↓

＜システム改変結果＞

成田空港検疫所と情報連携について協議を行い次の３点に関して協力及び連携を行うこととなった。

ｉ）現システムでの行政ブロック群の中で、「国立感染症研究所」のブロック名を「国立の感染症関係機関」とｓぢて名称変更した。

ii）成田空港検疫所から感染症情報センター情報網に対して；

・成田空港検疫所で把握している情報(成田オリジナル情報)の提供。

iii）感染症情報センター情報網から成田空港検疫所に対して；

・水際対策を通過した国内発生例の把握に対する協力。具体的には、海外渡航者の地域での発症情報の提供を行う。

iv）成田空港検疫所が管理している海外感染症情報メーリングリスト（＝情報源はＰｒｏＭＥＤ）への登録。

*奈良県保健環境研究センターから全国へ連絡。

## Ｅ．考察

平成１５年度におけるわれわれの研究班活動により、中央感染症情報センターと地方感染症情報センターの担当者の全国レベルでの一覧リストが作成されたことにより、各担当者間の連絡が円滑になった。また、異動に伴う一覧リストの更新も、本システムで採用した自記式での登録内容変更機能により円滑に行われる状態にあった。更に、ブロック内や全国へのメール一斉送信機能や受信確認・送信履歴機能などの装着により、平常時の情報連携システムとしての実用性を高めることに成功した。

しかし、ブロックの設定範囲は行政的-地理的配列に依拠している関係上、感染症の伝播経路という実情とは一致しない事が少なからずある。例えば、福井県や石川県は東海北陸ブロックに配置されているが、物流や人の動きは近畿ブロックの滋賀県や京都府との繋がりが歴史的にも深い。そこで、これら４県の地域で感染症事例が発生した場合、一斉送信範囲を東海北陸ブロック・近畿ブロックの区分の他に、実情に合った一斉送信範囲の設定が状況に応じて容易に変更出来る事が情報連携上必要であることが認められた。

更に、これら上記の機能を新たに装着した平成１５年度に、ＳＡＲＳに罹患していることを当事者が知らなかったために行った国内旅行に起因するブロック範囲を跨っての感染の拡大防止の問題や、全国のどの地域で発生しても不思議ではないトリインフルエンザの問題等が、感染症分野の危機事例の実例として、全国を騒がせた。

そこで、平成１６年度のわれわれの本研究班における活動を、これらの危機事例における情報分野での有効な対策システムとして機能出来る情報連携システムの構築を活動の焦点とした。

具体的には、既述した３項目に対処できるシステムの構築を活動目標とした。以下に再述する。

１：「情報共有及び情報判断の正確度を増すシステムの構築」⇒送信情報が相手側に届く正確度の向上と受信情報の価値判断の誤りの低減をシステム改善で達成すること。

２：「突然発生した感染症事例に対処できるシステムの構築」⇒危機事例の発生を想定して必要に応じた一斉送信範囲設定ができること。

３：「国内に侵入する危険性のある感染症情報の迅速共有システムの構築」⇒国内への感染症侵入への情報分野における対策として危険性について全国の感染症情報センターが容易に共有できること。

以上３点を１６年度活動の目標として設定し、以下の形で達成した。

１に対して；

複数(３人)アドレスの登録を可能にした。

２に対して；

一括送信群の自由設定機能を装着した。

３に対して；

成田空港検疫所を本システム（感染症情報センター情報連携網）に組み込んだ。

次に、これら３点を達成するに当たって検討した諸点を記す。

１：複数アドレスの設定では、受信者側の誰かが受信したことを送信者側に通知（＝受信確認通知）した事を受信者側の他の担当者にも通知する仕組みを装着した。送信履歴・受信確認の一覧リストはは従来どおり自治体名で掲載する。

２：一括送信群の設定機能では、中央感染症情報センターの担当者(担当者の選定は中央感染症情婦尾センターに一任)と連携システムの管理者(現時点では奈良県保健環境研究センター担当者)が群の設定を行うとともに設定解除も行うこととした。新たに設定した群に適切な名称を与え、発信機関一覧リスト上にその名称により掲載できるようにした。送信履歴・受信確認は、従来どおりに自治体名で行う。

３：検疫所間においては‘Ｆｏｒｔｈ’と呼ばれている情報連携網がある。そこで、今年度は、諸外国からの物資や人の移動の最大拠点である成田空港検疫所と協議した。結果、成田空港検疫所の本システムへの参加協力を得、検疫所間の情報連携網と接続することが成立できた。

## Ｆ．まとめ

１；平成１５年度に本研究班で報告した、Ｗｅｂを用いた「地方感染症情報センター連携システム」に関して、次の３点に関する質的向上を図った。

ｉ）情報共有及び情報判断の正確度を増すシステムの構築

ii）突発発生した感染症事例に対処できるシステムの構築

iii）国内に侵入する危険性のある感染症情報の迅速共有システムの構築

２；情報共有及び情報判断の正確度を増すために、複数アドレスの登録を可能にした。

３；突発発生した感染症事例に対処できるシステムの構築として、突発した感染症事例に関係した自治体の感染症情報センターを一斉送信群として自由設定できる機能を装着した。(設定及び設定解除は中央感染症情報センターとシステム管理者)

４；諸外国からの感染症の侵入に対して、

‘水際’対策から国内感染症対策までの連携を図るために‘水際’対策の中心である検疫所(成田空港検疫所)の連携システムへの参画を得た。

謝辞；感染症情報連携システムへの協力に快諾を頂きました、成田空港検疫所検疫課長 佐野友昭氏 に深謝いたします。

# Ⅲ. 研究成果の刊行に関する一覧表

研究成果の刊行に関する一覧表

| 著者氏名 | 論文タイトル名 | 発表誌名 | 巻号 | ページ | 出版年 |
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# Ⅳ. 研究成果の刊行物・別刷

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# Evaluation of a Method for Issuing Warnings Pre-epidemics and Epidemics in Japan by Infectious Diseases Surveillance

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## Original Article

# Evaluation of a Method for Issuing Warnings Pre-epidemics and Epidemics in Japan by Infectious Diseases Surveillance

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BACKGROUND: Simple methods have been developed to warn of pre-epidemics and epidemics in small areas using data of infectious diseases surveillance. Epidemic warnings are made if the index of cases per week per sentinel medical institution is greater than a defined value. A pre-epidemic warning means that an epidemic warning will be given in the following four weeks. While the methods are used routinely for surveillance in Japan, they remain to be validated.

METHODS: Infectious diseases surveillance data of influenza-like illness and 12 pediatric diseases in the fiscal year between 1999 and 2001 were used in the analysis. We examined the frequency of warnings, temporal changes in the index before and after the onset of a warning, and the sensitivity, specificity, and positive predictive value of pre-epidemic warnings.

RESULTS: For the majority of the diseases investigated, the proportion of weeks in which a warning was issued ranged between 0% and 10%. In several diseases including influenza-like illness, we observed a rapid increase and gradual decrease in the index before and after a warning. The sensitivity, specificity, and positive predictive value of a pre-epidemic warning were 90.4%, 93.7% and 23.9% for influenza-like illness, and ranged between 25.1-54.2%, 86.1-99.2%, and 2.5-20.8% for the pediatric diseases (chickenpox, rubella, measles, and mumps), respectively.

CONCLUSIONS: The study showed that the methods used for determining whether or not to issue an epidemic warning were satisfactory in some diseases, including influenza-like illness, and may need to be improved in several other diseases.
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Key words: communicable disease, surveillance, disease outbreaks, warning, evaluation studies.

The surveillance of infectious diseases is conducted in many countries.[1-9] Numerous methods for detecting and forecasting epidemics from the surveillance data have been developed and evaluated, with some of these methods being used in surveillance systems.

A surveillance system of infectious diseases has been introduced in Japan with the aim of detecting epidemics in small areas (e.g. a public health center area).[9] The application of a warning system for small areas is unique to Japan when compared with other countries. The requirement for pre-epidemic and epidemic warnings of several infectious diseases are reviewed weekly in every public health center area using surveillance data. The information on influenza-like illness is then made available to the general public through the World Wide Web (http://idsc.nih.go.jp/

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others/topics/inf-keiho/trend02.html, Accessed on February 10, 2004). In April 1999, the surveillance system was expanded by the Infectious Disease Control Law. Prior to this law change, warnings of influenza-like illness were based on reports on the number of cases each week in sentinel medical institutions, selected mainly from pediatric departments in hospitals and clinics. After this law change, the surveillance system was expanded to include sentinel medical institutions in internal medicine departments in hospitals and clinics. The criteria for determining whether to issue pre-epidemic and epidemic warnings for infectious diseases including influenza-like illness were developed using surveillance data collected prior to the law change. However, these original criteria have been evaluated on data acquired by the current surveillance system. We therefore carried out a study to evaluate the performance of these methods using surveillance data collected in Japan from April 1999 through March 2002.

## METHODS

***Surveillance of Infectious diseases in Japan***

The National Epidemiological Surveillance of Infectious Diseases in Japan is organized by the Ministry of Health, Labor, and Welfare[9] and is operated by the Infectious Disease Surveillance Center, National Institute of Infectious Diseases. The system collects data on influenza-like illness and pediatric diseases. Prior to the introduction of the Infectious Disease Control Law in April 1999, the sentinel medical institutions in the two surveillance systems were selected mainly from pediatric departments in hospitals and clinics. Following the introduction of this law, the influenza-like illness surveillance system also includes sentinel medical institutions of the internal medicine departments in hospitals and clinics. The number of sentinel medical institutions in April 2002 was 4,656 in the influenza-like illness surveillance system and 3,011 in the pediatric diseases surveillance system.[10] The number of sentinel medical institutions in the health center areas was approximately proportional to their population size.[11] Sentinel medical institutions were recruited on a voluntary basis, and each of the sentinel medical institutions sent weekly reports of the number of cases of notifiable diseases to the public health center. The public health center notified local government using an online computer network. The notifiable diseases were influenza-like illness in the influenza-like illness surveillance system and 12 diseases in the pediatric diseases surveillance system (Table 1).

***The method for detecting epidemics***

The warnings were based on an index calculated from the number of cases per week per sentinel medical institution. An epidemic warning in a public health center area was given if the index in the area exceeded the critical value for the onset of an epidemic and continued until the index in that area was lower than the critical value for the end of an epidemic.[12] The critical value for the onset of an epidemic fell between the 95th and 99th percentiles of the distribution of indices in 1993-1997, while the critical values for the end of epidemic were defined as the 90th percentiles of the distribution.[13] The method for issuing an epidemic warning was applied to data on influenza-like illness and 12 pediatric diseases. Like infectious disease surveillance in Japan, we made a pre-epidemic warning, which was issued before an epidemic warning, for five diseases (influenza-like illness, chickenpox, rubella, measles and mumps). These diseases would need much attention against early detection of epidemic for the public health activities. In a public health center area, a pre-epidemic warning was made only if the index in the area exceeded the critical value for a pre-

**Table 1.** Critical values (cases per week per sentinel medical institution) for issuing (onset) and ending epidemic warnings, and issuing pre-epidemic warning in infectious disease surveillance in Japan.

| | Warning | | Pre-epidemic |
|---|---|---|---|
| Diseases | onset | end | warning |
| Influenza-like illness | 30 | 10 | 10 |
| Pharyngoconjunctival fever | 1 | 0.1 | — |
| Group A streptococcal pharyngitis | 4 | 2 | — |
| Infectious gastroenteritis | 20 | 12 | — |
| Chickenpox | 7 | 4 | 4 |
| Hand-foot-mouth disease | 5 | 2 | — |
| Erythema infectiosum | 2 | 1 | — |
| Exanthema subtium | 4 | 2 | — |
| Pertussis | 1 | 0.1 | — |
| Rubella | 3 | 1 | 1 |
| Herpangina | 6 | 2 | — |
| Measles | 1.5 | 0.5 | 0.5 |
| Mumps | 5 | 2 | 3 |

The numbers in the table are cases per week per sentinel medical institution.

epidemic warning. This meant that an epidemic warning would then be issued in that area in the following four weeks. The critical value was determined according to the sensitivity, specificity, and positive predictive value of a pre-epidemic warning calculated using surveillance data of 1993-1997. This method for determining a pre-epidemic warning was then applied to data on influenza-like illness and four pediatric diseases. Table 1 shows the critical values for each disease.

***Evaluation of the method for detecting epidemics***

We analyzed surveillance data of infectious diseases collected from April 1999 through March 2002. The public health center areas in the survey in April 1999 (583 areas) were used for the analysis. The data set consists of reports on the number of cases per week per sentinel medical institution in each public health center area(583 areas) collected over the 3 fiscal years of the study (i.e.157 weeks).

The proportion of weeks, in which epidemic and pre-epidemic warnings was issued in the 583 public health center areas during the fiscal year of 1999-2001, was calculated and compared with similar data of 1993-1997. Temporal changes in the indices before and after an epidemic warning during 1999 and 2001 were examined for the evaluation of warning. The sensitivity, specificity, and positive predictive values of pre-warning were calculated for the evaluation of pre-warning. Sensitivity was calculated as the proportion of valid pre-warnings made four weeks prior to an epidemic warning, while specificity was calculated as the proportion of weeks in which no pre-epidemic warning was issued relative to the total number of weeks without an epidemic warning including the four weeks before and after the warning. The positive predictive value was defined as the proportion of valid pre-epidemic warnings relative to the total number of pre-epidemic warnings.

## RESULTS

The annual number of cases per sentinel medical institution is shown in Table 2. For many diseases, including influenza-like illness, the numbers of cases per sentinel medical institution in the fiscal years of 1999-2001 varied within or near the range of those recorded of 1993-1997. For group A streptococcal pharyngitis, chickenpox, exanthema subtium, and herpangina, the number of cases per sentinel medical institution was higher in the years 1999-2001 compared to 1993-1997. In contrast, the number of cases of rubella per sentinel medical institution was lower in the years 1999-2001 than in 1993-1997.

Table 3 shows the proportions of weeks in which an epidemic warning for influenza-like illness or the 12 pediatric diseases was issued in the 583 public health center areas during the fiscal year of 1999-2001. These proportions were similar to those recorded in 1993-1997. In exanthema subtium, pertussis, and rubella, the proportions of weeks with an epidemic warning were lower in the years of 1999-2001 than in 1993-1997.

The temporal changes in the number of cases per week per sentinel medical institution before and after a warning onset are summarized in Table 4. For influenza-like illness, the median index of weeks in which the 596 epidemic warnings were issued in 1999-2001 was 37.0. The index increased markedly in the 4 weeks before the warnings were made as seen by following changes in median values: 1.3 on the 4th week before the warnings had been issued, 3.5 on the 3rd week, 9.0 on the 2nd week, and 20.0 on the 1st week. The median index was observed to then decrease gradually, being 39.0 in the 1st week after the warning had been issued, 29.9 on the 2nd week, 18.7 on the 3rd week, and 11.3 on the 4th

**Table 2.** Annual numbers of cases per sentinel medical institution in infectious disease surveillance in Japan, April 1999-March 2002, compared with range of those in 1993-1997.

| Annual numbers of cases per sentinel medical institution | | | | | |
|---|---|---|---|---|---|
| | | | | Range(1993-1997) | |
| Diseases | April 1999-March 2000 | April 2000-March 2001 | April 2001-March 2002 | minimum | maximum |
| Influenza-like illness | 193.13 | 57.01 | 144.50 | 44.75 | 312.12 |
| Pharyngoconjunctival fever | 4.12 | 7.85 | 7.76 | 1.76 | 4.39 |
| Group A streptococcal pharyngitis | 43.81 | 57.60 | 50.82 | 24.71 | 34.88 |
| Infectious gastroenteritis | 294.63 | 299.58 | 287.90 | 192.51 | 498.41 |
| Chickenpox | 84.02 | 97.85 | 83.54 | 73.40 | 77.98 |
| Hand-foot-mouth disease | 18.68 | 70.25 | 41.10 | 10.07 | 65.35 |
| Erythema infectiosum | 8.64 | 14.31 | 23.09 | 5.29 | 22.74 |
| Exanthema subtium | 42.79 | 42.67 | 40.70 | 34.22 | 36.75 |
| Pertussis | 1.16 | 1.18 | 0.56 | 1.14 | 2.34 |
| Rubella | 1.24 | 1.05 | 0.89 | 6.70 | 61.20 |
| Herpangina | 53.80 | 49.12 | 47.06 | 29.98 | 39.60 |
| Measles | 3.40 | 9.42 | 9.28 | 6.50 | 14.30 |
| Mumps | 30.89 | 58.13 | 83.66 | 29.21 | 62.37 |

Data of fiscal years are used in 3 years from 1999 through 2001.

week. These median values were higher than those measured in other weeks. For hand-foot-mouth disease and herpangina, we also observed a rapid increase in the value of median indices prior to an epidemic warning and a gradual decrease after this warning similar to that seen with influenza-like illness. However, for pertussis and rubella, these changes in the value of the median indices before and after epidemic warnings onset were not observed.

The proportions of weeks over the period of 1999-2001 in which a pre-epidemic warning was made for influenza-like illness and the 4 pediatric diseases, chickenpox, rubella, measles, and mumps in the 583 public health center areas is shown in Table 5. For influenza-like illness, the proportions of weeks with a pre-epidemic warning were 5.7%, 2.7%, and 4.6% in 1999, 2000, and 2001, respectively. These proportions were similar to those recorded in 1993-1997. For rubella, the proportion of weeks with a pre-warning warning in 1999-2001 was lower than in 1993-1997.

Table 6 shows the temporal changes in the number of cases per week per sentinel medical institution before and after a pre-epidemic warning onset. For influenza-like illness, the median index in the 1,333 in which a pre-epidemic warning was issued over the period of 1999-2001 was 13.6. The median index increased in the 4 weeks prior to this warning and was found to be 0.5 on the 4th week before the pre-warning had been issued, 1.1 on the 3rd week, 2.8 on the 2nd week, and 6.3 on the 1st week. The median index continued to increase and then decreased gradually being 19.0, 20.7, 18.0, and 12.7 on the 1st, 2nd, 3rd, and 4th weeks after the warning, respectively. These median indices were higher than those measured in the other weeks. For chickenpox and mumps, the median indices before and after the pre-epidemic warning were also higher than in the other weeks, whereas for rubella and measles, many of the indices before and after the warning were zero, similar to that observed in the other weeks.

The sensitivity, specificity, and positive predictive values of the pre-epidemic warnings are listed in Table 7. For influenza-like illness, the sensitivity was 90.4%; the specificity was 93.7% and the positive predictive value 23.9%. For the four pediatric diseases, the sensitivity ranged between 25.1% and 54.2%, the specificity between 86.1% and 99.2%, and the positive predictive value between 2.5 and 20.8%.

## DISCUSSION

This study is to evaluate a method of pre-epidemic and epidemic warning by examining a huge number of observations. For this purpose, we decided to provide a detailed description of data and not to use a method of statistical testing.

In this study, the critical values for determining when epidemic warnings should be issued at both the onset and the end of an epidemic were determined using data of the frequency of epidemic warnings from 1993 through 1997. The reason for establishing these critical values is that the definition of epidemic is not well standardized in many infectious diseases, and also that neither frequent nor very rare warnings are adequate for public health standards. In many of the diseases we investigated, including influenza-like illness, the proportion of weeks in which an epidemic warning was issued was very similar in the two study periods.

**Table 3.** The proportion of weeks in which an epidemic warnings were issued in public health center areas in April 1999-March 2002, compared with range of those in 1993-1997.

| | The proportion of epidemic warning weeks (%) | | | | |
|---|---|---|---|---|---|
| | | | | Range(1993-1997) | |
| Diseases | April 1999-March 2000 | April 2000-March 2001 | April 2001-March 2002 | minimum | maximum |
| Influenza-like illness | 3.3 | 0.5 | 5.5 | 0.7 | 10.9 |
| Pharyngoconjunctival fever | 3.2 | 6.4 | 7.3 | 1.8 | 5.0 |
| Group A streptococcal pharyngitis | 4.6 | 7.7 | 6.4 | 3.6 | 5.2 |
| Infectious gastroenteritis | 6.5 | 6.9 | 6.0 | 3.6 | 7.3 |
| Chickenpox | 2.8 | 4.3 | 2.7 | 4.1 | 4.7 |
| Hand-foot-mouth disease | 1.7 | 10.5 | 5.2 | 1.0 | 11.9 |
| Erythema infectiosum | 1.7 | 3.1 | 6.6 | 1.2 | 8.9 |
| Exanthema subtium | 0.7 | 0.5 | 0.3 | 1.8 | 2.7 |
| Pertussis | 0.3 | 0.4 | 0.1 | 0.8 | 2.1 |
| Rubella | 0.1 | 0.1 | 0.0 | 1.7 | 19.6 |
| Herpangina | 7.8 | 6.2 | 6.7 | 4.2 | 6.7 |
| Measles | 1.2 | 3.8 | 4.5 | 4.2 | 8.2 |
| Mumps | 2.0 | 5.9 | 11.2 | 3.4 | 9.5 |

Data of fiscal years are used in 3 years from 1999 through 2001.
The proportion of epidemic warning weeks: the number of epidemic warnings which were issued in all the public health center area during the fiscal year 1999-2001 divided by the number of weeks in all the public health center area (583 areas) during the fiscal year 1999-2001(157 weeks).

**Table 4.** Median, the 25th and 75th percentile of weekly cases per sentinel medical institution before and after the issuing of an epidemic warning.

| | | Weekly cases per sentinel medical institution | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Before warning onset | | | | Onset | After warning onset | | | | Non-warning |
| | | 4weeks | 3weeks | 2weeks | 1week | week | 1week | 2weeks | 3weeks | 4weeks | weeks |
| Influenza-like illness | median | 1.3 | 3.5 | 9.0 | 20.0 | 37.0 | 39.0 | 29.9 | 18.7 | 11.3 | 0.0 |
| | 25th percentile | 0.3 | 1.2 | 5.2 | 14.6 | 32.5 | 28.2 | 20.3 | 11.9 | 5.8 | 0.0 |
| | 75th percentile | 4.0 | 7.4 | 14.9 | 25.0 | 44.2 | 52.5 | 44.9 | 30.0 | 18.9 | 0.3 |
| | number of observation | 596 | 596 | 596 | 596 | 596 | 595 | 594 | 586 | 579 | 84,353 |
| Pharyngoconjunctival fever | median | 0.0 | 0.0 | 0.0 | 0.1 | 1.1 | 0.3 | 0.3 | 0.3 | 0.2 | 0.0 |
| | 25th percentile | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 75th percentile | 0.2 | 0.3 | 0.3 | 0.5 | 1.5 | 1.0 | 0.8 | 0.8 | 0.6 | 0.0 |
| | number of observation | 955 | 955 | 955 | 955 | 955 | 949 | 946 | 942 | 939 | 80,050 |
| Group A streptococcal pharyngitis | median | 1.3 | 1.5 | 1.9 | 2.0 | 4.5 | 2.8 | 2.3 | 2.3 | 2.0 | 0.4 |
| | 25th percentile | 0.7 | 0.7 | 1.0 | 1.3 | 4.0 | 1.5 | 1.2 | 1.0 | 1.0 | 0.0 |
| | 75th percentile | 2.0 | 2.3 | 2.7 | 3.0 | 5.3 | 4.0 | 4.0 | 3.6 | 3.8 | 1.0 |
| | number of observation | 873 | 873 | 873 | 873 | 873 | 870 | 867 | 862 | 854 | 81,355 |
| Infectious gastroenteritis | median | 6.3 | 8.1 | 11.1 | 15.0 | 23.0 | 21.7 | 18.5 | 14.6 | 12.3 | 2.7 |
| | 25th percentile | 3.7 | 5.3 | 8.0 | 12.2 | 21.0 | 16.3 | 12.5 | 9.0 | 8.0 | 0.9 |
| | 75th percentile | 10.0 | 11.6 | 14.0 | 17.5 | 26.3 | 28.3 | 27.4 | 21.8 | 18.3 | 5.8 |
| | number of observation | 1,012 | 1,012 | 1,012 | 1,012 | 1,012 | 1,011 | 1,010 | 1,004 | 996 | 79,140 |
| Chickenpox | median | 2.7 | 3.0 | 4.3 | 3.3 | 8.0 | 4.0 | 5.5 | 4.0 | 4.3 | 1.0 |
| | 25th percentile | 1.5 | 1.5 | 3.0 | 2.0 | 7.3 | 2.7 | 3.6 | 2.3 | 2.5 | 0.3 |
| | 75th percentile | 4.0 | 4.4 | 5.5 | 4.8 | 9.0 | 5.8 | 8.0 | 5.8 | 6.5 | 2.0 |
| | number of observation | 628 | 628 | 628 | 628 | 628 | 624 | 620 | 617 | 613 | 84,541 |
| Hand-foot-mouth disease | median | 0.8 | 1.3 | 2.0 | 3.0 | 6.0 | 6.1 | 6.1 | 5.3 | 4.5 | 0.0 |
| | 25th percentile | 0.2 | 0.5 | 1.0 | 2.0 | 5.3 | 3.7 | 3.0 | 2.3 | 2.0 | 0.0 |
| | 75th percentile | 1.7 | 2.1 | 3.0 | 4.0 | 7.5 | 8.6 | 10.2 | 10.4 | 10.0 | 0.4 |
| | number of observation | 743 | 743 | 743 | 743 | 743 | 743 | 743 | 742 | 741 | 80,735 |
| Erythema infectiosum | median | 0.5 | 0.5 | 0.7 | 0.8 | 2.3 | 1.1 | 1.0 | 1.0 | 0.8 | 0.0 |
| | 25th percentile | 0.0 | 0.0 | 0.2 | 0.3 | 2.0 | 0.5 | 0.4 | 0.3 | 0.3 | 0.0 |
| | 75th percentile | 1.0 | 1.0 | 1.1 | 1.3 | 2.7 | 2.0 | 2.0 | 1.8 | 1.6 | 0.3 |
| | number of observation | 611 | 611 | 611 | 611 | 611 | 609 | 604 | 598 | 593 | 84,750 |
| Exanthema subtium | median | 1.3 | 1.3 | 1.3 | 1.3 | 4.3 | 2.0 | 2.0 | 1.8 | 1.7 | 0.6 |
| | 25th percentile | 0.9 | 1.0 | 0.7 | 1.0 | 4.0 | 1.0 | 1.0 | 1.0 | 0.8 | 0.3 |
| | 75th percentile | 2.3 | 2.0 | 2.0 | 2.5 | 5.0 | 3.0 | 2.7 | 3.0 | 2.7 | 1.0 |
| | number of observation | 133 | 133 | 133 | 133 | 133 | 132 | 131 | 131 | 131 | 90,158 |
| Pertussis | median | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 25th percentile | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 75th percentile | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| | number of observation | 134 | 134 | 134 | 134 | 134 | 133 | 133 | 133 | 133 | 90,271 |
| Rubella | median | 0.0 | 0.0 | 0.0 | 0.0 | 3.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 25th percentile | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 75th percentile | 0.3 | 0.8 | 0.3 | 0.7 | 5.0 | 2.0 | 2.0 | 1.0 | 0.0 | 0.0 |
| | number of observation | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 91,409 |
| Herpangina | median | 0.5 | 1.0 | 2.2 | 3.8 | 7.5 | 8.0 | 7.8 | 6.0 | 4.3 | 0.0 |
| | 25th percentile | 0.1 | 0.5 | 1.0 | 2.5 | 6.5 | 5.6 | 4.6 | 3.3 | 2.2 | 0.0 |
| | 75th percentile | 1.3 | 2.0 | 3.3 | 4.9 | 9.2 | 11.3 | 12.0 | 10.5 | 7.7 | 0.3 |
| | number of observation | 972 | 972 | 972 | 972 | 972 | 972 | 972 | 972 | 972 | 77,651 |
| Measles | median | 0.1 | 0.2 | 0.4 | 0.4 | 1.9 | 0.8 | 0.8 | 0.6 | 0.6 | 0.0 |
| | 25th percentile | 0.0 | 0.0 | 0.0 | 0.0 | 1.6 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 75th percentile | 0.5 | 0.5 | 0.8 | 0.8 | 2.3 | 1.4 | 1.6 | 1.5 | 1.3 | 0.0 |
| | number of observation | 449 | 449 | 449 | 449 | 449 | 444 | 442 | 442 | 440 | 85,802 |
| Mumps | median | 1.5 | 2.5 | 2.7 | 2.5 | 5.7 | 3.0 | 3.7 | 4.0 | 3.0 | 0.5 |
| | 25th percentile | 1.0 | 1.7 | 1.7 | 1.5 | 5.3 | 2.0 | 2.5 | 2.5 | 1.8 | 0.0 |
| | 75th percentile | 2.7 | 3.5 | 3.6 | 3.4 | 6.5 | 4.5 | 5.0 | 5.7 | 4.8 | 1.0 |
| | number of observation | 504 | 504 | 504 | 504 | 504 | 495 | 487 | 480 | 475 | 83,647 |

The data are expressed as median, the 25th and 75th percentile of cases per week per sentinel medical institution.
The number of observations represents the total number of weeks in which indices fall into the various categories.
The period from the beginning of week in April 1999 till the end of week in March 2002 are used for the analysis.

**Table 5.** The proportions of weeks in which an pre-epidemic warnings were issued in public health center areas from April 1999 through March 2002, compared with the range of those in 1993-1997.

| | The proportion of pre-epidemic warning weeks (%) | | | | |
|---|---|---|---|---|---|
| | | | | Range(1993-1997) | |
| Diseases | April 1999-March 2000 | April 2000-March 2001 | April 2001-March 2002 | minimum | maximum |
| Influenza-like illness | 5.7 | 2.7 | 4.6 | 1.9 | 4.5 |
| Chickenpox | 6.0 | 7.4 | 5.8 | 6.2 | 6.9 |
| Rubella | 0.4 | 0.2 | 0.2 | 3.4 | 9.5 |
| Measles | 2.3 | 6.2 | 5.8 | 5.2 | 8.2 |
| Mumps | 1.9 | 4.0 | 6.0 | 2.1 | 4.7 |

Data of fiscal years are used in 3 years from 1999 through 2001.
The proportion of pre-epidemic warning weeks: the number of pre-epidemic warnings which were issued in all the public health center area during the fiscal year 1999-2001 divided by the number of weeks in all the public health center area (583 areas) during the fiscal year 1999-2001(157 weeks).

**Table 6.** Median, the 25th and 75th percentile of weekly cases per sentinel medical institution before and after the issuing of a pre-epidemic warning.

| | | Weekly cases per sentinel medical institution | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 4weeks | 3weeks | 2weeks | 1week | Onset week | 1week | 2weeks | 3weeks | 4weeks | Other weeks* |
| Influenza-like illness | median | 0.5 | 1.1 | 2.8 | 6.3 | 13.6 | 19.0 | 20.7 | 18.0 | 12.7 | 0.0 |
| | 25th percentile | 0.0 | 0.3 | 1.3 | 4.3 | 11.5 | 12.6 | 12.3 | 8.9 | 5.9 | 0.0 |
| | 75th percentile | 1.4 | 2.6 | 4.8 | 8.2 | 17.1 | 27.4 | 32.5 | 30.0 | 23.0 | 0.1 |
| | number of observation | 1,333 | 1,333 | 1,333 | 1,333 | 1,333 | 1,332 | 1,325 | 1,317 | 1,308 | 79,626 |
| Chickenpox | median | 2.0 | 2.0 | 2.5 | 2.0 | 4.5 | 2.7 | 3.4 | 2.7 | 2.9 | 0.9 |
| | 25th percentile | 1.0 | 1.0 | 1.7 | 1.3 | 4.1 | 1.7 | 2.3 | 1.7 | 1.8 | 0.3 |
| | 75th percentile | 3.0 | 3.0 | 3.3 | 3.0 | 5.1 | 3.8 | 4.9 | 4.0 | 4.3 | 1.8 |
| | number of observation | 2,239 | 2,239 | 2,239 | 2,239 | 2,239 | 2,220 | 2,205 | 2,191 | 2,184 | 72,190 |
| Rubella | median | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 25th percentile | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 75th percentile | 0.0 | 0.0 | 0.0 | 0.0 | 1.5 | 0.3 | 0.2 | 0.0 | 0.0 | 0.0 |
| | number of observation | 154 | 154 | 154 | 154 | 154 | 151 | 150 | 149 | 148 | 90,185 |
| Measles | median | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.2 | 0.2 | 0.0 | 0.0 | 0.0 |
| | 25th percentile | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 75th percentile | 0.2 | 0.2 | 0.3 | 0.2 | 0.8 | 0.5 | 0.5 | 0.4 | 0.5 | 0.0 |
| | number of observation | 1,818 | 1,818 | 1,818 | 1,818 | 1,818 | 1,803 | 1,787 | 1,779 | 1,772 | 75,926 |
| Mumps | median | 1.5 | 1.7 | 1.7 | 1.5 | 3.3 | 2.0 | 2.0 | 2.3 | 2.0 | 0.4 |
| | 25th percentile | 0.8 | 1.0 | 1.0 | 1.0 | 3.0 | 1.1 | 1.3 | 1.5 | 1.0 | 0.0 |
| | 75th percentile | 2.1 | 2.3 | 2.3 | 2.0 | 3.8 | 2.8 | 3.0 | 3.3 | 3.0 | 1.0 |
| | number of observation | 1,444 | 1,444 | 1,444 | 1,444 | 1,444 | 1,435 | 1,421 | 1,408 | 1,395 | 79,159 |

The data are expressed as median, the 25th and 75th percentile of cases per week per sentinel medical institution.
The number of observations represents the total number of weeks in which indices fall into the various categories.
The period from the beginning of week in April 1999 till the end of week in March 2002 are used for the analysis.
*Other weeks: weeks that exclude the week of onset and before and after the onset of a pre-epidemic warning.

**Table 7.** The sensitivity, specificity, and positive predictive values of an pre-epidemic warning in infectious disease surveillance in Japan, April 1999-March 2002.

| | Sensitivity | Specificity | Positive predictive value |
|---|---|---|---|
| Influenza-like illness | 90.4 | 93.7 | 23.9 |
| Chickenpox | 54.2 | 86.1 | 17.7 |
| Rubella | 36.4 | 99.2 | 2.5 |
| Measles | 43.7 | 89.3 | 16.3 |
| Mumps | 25.1 | 91.7 | 20.8 |

The numbers in the table are expressed as percentage (%)
The above result is based on the analysis of all the weekly cases per sentinel medical institution in the public health center areas (583 areas), from the beginning of week in April 1999 till the end of week in March 2002 (157 weeks).
The sensitivity is the proportion of valid pre-warnings, in the 4 weeks before the onset of an epidemic warning.
The specificity is the proportion of weeks without a pre-epidemic warning relative to the total number of weeks, in which there was no epidemic warning nor the 4 weeks before and after epidemic warning.
The positive predictive value is the proportion of valid pre-epidemic warnings relative to the total of pre-epidemic warnings.

With regard to the frequency of epidemic warnings, the method for determining when an epidemic warning should be issued in the current surveillance system was as applicable as that in the previous surveillance system. However, the frequency of epidemics of exanthema subtium, pertussis, and rubella during a 3 year period from 1999 through 2001 was lower than that in 1993-1997. With regard to rubella, the number of cases per week per sentinel medical institution in 1999-2001 was considerably lower than in 1993-1997, a difference that was reflected by a lower prevalence of epidemics in 1999-2001. For exanthema subtium and pertussis, the patterns of epidemics appeared to be different between the two periods and therefore it may be necessary to modify the critical values of these epidemic warning.

In a situation when many cases occur in the weeks immediately after an epidemic warning, such warnings are useful because they initiate public health activities against the epidemic. In our study we examined the temporal changes in the numbers of cases per week per sentinel medical institution before and after an epidemic warning over the period of 1999-2001. For several diseases including influenza-like illness, we observed a gradual decrease in the index after the onset of an epidemic warning. This observation suggested that an epidemic warning may in itself result in useful public health activities against an epidemic. However, such a desirable temporal change was not observed for diseases such as pertussis and rubella.

The frequency of pre-epidemic warnings for influenza-like illness, chickenpox, measles, and mumps in 1999-2001 was similar to that recorded in 1993-1997. With regard to the frequency of pre-epidemic warnings, the method used currently for issuing these warnings was as applicable as that used in previous surveillance system. For example, although the frequency of pre-epidemic warnings for rubella in 1999-2001 was lower than in 1993-1997 this may simply reflect that there was a lower incidence of this disease in 1999-2001.

In this study we also examined the temporal changes in the number of cases per week per sentinel medical institution before and after a pre-epidemic warning in 1999-2001. For influenza-like illness, the index continued to increase and then decreased gradually after the warning had been issued. This pattern of temporal changes is a desirable outcome of a pre-epidemic warning. In contrast, pre-epidemic warnings for the four other diseases we investigated did not result in these desirable temporal changes.

The sensitivity, specificity, and positive predictive value of the critical values selected for issuing a pre-epidemic warning were also determined using surveillance data in 1993-1997. The specificity of the pre-epidemic warnings issued in 1999-2001 for all the diseases investigated ranged between 86.1% and 99.2%. We have pointed out in a previous report that pre-epidemic warnings require a high specificity for routine infectious disease surveillance. The results of the present study confirm that pre-epidemic warnings in 1999-2001 had suitably high specificity. Our data also showed the sensitivity of the critical values was 90.4% in influenza-like illness and between 25.1% and 54.2% in other diseases. As discussed above, there may have been only the small number of rubella cases, and as we have pointed out previously, it would not be expected to find high positive predictive value when

epidemics were not frequent. Overall these results indicate that pre-epidemic warnings in 1999-2001 for influenza-like illness had sufficient sensitivity, but that detection of other four diseases at an early stage of an epidemic may not be easy. We showed the efficiency of pre-warning on influenza-like illness and extra years of observation is needed in the further examination of the other four diseases.

Our study had some inherent problems and limitations. The major problem was the definition of an epidemic with warnings being issued on the basis of the number of cases per week per sentinel medical institution. It is possible that the critical value used may vary according to the type of disease, season, and area. Although 3 years' data were available after the introduction of the expanded surveillance system, additional data are necessary in order to examine variation in the critical values.

In summary, this study examined the frequency of epidemic and pre-epidemic warnings, the temporal changes in the number of cases per week per sentinel medical institution before and after these warnings, and the sensitivity, specificity and positive predictive values of pre-epidemic warnings. We suggest other viewpoints (e.g. early detection of epidemic dispersion) may also be important for evaluating epidemic and pre-epidemic warnings.

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と疥癬トンネルを生じる。疥癬トンネルは，雌虫が角層内に侵入して，常色，5～10 mm, S 字状に曲がった線条隆起として認められる。


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*suggestion*

## STI としての B 型肝炎ウイルス感染

ウイルス肝炎を STI として考える場合，現在問題となることは B 型肝炎ウイルス（HBV）感染である。

日本赤十字中央血液センターの報告(柚木久雄，2003 年 5 月日本輸血学会，北九州市）では，通常のスクリーニングでは見落とされた検体を NAT で検査すると，全国で 1999 年 7 月から 2002 年 12 月まで血液約 1,820 万本中に 327 例の HBV DNA 陽性を見出している。これらは，感染しているが未だ抗体が出現していない window period の期間である例と考えられる。

一方，HBV については，以前は，adr，adw，ayr，ayw などのサブタイプを感染経路の 1 つのマーカーと考えていたが，現在ではジェノタイプによって分類されている。一般的に，わが国でのサブタイプ adr は，ジェノタイプ C，adw はジェノタイプ B と考えられている。

NAT 検査で見出された例では，わが国では比較的まれで，米国などに多いとされるジェノタイプ A が 35 例と約 10%を占めている。しかも，この A 型はほとんど大都市周辺で検出され，さらにすべて男性であった。また，20 歳あるいは 30 歳代であった。

ジェノタイプ B および C では両性間の差はとくにみとめられず，ジェノタイプ A のみが特異的であった。

他の報告でも，HIV および HBV の重感染の男性同性愛者では，HBV のジェノタイプはすべて A 型であった。このことから，NAT で検出された例でも同様であることが推定される。また，ジェノタイプ A の感染では成人でもキャリアー化するとの報告がある。

以上のようなデータから，わが国での急性ウイルス肝炎は STI の性格を有する例が多いと考えられるが，とくに性行為の多様化に伴う感染症の研究も一工夫あってもよいのではないかと考えられる。すなわち，ハイリスクグループにおいては，HIV 感染のみならず他の感染症のことも念頭において研究をすすめ，幸い HBV には，すでにワクチンが存在していることから，ハイリスクグループにはワクチン接種をすすめるなどの啓蒙活動も必要であろう。


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# 主要な性感染症の動向

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## ● はじめに

性感染症（sexually transmitted infections：STI）は性的接触によって感染する感染症の総称で，その数は20種を超えるとされるが，1999年（平成11年）4月から，わが国で施行されている「感染症の予防および感染症の患者に対する医療に関する法律」（以下，感染症法）のもとでSTIとして動向調査が行われているのは，次のとおりである。4類感染症の定点把握疾患として性器クラミジア感染症，性器ヘルペスウイルス感染症，尖形コンジローム，淋菌感染症の4種，全数把握疾患として梅毒，これら合わせて5種である。同様に4類の全数把握の対象となっているHIV/AIDSも，現在の主な感染ルートは性的接触であることを考えれば，STIとしてとらえることができる。ここでは上記の6疾患について，感染症法施行後の最近の動向を解説する。あくまでも現行の法律で得られる調査データの解析であり，調査方法自体に起因する問題を包含する点に関しても，最後に説明を加えたい。

## ● 定義

### 1　定点把握対象のSTI

あらかじめSTI定点として指定された医療機関が，月ごとにまとめて管轄の保健所へ届け出る。報告内容は，各疾患の性別，年齢別の人数である。STI定点の数は保健所ごとに管内人口に基づいて決められ，定点の指定は，各都道府県が産婦人科系（産婦人科または産科もしくは婦人科）と泌尿器科・皮膚科系（性病科または泌尿器科もしくは皮膚科もしくは皮膚泌尿器科）がおおむね同数になるように行うことになっている。現在，STI定点は全国で約900である。

### 2　全数把握対象のSTI

診断した医師が7日以内に管轄の保健所へ届け出る。報告は個人名を除いた個票で行われ，性別・年齢・症状・検査方法などのさまざまな情報が記載されている。各疾患の診断基準などについては，文献[1]を参照願いたい。

## ● 定点把握STI

### 1　経時的トレンド

性器クラミジア，性器ヘルペス，尖形コンジローム，淋菌感染症の定点あたり報告数の年次月別推移を男女別に図1に示した。これらの疾患に関しては1987年より感染症サーベイランス事業の一環として，定点把握サーベイランスが開始されており，1999年（平成11年）4月から感染症法で引き継がれたかたちとなっている。しかし，感染症法の施行に際して，STI定点として選定する医療機関の数と診療科構成に変更が加えられたため，1999年4月を境に報告数にはギャップが生じ，男女比も変わるなどし（後述する），その変化を継続的なものとしてとらえることはできない。だが，男女ともに性器クラミジアと淋菌感染症の増加傾向を大きなトレンドとして読むことが可能である。1992年はAIDSに対する認識が高まった影響でSTI全

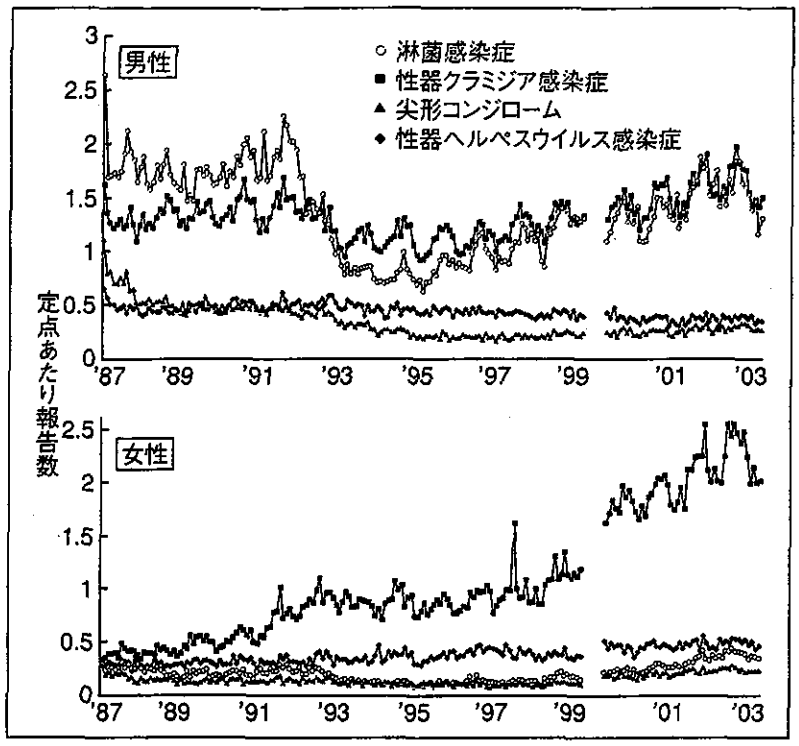


図 1　感染症発生動向調査による性感染症の年次推移

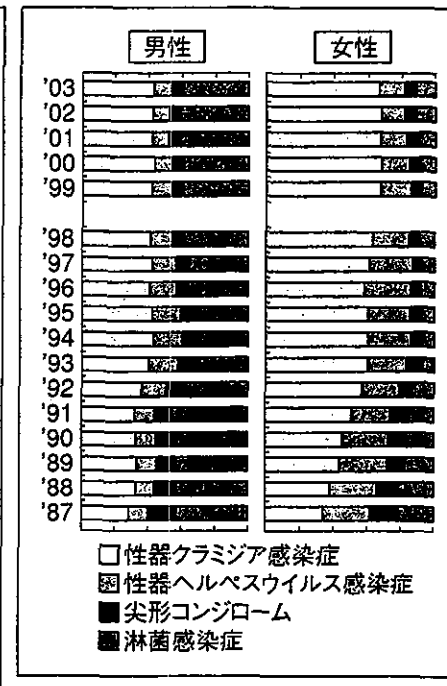


図 2　感染症発生動向調査による年次別性感染症の比率

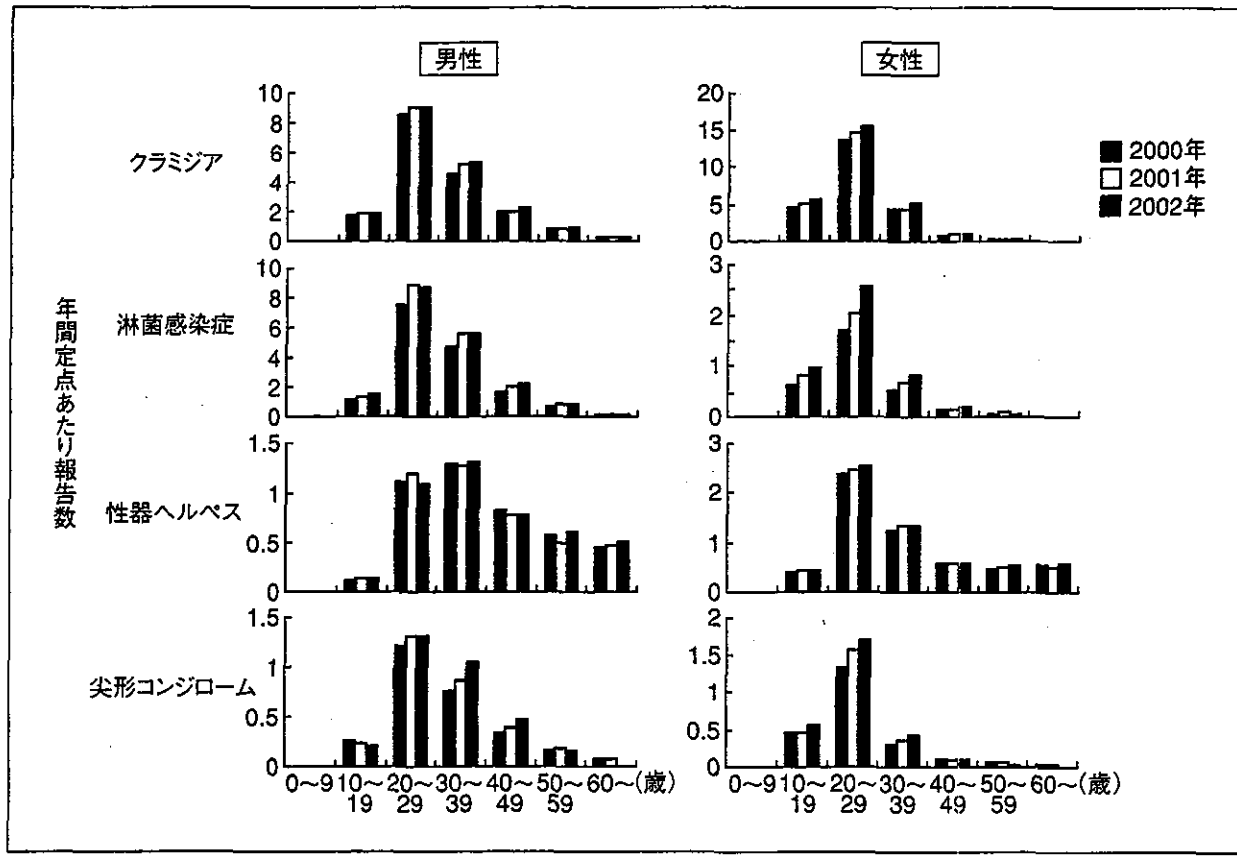


図 3　感染症発生動向調査による各性感染症の年次別，年齢別患者報告数

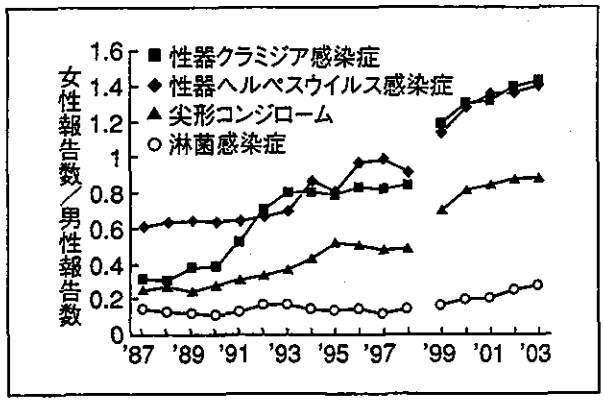


図 4　感染症発生動向調査による各性感染症の男女比の年次推移

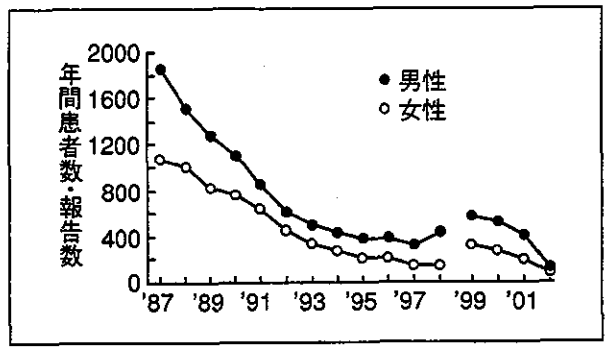


図 5　伝染病統計調査・感染症発生動向調査による梅毒の患者数・報告数
1999 年の報告数は伝染病統計調査と感染症発生動向調査の合計。2001，2002 年の報告数はまだ確定していない。

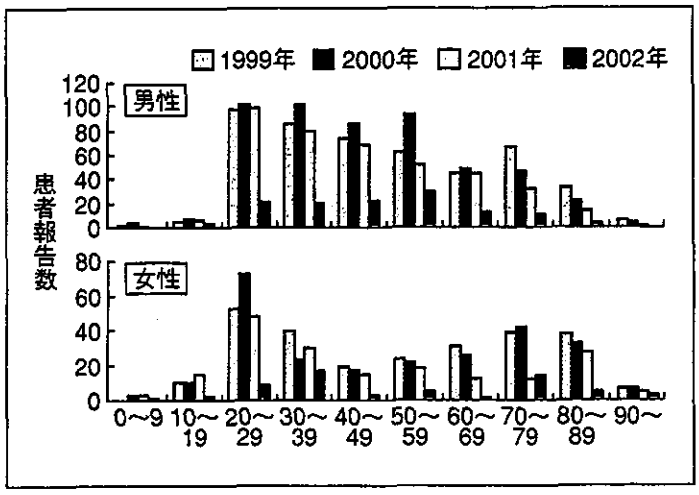


図 6　感染症発生動向調査による梅毒の年次別，年齢別患者報告数

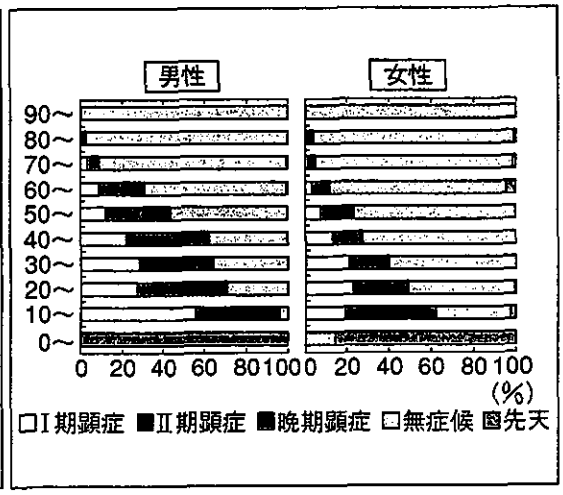


図 7　梅毒報告例の年齢別病型の比率
(2000～2002 年)

体が減少し，特に男性で淋菌感染症が激減した。しかし，AIDS に対する不安や関心が薄れるとともに 1996 年からは再び増加に転じている。クラミジアは女性においては，一貫して増加を続けている。男女ともに，夏に多く冬に少ない季節変動がみられる。

### 2　疾患の割合

疾患の割合を男女別にみた場合(図 2)，現在，男性ではクラミジアと淋菌感染症がほぼ等しく，それぞれ定点把握 STI 全体の 4 割を占めている。女性ではクラミジアが増え続けて約 6 割に達している一方，近年になって淋菌感染症も増加傾向にある。

### 3　年齢構成

各疾患について，感染症法施行後の年齢別報告数の経時変化を男女別に示した(図 3)。全体に男性では 20 歳代，30 歳代が中心であるが，女性の報告数は，より若年齢層にシフトしているのが特徴である。若年齢層の女性においては，いずれの疾患も顕著な増加傾向がみられる。性器ヘルペスは感染すると生涯にわたって潜伏，再発を繰り返すため，常時，高年齢層からの報告が少なくない。

### 4　男女比

各疾患について，男女比の経時変化を図 4 に示した。1999 年に女性の比率が突然高くなった理由は，STI 定点の構成の変更によるものと考えられる。すなわち，感染症法の施行にあたり STI 定点となる医療機関を再選定した際，意図的に産婦人科系を増やした結果，女性報告数が