

Leprosy in China: epidemiological trends between 1949 and 1998

Xiang-Sheng Chen,¹ Wen-Zhong Li,² Cheng Jiang,³ & Gan-Yun Ye⁴

Objective To report the epidemiological trends of leprosy in China from 1949 to 1998.

Method Data for the study were obtained from the computerized database of the National System of Leprosy Surveillance.

Findings A total of 474 774 leprosy patients were detected during this 50-year period. Case detection rates per 100 000 population were highest in the 1950s and 1960s, with peaks appearing in 1957–58, 1963–66, 1969–70, and 1983–84, corresponding to mass surveys or screening surveys carried out in most areas or selected areas of the country. While the duration of the disease at the time of detection fell over the period, the disability rates, which were >50% in the early 1950s, have decreased gradually to 20.8% by 1997–98 but are still too high. More than 50% of cases were found through active methods in the periods 1955–58, 1965–66, and 1969–76, but in recent years cases are mostly detected through dermatological clinics or by voluntary reporting. The peak prevalences of the 1960s (i.e. >2 per 10 000 population) decreased annually from the 1970s onwards. By the end of 1998 the prevalence was 0.05 per 10 000 population.

Conclusions This study shows that leprosy was well controlled in China and that the WHO goal of elimination of leprosy as a public health problem has been achieved at the national and subnational levels. However, leprosy is still unevenly distributed in the country. According to the criterion for leprosy elimination in China — defined as a prevalence of <1 per 100 000 in county or city — there are still more than 10% of counties or cities where this target has not yet been reached. Special attention must therefore be given to achieve elimination and final eradication of leprosy in China.

Keywords: Leprosy/epidemiology/prevention and control; Disease notification; China (*source: MeSH*).

Mots clés: Lèpre/épidémiologie/prévention et contrôle; Notification maladie; Chine (*source: INSERM*).

Palabras clave: Lepra/epidemiología/prevenición y control; Notificación de enfermedad; China (*fuentes: BIREME*).

Bulletin of the World Health Organization, 2001, **79**: 306–312.

Voir page 311 le résumé en français. En la página 311 figura un resumen en español.

Introduction

The largest share of the estimated total number of cases of leprosy, a chronic infectious disease caused by *Mycobacterium leprae*, which essentially affects the peripheral nervous system but also involves the skin and sometimes certain other tissues, occurs in Asia

(1). While the transmission modes of leprosy are still unclear, it is generally believed that humans are the only known reservoir of the infection. The two portals of exit of *M. leprae* that are often described are the skin and mucosa, and the two major portals of entry are the skin and upper respiratory tract (2). There is historical evidence that leprosy spread from India to China around 500 BC (3) and that the disease has been endemic in China for more than 2000 years.

Historically in China the endemicity of leprosy was much higher along the coast and in the Yangtze valley. Various causes contributed to the long-term existence and spread of leprosy in the country. In the past, people frequently lived in poverty under poor health conditions with overcrowding and poor nutrition (4). At that time, the majority of leprosy hospitals were run by foreign missionaries. In 1950, one year after the founding of the People's Republic of China, the leprosy control programme was initiated, with the work being organized by the Ministry of Health and implemented by vertical programmes from national to county levels. Repeated mass or general

¹ Associate Professor and Epidemiologist, National Centre for STD and Leprosy Control, Institute of Dermatology, Chinese Academy of Medical Sciences (CAMS) and Peking Union Medical College (PUMC), 12 Jiangwangmiao Street, Nanjing 210042, People's Republic of China (email: xschen@jlonline.com). Correspondence should be addressed to this author.

² Deputy Director and Professor, National Centre for STD and Leprosy Control, Institute of Dermatology, CAMS and PUMC, Nanjing, People's Republic of China.

³ Associate Professor, National Centre for STD and Leprosy Control, Institute of Dermatology, CAMS and PUMC, Nanjing, People's Republic of China.

⁴ Senior Adviser and Professor in Leprosy and STD, National Centre for STD and Leprosy Control, Institute of Dermatology, CAMS and PUMC, Nanjing, People's Republic of China.

Ref. No. 99-0484

surveys were conducted in 1956–58, 1964–66, and 1971–73 in most areas of the country.

Understanding of the evolution of the epidemiological trend of leprosy is very important for evaluating and monitoring control strategies. In most countries, reliable epidemiological data on leprosy are difficult to collect for many reasons. However, in China, where the leprosy programme is well organized and where medical records of leprosy patients are well documented, computerization of data on leprosy patients registered from 1949 onwards — through the National Leprosy Recording and Reporting System (5) — was initiated under the authority of the Ministry of Health and the National Centre for STD and Leprosy Control. Reliable data on leprosy over the past 50 years in China are thus available.

This article presents a trend analysis of the number of leprosy patients and the epidemiological evolution over the period. Two relatively distinct stages were identified. The first stage, from the 1950s to 1980, aimed at control of the infectious sources of the disease; and the second stage, from 1981 onwards, aimed to work towards the achievement of eliminating leprosy (prevalence <1 case per 100 000 population) at the county level (6).

Materials and methods

The present study is based on information in the National Leprosy Recording and Reporting System's computerized database, which was initiated in 1990 and covers the whole of the People's Republic of China. Data on all leprosy patients detected from 1949 onwards were collected using four kinds of individual forms that were specially designed for the system. All the forms were completed manually by the leprosy workers at county level annually and sent to the National Centre at the start of the following year. By June 1999, computerization of all the data was completed and a total of 730 106 records were examined for the study.

Diagnosis of leprosy was based on clinical, bacteriological, and sometimes histopathological profiles. The Ridley–Jopling classification (7) was substituted for the Madrid classification in the early 1970s. In the present study, clinical classification was used, in which lepromatous (L) and borderline (B) leprosy in the Madrid classification and lepromatous (LL), borderline-lepromatous (BL) and mid-borderline (BB) in the Ridley–Jopling classification were all classified as *multibacillary* (MB) leprosy; and tuberculoid (T) leprosy in the Madrid classification, indeterminate (I) in both classifications, and tuberculoid (TT) and borderline-tuberculoid (BT) in the Ridley–Jopling classification were all classified as *paucibacillary* (PB) leprosy. Disability was recorded and graded according to the WHO grading system, which was revised in 1988 (8), and patients with WHO grade II (visible) deformity or damage were defined as “disabled” for

the calculation of the disability rate. The criteria for clinical cure were based on disappearance of active lesions, and BI-negative conversion of skin-smears for two consecutive follow-ups in MB patients. Patients who had not achieved clinical cure were considered as clinically active for calculation of the prevalences. Delay in detection (duration of illness at the time of diagnosis) was based upon patient recall and defined as the duration of disease before a confirmed diagnosis, i.e. duration between the onset of disease (awareness of the first symptom) and its confirmed diagnosis (9). Owing to the strongly positive skewness of the delay distribution, a median was calculated to express the average duration of delay in detection. Relapsed cases were not registered as new patients, and their situation was reported separately (10, 11).

Results

Between 1949 and 1998 a total of 474 774 leprosy cases were detected in China; 75.2% were males and 24.8% were females (male:female = 3:1). The average age at onset was 29.9 ± 13.9 years and the average age at detection was 34.8 ± 14.2 years. A total of 24 061 cases aged below 15 years at detection were diagnosed during this period, accounting for 5.1% of all cases. For the clinical classification, 195 468 (41.17%) were MB, 278 532 (58.67%) were PB, and 772 (0.16%) were patients whose classification was unclear. In 1998, the detection rate was 0.15 per 100 000 population (0.21 per 100 000 for males and 0.09 per 100 000 for females), with the prevalence being 0.056 per 10 000 population.

Case detection

The annual case detection rates from 1949 to 1998 for the whole country are shown in Table 1. In the early 1950s the detection remained at a relatively low level and then increased, reaching a peak of 4.36 per 100 000 population in 1957–58. Subsequently there were another three increases (rate ratio >1.0 in Table 1) in the case detection rate in 1963–66, 1969–70, and 1983–84.

During the periods studied, significantly more male than female cases were detected, but the ratio of males to females gradually decreased to 2.4–2.8 in the 1990s. The proportion of MB patients was high during the initial period of the study. After 15–20 years of control, the proportion decreased to about 30% and then rose annually to reach 66% over the period 1995–98. The proportion of children among all newly detected cases was also high during the early period. After a slight increase in the early 1960s, this proportion decreased slowly and remained at 3–4% after the 1970s, although it rose to 5.0% in 1997–98. The duration of the disease at the time of detection has been shortened over the years, with the median delay time in detection decreasing from 60 months (5 years) in 1955–56 to 19 months (1.6 years) from 1993 onwards. The disability rate was >50% in the early

Table 1. **Newly detected leprosy cases and detection rates in China, 1949–98^a**

Year	Detection rates (per 100 000) ^b	Rate ratio ^c	M/F ratio ^d	MB ^e (%)	Children (%)	Median delay in detection (months)	Disability rate (%)	% by active case-finding
1949–50	0.246	—	3.5	56.9	9.7	26	54.5	25.4
1951–52	0.450	1.83	3.5	53.7	8.1	34	50.3	22.5
1953–54	0.959	2.13	4.0	51.4	6.2	38	43.2	28.5
1955–56	3.058	3.19	3.7	43.9	5.1	60	44.3	61.7
1957–58	4.357	1.42	3.2	44.2	5.8	44	42.3	54.8
1959–60	3.655	0.84	3.1	40.6	6.5	33	39.8	48.5
1961–62	1.852	0.51	3.2	37.6	7.5	27	37.2	37.8
1963–64	2.377	1.28	3.1	36.0	6.0	36	38.4	45.2
1965–66	2.920	1.23	2.8	33.8	4.8	39	38.4	52.6
1967–68	1.410	0.48	3.1	37.2	4.8	27	34.7	36.9
1969–70	1.793	1.27	3.0	33.2	4.0	33	34.6	50.7
1971–72	1.773	0.99	2.8	31.5	3.6	36	33.3	54.4
1973–74	1.215	0.69	2.8	33.8	4.1	33	32.3	49.6
1975–76	1.047	0.86	2.7	36.6	4.3	30	30.6	51.1
1977–78	0.744	0.71	2.9	41.1	4.0	27	28.2	43.5
1979–80	0.593	0.80	3.0	45.2	3.7	29	31.2	45.5
1981–82	0.497	0.84	2.9	49.2	3.3	30	30.2	44.6
1983–84	0.544	1.10	3.0	52.5	3.4	36	31.1	46.9
1985–86	0.451	0.83	2.8	54.0	3.3	30	30.5	45.7
1987–88	0.370	0.82	2.6	56.1	3.7	24	26.6	36.1
1989–90	0.293	0.79	2.8	60.2	4.0	23	26.5	31.7
1991–92	0.233	0.79	2.7	62.5	3.6	21	26.4	30.8
1993–94	0.164	0.71	2.6	65.2	3.8	19	23.1	29.1
1995–96	0.145	0.88	2.6	66.0	3.8	19	22.2	29.9
1997–98	0.141	0.97	2.4	65.5	5.0	19	20.8	33.2

^a Mean of rates, proportions or ratios in two successive years.

^b Per 100 000 population.

^c Rate ratio = ratio of detection rates in the biennial period to the previous biennial period.

^d M/F = male/female.

^e Multibacillary leprosy.

1950s and decreased gradually to 20.8% in 1997–98. In the early years of the study period, about a quarter of cases were detected through active case-finding methods, such as mass survey, clue survey, family contacts survey, etc. However, over the periods 1955–58, 1965–66, and 1969–76 more than 50% of cases were found through active methods.

Prevalence

Table 2 presents the prevalences of leprosy, by type, over the period 1949–98. For the whole country, peak prevalence was found in the 1960s, remaining at >2 per 10 000 population and decreased annually from the 1970s onwards. By the end of 1998, the prevalence had decreased to 0.056 per 10 000 population. The prevalence of MB leprosy was higher than that of PB leprosy, but the rate of decrease in prevalence was similar for the two types.

Multidrug therapy (MDT) coverage increased rapidly from <81% before 1989 to >95% in the 1990s. By the end of 1998, a total of 98.9% of registered cases were treated with MDT. Over the period 1981–98, <1% of all registered cases were not treated with any regimen

because either they refused treatment or dropped out of follow-up.

Relationship between case detection rate and prevalence

The case detection rates and prevalences were relatively close each other in the early 1950s but subsequently gradually diverged; while the detection rates started to increase, the prevalences increased even more and reached a peak of >2.0 per 10 000 population in the 1960s. After the 1980s the two rates tended to converge again (Fig. 1). The ratio of prevalences to detection rates was 2.2–5.3 in the 1950s, gradually increased to a peak of 15.1 in 1967–68, and decreased to 3.47 in 1997–98.

Discussion

The epidemiology of leprosy is one of the most important ways of controlling the disease. The present study is based on 50 years of comprehensive data from the leprosy control programme in China, which aimed at control of infection during the first

Table 2. Prevalence of active multibacillary (MB) and paucibacillary (PB) leprosy, multidrug therapy (MDT) coverage, and proportion of untreated cases, China, 1949–98^a

Years	Prevalence ^b			Rate ratio ^c			MDT coverage (%)	Untreated cases (%)
	MB	PB	Total	MB	PB	Total		
1949–50	0.050	0.034	0.084	—	—	—	—	10.6
1951–52	0.092	0.057	0.149	1.84	1.68	1.77	—	8.1
1953–54	0.191	0.104	0.296	2.08	1.82	1.99	—	4.7
1955–56	0.516	0.167	0.685	2.70	1.61	2.31	—	4.5
1957–58	1.056	0.317	1.375	2.05	1.90	2.01	—	4.0
1959–60	1.449	0.495	1.947	1.37	1.56	1.42	—	3.2
1961–62	1.473	0.575	2.052	1.02	1.16	1.05	—	2.9
1963–64	1.492	0.639	2.135	1.01	1.11	1.04	—	3.0
1965–66	1.545	0.741	2.290	1.04	1.16	1.07	—	3.0
1967–68	1.372	0.758	2.133	0.89	1.02	0.93	—	2.8
1969–70	1.238	0.773	2.014	0.90	1.02	0.94	—	2.8
1971–72	1.077	0.807	1.887	0.87	1.04	0.94	—	2.8
1973–74	0.898	0.789	1.689	0.83	0.98	0.90	—	2.9
1975–76	0.730	0.647	1.379	0.81	0.82	0.82	—	2.2
1977–78	0.593	0.503	1.097	0.81	0.78	0.80	—	1.5
1979–80	0.459	0.408	0.868	0.77	0.81	0.79	—	1.2
1981–82	0.328	0.319	0.647	0.71	0.78	0.75	24.1	0.9
1983–84	0.258	0.253	0.512	0.79	0.79	0.79	37.8	0.7
1985–86	0.199	0.181	0.381	0.77	0.72	0.74	57.8	0.6
1987–88	0.150	0.094	0.244	0.75	0.52	0.64	80.7	0.5
1989–90	0.132	0.031	0.162	0.88	0.33	0.66	96.3	0.5
1991–92	0.102	0.024	0.126	0.77	0.77	0.78	97.8	0.6
1993–94	0.073	0.016	0.089	0.72	0.67	0.71	98.0	0.7
1995–96	0.049	0.011	0.060	0.67	0.69	0.67	98.1	0.9
1997–98	0.040	0.009	0.049	0.82	0.82	0.82	98.9	0.4

^a Mean of rates or proportions in two successive years.

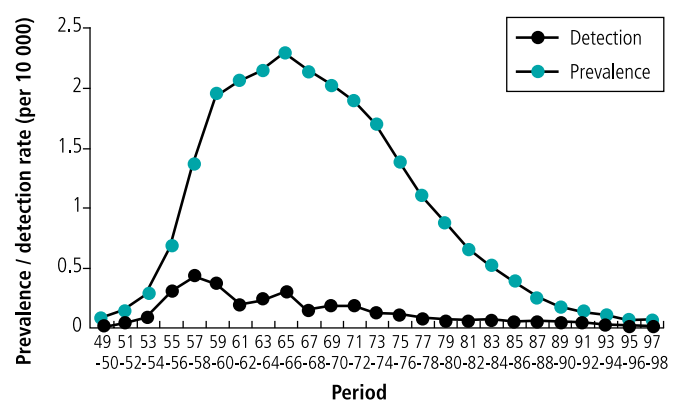
^b Per 10 000 population.

^c Ratio of prevalences in the biennial period to the previous biennial period.

stage (1949–81) and elimination of the disease during the second (1981–2000) (12).

The peak case detection rates correspond to the active case-finding surveys carried out in most areas of the country in 1957–58, 1965–66, 1971–73 and in selected areas in 1983. In these surveys, the major symptoms of leprosy were made widely known to the public, and people were requested to report suspected cases to local dermatology/leprosy institutes for further examination. In addition, mass surveys in communities or screening surveys in schools, and clue surveys were also conducted by the vertical leprosy control programme. Over the period studied, the highest detection rate (4.36 per 100 000) was in 1957–58, perhaps due to the accumulation of previously undetected cases in the early years of the control programme. Beginning in the 1970s the leprosy detection rate decreased annually, which was comparable with that observed in other countries in Asia and Africa (13). Over the last 10 years, both the detection rates of leprosy (0.14–0.37 per 100 000 population) and the proportion of child cases (3–5%) in China were significantly lower than in some other endemic areas (14, 15); and the detection rates of child leprosy remained at a low level (16), an indication of good leprosy control in the country. However, there was a

Fig. 1. Case detection rate and prevalence of leprosy in China, 1949–98



slight increase in the proportion of child cases in 1997–98, perhaps because a leprosy elimination campaign was conducted in some endemic areas and that overdiagnosis may have resulted (17). As reported in some countries (18, 19), implementation of MDT has not had a significant impact on the endemic trends of leprosy, because the detection rate reached a plateau at a low level and is at a “flat” stage (20). However, improvement in case-finding through a nationwide

introduction of MDT resulted in a slight increase in the detection rate in 1983–84.

It has been reported that in an effective control programme, the MB:PB leprosy ratios over a period of years, based on the year of detection, will form a U-shaped curve (21). In the present study, the proportion of MB leprosy over the years also showed this trend. Initially, the proportion was high because more MB patients were detected. Later, as case detection improves, the proportion will plateau at a low level. Finally, as the number of new infections and patients become fewer and fewer, more MB patients with long incubation periods will be diagnosed and the curve will once again take an upward turn. In addition, a significant increase in the MB proportion in recent years can partly be attributed to the changes to the definition of MB made in 1988 (8) and again in 1991 (22), as well as to the preference of leprosy workers to classify patients as MB for the purpose of treatment (23), resulting in an increasing tendency to classify patients as MB as opposed to PB, as seen in Brazil (24). On the other hand, the rise in the MB:PB ratio was an indicator of the end of the endemic phase, reflecting the reduction of the epidemic status (19, 25, 26). However, whether the change in this ratio or proportion really reflects a true evolution in the epidemiological pattern of the disease is hard to establish (14). The disability rate of newly detected cases has decreased over the years, but is still far too high (27), indicating that there are still many patients who are detected only after they present visible disabilities. With the decrease of leprosy in China, more and more patients are being detected through indirect methods. Thus, detection of cases through dermatological clinics and by voluntary reporting have become the main sources for case-finding in recent years, accounting for 37.3% and 28.6% of cases, respectively (28).

In the absence of precise tools to measure *M. leprae* infection and of an effective method to monitor the endemic trend of leprosy at present, estimates of the leprosy endemic status mainly depend on the evaluation of prevalences (15). However, the prevalence is not only influenced by the detection rate, but is also associated with the disease's duration, MB:PB type ratio, as well as the criteria for declaring a clinical cure, i.e. definition of a case. In 1997–98, the prevalence of leprosy of 0.049 per 10 000 population in China was significantly lower than the average global level (1.67 per 10 000) or that in the WHO Western Pacific Region as a whole (0.20 per 10 000) (15). It is worth noting that the prevalence in China is based on the number of active cases, whereas the global prevalence is based on the cases registered for treatment. It should be noted, however, that in China the prevalence is

much lower because patients are still considered to be active even if they have completed their prescribed treatment, but not attained clinical cure. The annual increase in prevalences in China from the 1950s to the early 1960s is a result of adequate finding of new cases, but this rate gradually decreased from the 1970s onwards. In the 1950s the prevalence of MB increased at a higher rate than that of PB, while the prevalence of PB increased for a longer period than that of MB; however, in recent years the prevalence of MB and PB decreased at a similar rate.

Over the period studied, MDT coverage increased significantly to >95% in the 1990s and only a very few cases were not treated with any regimen, which may be attributed to the well-organized vertical programme of leprosy control.

As far as the relationship between detection rates and prevalences is concerned, it should be noted that the increase in detection rates in 1950–59 exerted a great impact on the rise in the prevalences. The peak of the prevalence in 1963–68 reflects the number of cases that had accumulated and were detected after the founding of the People's Republic of China in 1949. After a mean duration of disease of about 10–15 years during the dapsone monotherapy era, the prevalences decreased steadily and were not affected by the slight increase in the detection rates in the 1970s. Unlike the findings in some countries (29), the detection rates neither overlapped nor were lower than the prevalences and even appeared to restrain each other. This was probably because: (1) there were not many backlog cases, so that the detection did not increase significantly during the first years of implementing MDT; (2) the criteria for clinical cure in China were more strict, so that the numerator for calculating the prevalence is different from that used by WHO and by other countries.

The epidemiological trends of leprosy in China from 1949 to 1998 show significant changes, but the distribution of the disease remains uneven between different areas of the country. WHO's target for elimination of leprosy as a public health problem was reached in China at the national level in 1981, at the provincial level in 1992, and at the county/city level (98.4%) in 1996. According to the criterion for leprosy elimination in China — a prevalence of <1/100 000 in terms of county or city (6) — there were still 13.8% of counties or cities where this target had not been reached in 1996 (30). Special attention must therefore be given to eliminate and finally eradicate leprosy in China. ■

Conflict of interests: none declared.

Résumé

La lèpre en Chine : tendances épidémiologiques entre 1949 et 1998

Objectif Rapporter les tendances épidémiologiques de la lèpre en Chine de 1949 à 1998.

Méthodes Les données utilisées dans l'étude proviennent de la base de données informatisée du système national de surveillance de la lèpre.

Résultats Pendant cette période s'étendant sur 50 ans, 474 774 cas de lèpre ont été détectés. Les taux de détection des cas pour 100 000 habitants ont été les plus élevés pendant les années 50 et 60, et ont présenté des pics en 1957-1958, 1963-1966, 1969-1970 et 1983-1984, périodes qui correspondent à des enquêtes à grande échelle ou à des campagnes de dépistage organisées dans la plupart des régions du pays ou seulement dans certaines d'entre elles. Alors que la durée d'évolution de la maladie au moment de la détection du cas a chuté au cours de la période considérée, les taux d'incapacité, qui dépassaient 50 % au début des années 50, se sont abaissés progressivement jusqu'à 20,8 % en 1997-1998 mais restent trop élevés. Plus de 50 % des cas ont été détectés par

dépistage actif pendant les périodes 1955-1958, 1965-1966 et 1969-1976, mais depuis quelques années ils le sont essentiellement par les dispensaires de dermatologie ou par notification spontanée. Les pics de prévalence observés dans les années 60 (plus de 2 cas pour 10 000 habitants) diminuent chaque année depuis les années 70, et la prévalence à la fin de 1998 était de 0,05 pour 10 000 habitants.

Conclusion Cette étude montre que la lèpre a été bien maîtrisée en Chine et que le but fixé par l'OMS de l'élimination de la lèpre en tant que problème de santé publique a été atteint au niveau national et subnational. La maladie reste toutefois inégalement répartie dans le pays. Selon le critère d'élimination de la lèpre en Chine – soit une prévalence inférieure à 1 pour 100 000 habitants dans un district ou une ville – il y a encore plus de 10 % des districts ou des villes où l'élimination n'a pas encore été réalisée. Il faut donc accorder une attention spéciale à la réalisation de l'élimination de la lèpre en Chine, puis de son éradication.

Resumen

La lepra en China: tendencias epidemiológicas entre 1949 y 1998

Objetivo Informar sobre las tendencias epidemiológicas de la lepra en China entre 1949 y 1998.

Métodos Los datos empleados en el estudio se obtuvieron a partir de la base de datos computarizada del Sistema Nacional de Vigilancia de la Lepra.

Resultados Durante el periodo de 50 años considerado se detectaron en total 474 774 enfermos de lepra. Las tasas de detección de casos por 100 000 habitantes fueron máximas durante los años 50 y 60, con picos en 1957–1958, 1963–1966, 1969–1970 y 1983–1984, correspondientes a encuestas o cribados masivos llevados a cabo en la mayoría de las regiones o en determinadas zonas del país. Si bien la duración de la enfermedad en el momento de la detección disminuyó a lo largo del periodo considerado, las tasas de discapacidad, que eran superiores al 50% a principios de los años 50, se han reducido gradualmente hasta situarse en el 20,8% en 1997–1998, pero son aún demasiado altas. Más del 50% de los casos se detectaron mediante métodos activos durante los

periodos de 1955–1958, 1965–1966 y 1969–1976, pero en los últimos años los casos se han detectado principalmente en dispensarios de dermatología o por notificación espontánea. Las prevalencias máximas alcanzadas en los años 60 (esto es, > 2 por 10 000 habitantes) disminuyeron cada año a partir de la década de 1970. A finales de 1998 la prevalencia era de 0,05 por 10 000 habitantes.

Conclusión Este estudio muestra que la lepra estaba bien controlada en China, y que a nivel nacional y subnacional se ha alcanzado la meta de la OMS de eliminar esa enfermedad como problema de salud pública. Sin embargo, la enfermedad sigue estando desigualmente distribuida en el país. Si nos atenemos al criterio establecido para considerar eliminada la lepra en China — prevalencia inferior a 1 por 100 000 habitantes en un distrito o ciudad —, queda aún más de un 10% de distritos o ciudades donde aún no se ha alcanzado esa meta. Así pues, hay que extremar la atención para lograr la eliminación y la erradicación final de la lepra en China.

References

1. Bryceson A, Pfaltzgraff RE. *Leprosy*. Edinburgh, Longman Group Ltd, 1990: 1.
2. Browne SG. The history of leprosy. In: Hastings RC, ed. *Leprosy*. Edinburgh, Longman Group Ltd, 1985: 1–14.
3. Noordeen SK. The epidemiology of leprosy. In: Hastings RC, ed. *Leprosy*. Edinburgh, Longman Group Ltd, 1985: 15–30.
4. Ma H, Ye GY. A general condition of the work on the prevention and treatment of leprosy in China. *International Journal of Leprosy and Other Mycobacterial Diseases*, 1981, **49**: 218–223.
5. Chen X-S et al. Computerization of leprosy records: National Leprosy Recording and Reporting System in China. *Leprosy Review*, 2000, **71**: 47–56.
6. Li H-Y et al. Long-term effect of leprosy control in two prefectures of China, 1953–1993. *International Journal of Leprosy and Other Mycobacterial Diseases*, 1995, **63**: 213–221.
7. Ma H, ed. *Handbook of leprosy control*. Nanjing, Jiangsu Science and Technology Publishing House, 1989: 169–186.
8. WHO Expert Committee on Leprosy. *Sixth Report*. Geneva, World Health Organization, 1988 (WHO Technical Report Series, No. 768).
9. Chen X-S et al. A study on delay in detection of leprosy patients in China. *Annals of Tropical Medicine and Parasitology*, 2000, **94**: 181–188.

10. **Chen X-S et al.** Studies on risk of leprosy relapses in China: relapses after treatment with dapsone monotherapy. *International Journal of Leprosy and Other Mycobacterial Diseases*, 1999, **67**: 371–378.
11. **Chen X-S et al.** Studies on risk of leprosy relapses in China: relapses after treatment with multidrug therapy. *International Journal of Leprosy and Other Mycobacterial Diseases*, 1999, **67**: 379–387.
12. **Li W-Z et al.** Present situation and prospects of leprosy control. *Chinese Journal of Dermatology*, 1998, **31**: 345–347.
13. **Meima A et al.** Trends in leprosy case detection rates. *International Journal of Leprosy and other Mycobacterial Diseases*, 1997, **65**: 305–319.
14. **Myint T et al.** Leprosy in Myanmar, epidemiological and operational changes, 1958–92. *Leprosy Review*, 1996, **67**: 18–27.
15. Progress towards the elimination of leprosy as a public health problem. *Weekly Epidemiological Record*, 1996, **71** (20): 149–156.
16. **Chen X-S et al.** Leprosy in children: a retrospective study in China, 1986–1997. *Journal of Tropical Pediatrics*, 2000, **46**: 207–211.
17. **Sansarricq H.** Leprosy elimination — urgent action required. *International Journal of Leprosy and other Mycobacterial Diseases*, 1999, **66**: 60–63.
18. **Jakeman P et al.** Trends in leprosy in the Kingdom of Bhutan, 1982–1992. *Leprosy Review*, 1995, **66**: 69–75.
19. **Boerrigler G et al.** Does the introduction of WHO-MDT influence trends in the incidence of leprosy? — the Malawian experience. *Leprosy Review*, 1993, **64**: 227–235.
20. **Smith WCS et al.** Disability as relevant measure of progress in leprosy control. *Leprosy Review*, 1986, **57**: 251–259.
21. **Li H-Y et al.** Leprosy control in Shandong Province, China, 1955–1983; some epidemiological features. *International Journal of Leprosy and other Mycobacterial Diseases*, 1985, **53**: 79–85.
22. *Chemotherapy of leprosy. Report of a WHO Study Group.* Geneva, World Health Organization, 1994 (WHO Technical Report Series, No. 847).
23. **Peat M et al.** An evaluation of the contribution of the Swedish International Development Authority (SIDA) to leprosy control in India based on the implementation of multiple drug therapy (MDT) 1981–1993. *Indian Journal of Leprosy*, 1995, **67**: 447–465.
24. **Martelli CMT et al.** Changes in leprosy clinical pattern after multidrug therapy implementation. *International Journal of Leprosy and other Mycobacterial Diseases*, 1995, **63**: 95–97.
25. *Epidemiology of leprosy in relation to control. Report of a WHO Study Group.* Geneva, World Health Organization, 1985 (WHO Technical Report Series, No. 716).
26. *Epidemiological review of leprosy in the Western Pacific Region 1982–1995.* Manila, WHO Regional Office for the Western Pacific, 1996.
27. **Smith WCS et al.** Prevention of impairment in leprosy: results from a collaborative project in China. *International Journal of Leprosy and Other Mycobacterial Diseases*, 1995, **63**: 507–517.
28. **Chen X-S et al.** [Studies on detection modes of leprosy in China during the years 1981 through 1998]. *Chinese Journal of Dermatology*, 2000, **33** (supplement): 14–17 (in Chinese).
29. *Seventh Expert Committee on Leprosy, Geneva, 26 May–3 June 1997. Working paper prepared by Ji Baohong in collaboration with the WHO Action Programme for the Elimination of Leprosy.* Geneva, World Health Organization, 1997 (unpublished document WHO/LEP/EC/WP/97.1 available at http://whqlibdoc.who.int/hq/1997/WHO_LEP_EC_WP_97.1.pdf).
30. **Chen X-S et al.** Prediction of elimination of leprosy in leprosy endemic areas of China. *Indian Journal of Leprosy*, 1999, **71**: 189–201.