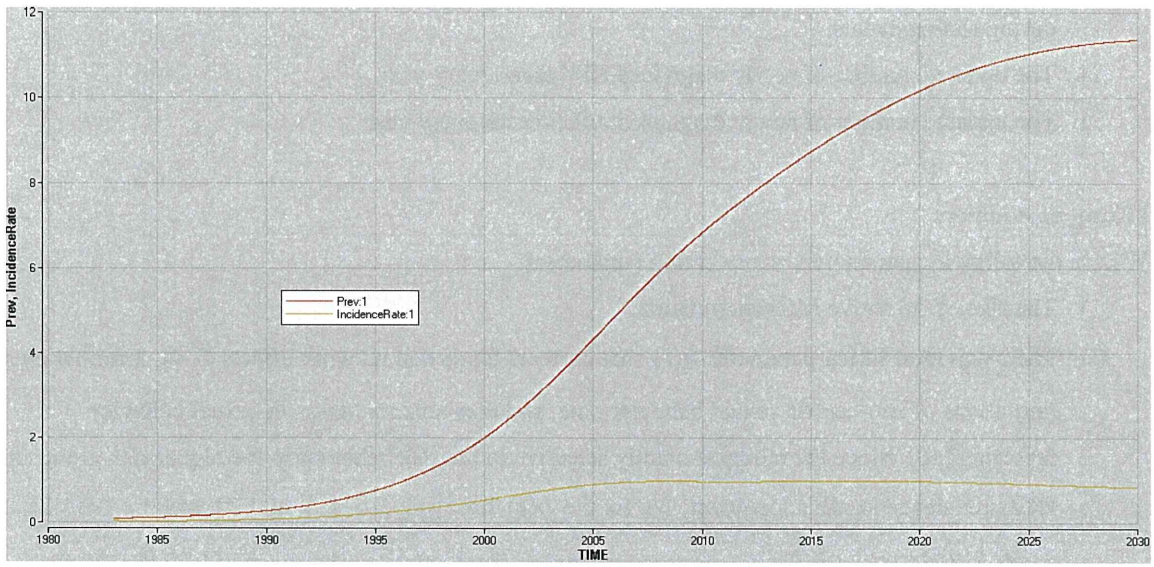

Figure 1. The estimated prevalence and incidence of HIV infection among Japanese men who have sex with other men (MSM)

The model also predicts that with current high HIV testing rate of about 50%, we can expect that about 780 HIV infections be detected among Japanese MSM in 2009. There have been more than 10,000 HIV infections among MSM since the discovery of the epidemic in the early eighties (Figure 2).

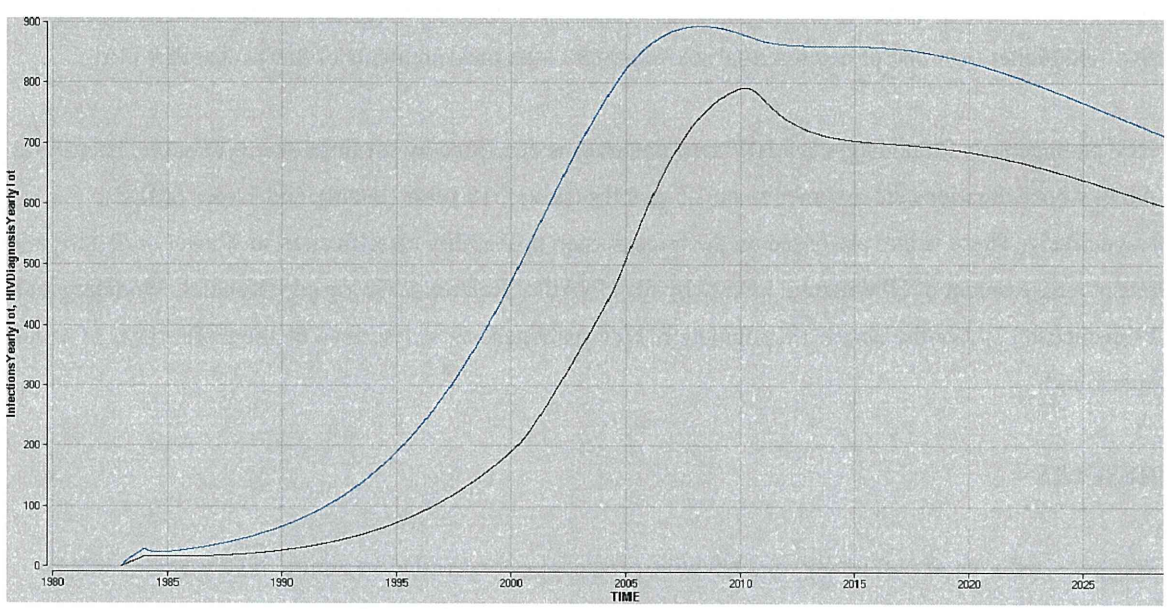

Figure 2. The numbers of new HIV infections and detected new HIV infections in a year among Japanese men who have sex with other men (MSM)

Sensitivity analyses of the key parameters in the model

The purpose of our sensitivity analysis was to determine whether adjustments in unknown / assumed parameters within reasonable limits still allow for model fit to three concurrent lines of data among MSM in Japan including 1) HIV prevalence as measured by point-prevalence surveys, 2) number of newly diagnosed HIV cases per year, and 3) number of newly diagnosed AIDS cases per year. We examined the sensitivity of our predictions for the outcomes of:

- True HIV prevalence in 2020
- HIV incidence rate in 2020
- New HIV infections per year in 2020
- New AIDS cases per year in 2020
- Total number of diagnosed HIV / AIDS cases in 2020
- Year in which the number of diagnosed HIV cases is predicted to peak

The parameters are:

- Condom use = 0.60
- Risk reduction with HIV diagnosis = 0.8
- Risk reduction with AIDS diagnosis = 1
- Fraction of repeat testers = 0.1
- Diagnosis rate = 0.5 beyond 2008

Implied variability for each parameter is +/- 15%. These choices represent the most influential parameters in our multiple analyses of the model.

In our original model, we did not account for the differing scales of all three sets of data (HIV prevalence as measured by point-prevalence surveys, number of newly diagnosed HIV cases per year, and number of newly diagnosed AIDS cases per year) when fitting the model concurrently to these datasets. Therefore, the data with the largest scale (number of newly diagnosed HIV cases per year) was weighted the most heavily, while HIV prevalence received the least weight. To provide equal weight for all three sets of data, we equalized the scales of the three sets of data according to their variances. As demonstrated in the table, we still were able to achieve fit to all three sets of data with this alteration. Model output varied only slightly. All further analyses within the sensitivity analysis were performed with the three data sets on an equal scale.

It should also be emphasized that this analysis was *not* performed to assess the effect of varying each of these parameters on the above outcomes. Rather, we investigated whether or not model fitting to the three lines of empirical data would remain robust if assumptions of parameter values were altered. Variability in new HIV infections per year appear large, but differ between model fits largely due to differences in the number of active MSM in Japan.

The two major point of the analysis are:

1) The model remains robust in terms of its ability to fit the empiric data with most adjustments in parameter values. However, the model fits less well with at least one of the empiric data sets in the context of high-assumed reduction of HIV risk behavior with HIV diagnosis (0.92), low-assumed fraction of re-testers (0.085), low assumed yearly HIV diagnosis rate beyond 2008 (0.42), and high-assumed HIV diagnosis rate beyond 2008 (0.58). It is therefore important that population estimates for each of these parameters is accurate for proper conduction of the model.

2) Estimates for prevalence and incidence at 2020, as well as year of peak number of HIV diagnoses, are very similar for each of the model fits. Therefore, the qualitative results of the model withstand all adjustments in parameter values for curve fits. It is therefore likely that:

   - The number of diagnoses of HIV infection of MSM will peak in the next one to two years.
   - HIV prevalence among MSM, will continue to increase as more infected persons enter therapy and survive for a long period of time despite a decrease in new infections.
   - The incidence rate is also likely to stabilize in the next few years.

	New HIV infections per year	New AIDS cases/year	Total HIV/AIDS cases	Year with peak # of HIV diagnoses / year
Baseline	643	113	756	2010
Baseline with fitting weights based on variance	793	139	942	2010
Condom use				
• **0.51**	863	152	1015	2010
• **0.69**	871	151	1022	2010
Risk reduction with HIV diagnosis				
• **0.68**	707	123	830	2010
• **0.92****	273	48	321	2009
Risk reduction with AIDS diagnosis				
• **0.85**	848	148	996	2010
Fraction of repeat testers				
• **0.085****	1101	192	1293	2010
• **0.115**	788	140	928	2010
Diagnosis rate beyond 2008				
• **0.42****	640	134	774	2011
• **0.58****	1061	166	1227	2009

** Reasonably poor fit to at least one set of empirical data.

DISCUSSION AND RECOMMENDATIONS

It is estimated that persistence of the relatively high diagnostic rate currently will lead to a gradual decline in the number of newly diagnosed AIDS cases among MSM in the next few years after reaching the peak sometime within the next two to three years.

We estimate that the substantial increases in uptake of HIV testing among MSM since the beginning of this decade have facilitated the diagnosis of large number of HIV infections. By the end of 2008, it is estimated that almost 70% of HIV infections among *living* MSM have already been diagnosed and that 55% of all HIV infections among MSM in Japan since the discovery of the epidemic were diagnosed prior to progression to AIDS. Given the assumed high diagnostic rate currently at 50% per person-year, close to half of incident HIV infections are currently diagnosed every year.

HIV incident rate among MSM in Japan is estimated currently at about 1.0% per person-year. The incidence rate has been growing since the discovery of the epidemic and its fastest growth was between 1995 and 2005. The incidence slowed its growth in the last three years and given the relatively high diagnostic rates currently, the incidence rate is likely to stabilize at current rates for the next few years.

A second generation bio-behavioral surveillance survey among MSM, that includes also STI surveillance with HSV-2 in particular, may substantially enhance our understanding of the epidemic, provide an estimate of actual HIV prevalence among MSM, and provide more accurate estimate of some of the model parameters. It is also recommended that better quantification of the levels of HIV diagnosis will be helpful for future estimation and projection.

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国内外のHIV感染症の流行動向及びリスク関連情報の戦略的収集と統合的分析に関する研究
（平成21-23年度総合報告書）

先進諸国における早期梅毒流行の再興とその背景要因について

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研究要約

先進国における梅毒流行のHIV流行における意味を明らかにするため、文献レビューを行った。1990年1月1日から2010年6月30日までの関連文献をPubMedで網羅的に検索し（検索ワード=syphilis, epidemic）、ヒットした56文献の内容を系統的に整理・分析した。その結果、1997年以降、ほとんどの先進諸国において、同時多発的な早期梅毒のアウトブレークが観察されていたことが明らかとなった。この流行には、感染者の大半（70-80%）が男性とセックスをする男性（MSM）であること、MSM症例中におけるHIV感染率が高い（約50%）ことなど、それ以前の梅毒流行とは全く異なる特徴があり、流行は、大都市の壮年～中年層のMSMが中心であった。この流行には、HIV感染症に対する多剤併用療法の導入による予後改善や楽観論、エイズ予防キャンペーンの停滞やキャンペーンに対する無視や予防疲れ、インターネットによる性的ネットワークの拡大やレクリエーショナルドラッグ使用の蔓延など、以前とは異なる要因による無防備な性行動の復活が指摘されている。我が国の梅毒報告数も、近年、他の性感染症（性器クラミジアや淋菌感染症）とは正反対の動向を示して増加しており、同性間感染による流行であることが強く示唆され、同性間のHIV/STD感染リスクが高まっている可能性が示唆された。

1．はじめに

梅毒は、最も古くから知られている性感染症（STI）の1つであり、第二次世界大戦以前は、欧米先進国でも猛威をふるい、その合併症や先天梅毒は大きな社会的脅威となっていた。しかし、1940年代におけるペニシリン療法の実用化以降、流行は激減し、1990年代の終わりまでには、ほとんどの先進国で流行はほぼ終息し、その根絶は時間の問題とさえ考えられるまでになっていた。例えば、米国の疾病管理予防センター（CDC）は、1999年にNational Plan to Eliminate Syphilisを打ち出し、国家目標（年間発生率<2.2/10万）と行動計画を定めてその根絶に乗り出した[1]。しかし、皮肉なことに、米国ではその前年から、早期梅毒（1期、2期梅毒と早期潜伏梅毒）のアウトブレークが相次ぎ[2]、他の先進国でも一