Title: Estimation for the prevalence of syphilis in Japan

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Introduction:

Over the past decades, the notified number of syphilis patients in Japan had steadily decreased, perhaps owing to provision of antibiotics and improvement in the manner of sexual intercourse among prostitutes. Nevertheless, there has been a recent increase in syphilis notifications especially among MSM (men having sex with men) in urban areas. Considering that the natural history of syphilis involves long incubation period and asymptomatic infection, all infected individuals are not counted by medical attendance. The presented study aimed to statistically estimate the incidence and prevalence of syphilis over time and age in Japan.

Methods:

A mathematical model that describes the natural history of Treponema pallidum was devised to fit the observable variables to empirical data and estimate undiagnosed fractions of cases. Estimating the time-dependent growth of infected individuals in each disease-stage and jointly quantifying the time-dependent rate of diagnosis, the incidence as well as prevalence of syphilis are estimated. A maximum likelihood method was applied, using the datasets of notified syphilis cases from the National Surveillance Report.

Results:

In Figure 1, which is the comparison between observed and expected data, we were able to obtain the goodness of fit in all stages, despite of the fact that primary and secondary syphilis were combined in the surveillance data in the recent years after 2001. Figure 2 shows the yearly incidence as newly infected incidences, lambda. In the recent years, we were able to estimate the increase in male's incidence, which can explain the recent resurgence. In addition, at that time, the incidence in female started to increase. Figure 3 illustrates the rates of diagnosis in all 4 stages. These diagnostic rates increased in 1990s, most likely due to the AIDS panic, contributing people to test their STIs more frequently in clinics. In the recent 5

years, diagnostic rates are quite low in all stages.

Conclusion:

We have identified that dramatic decline in incidence over 50 years from over 5000 individuals per year to below 1000 individuals in recent decades. There has been the recent resurgence. The most recent incidence was about 4000 persons per year. comparable to late 1960s. Resurgence was not caused by increased ascertainment in recent years

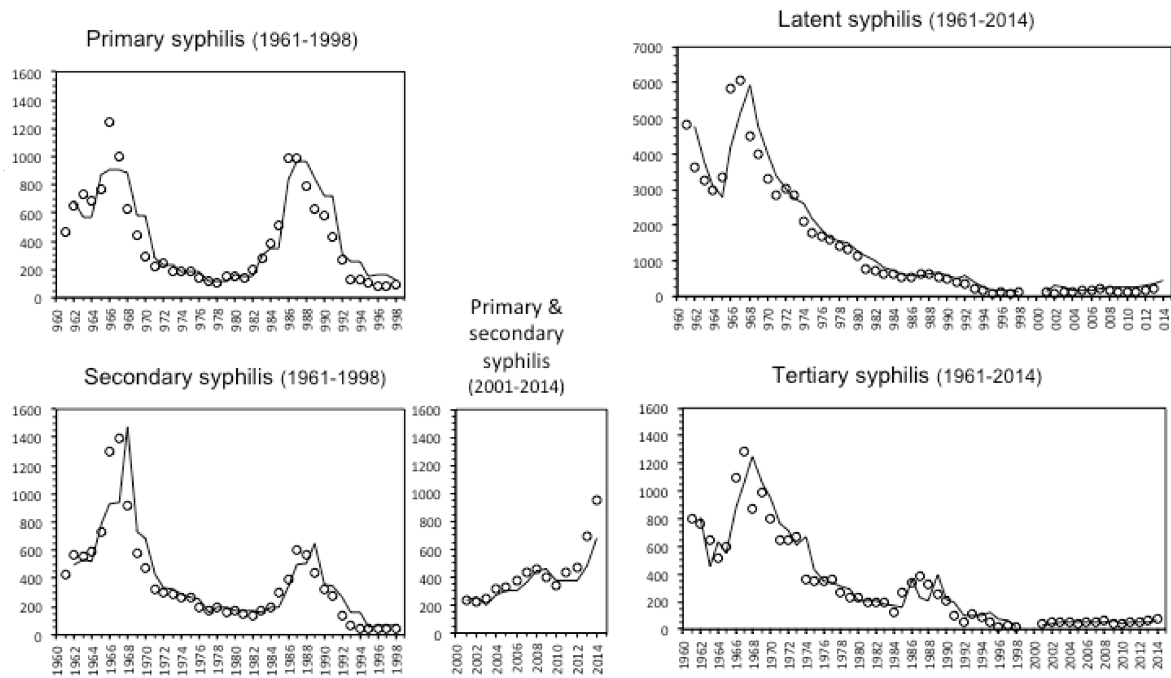Figure 1. Comparison between observed and expected data

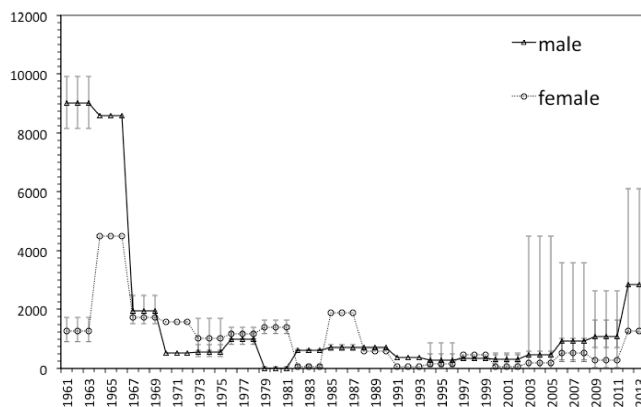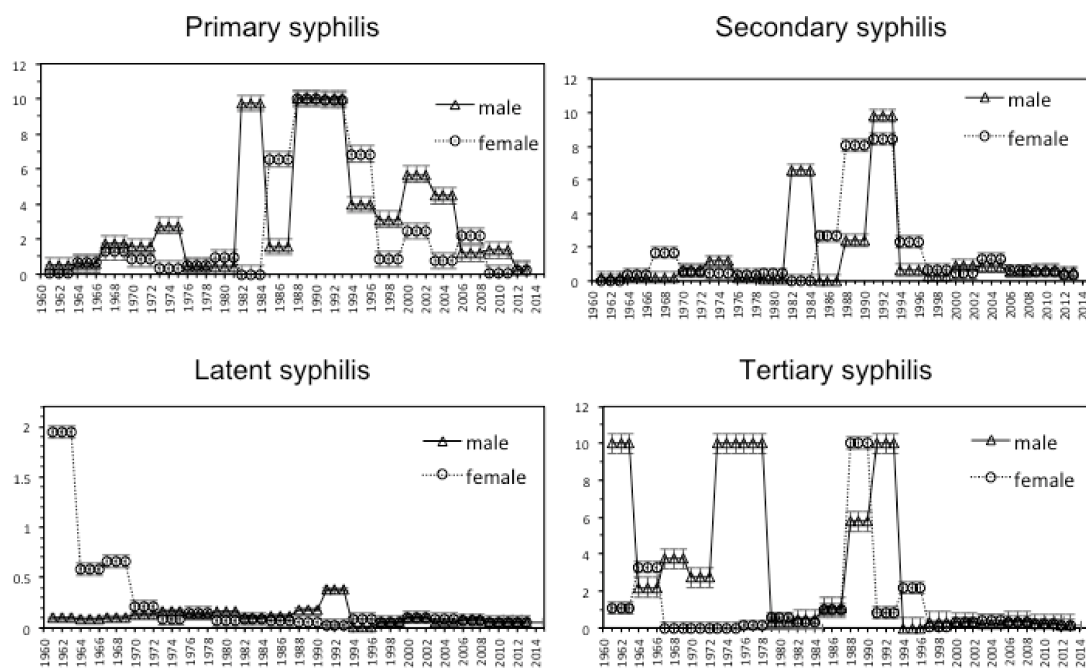Figure 2. Yearly incidence (lambda)

Figure 3. The rate of diagnosis

Primary syphilis

Secondary syphilis

Latent syphilis

Tertiary syphilis

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