

## **Computerization of leprosy records: national leprosy recording and reporting system in China**

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*Summary* This paper describes the national system of leprosy recording and reporting in China and the computerization of records. The system was designed for data collection at local level and data entry by optically scanned or manual mode as well as for sophisticated data analysis. The major functions include data entry, data check, sum-up, maintenance, communication, inquiry, statistics, graph and print. A total of 17 options for epidemiological and clinical data analysis are available. Through the implementation for about 10 years, the system has gained widespread acceptance. This acceptance would facilitate introduction of computer analysis to other leprosy projects and other disease control programs in China. Up to 1998, a database of more than 740,000 records covering all the leprosy patients detected since 1949 had been established by this system.

### **Introduction**

One of the major roles of leprosy surveillance is the collection, analysis and dissemination of information relating to demographic, epidemiological and clinical aspects of the disease. To fulfil this role, a national leprosy recording and reporting system is needed to provide for efficient recording of a database, rapid retrieval of information about epidemiological status and rapid, economical analysis of collected information. The computerization of medical records with or without the automated data entry system has been pursued for various diseases.<sup>1–4</sup> Along with the wider availability of micro-computers, computerized options for

data management should be applied in leprosy. This paper describes the computerization of records in the national system of leprosy recording and reporting in China.

## The system

The national leprosy recording and reporting system in China was initiated by the Ministry of Public Health in 1990 and is managed and implemented by the National Centre for STD and Leprosy Control, which is located in Nanjing. The demographic and clinical data on all patients detected from 1949 through 1996 were collected each with the individual forms (four types of one-sided forms, Figure 1a–d). The different forms are distinguished by colours. Patients are tracked between the different forms through their area code and registry number.

The forms were completed manually by leprosy workers or clerical staff at county level according to the guideline and instructions for the system (5–10 min being needed for one patient). All items had to be completed by filling numbers in blank boxes and marking (shading) the printing digit that corresponded to the number.

Data on the forms were entered automatically into an IBM computer by the Optical Mark Reader A30 (OMR) with the computer program designed for the system. Two digits (computer generated) were added to each two-digit number of calendar year to differ the year 1999 from the unknown year coded ‘99’, and to solve the problem of year 2000. During data entry, the computer could automatically check logical mistakes in the relationship between the items. If the computer found any mistake, it stopped to wait for a correction; alternatively, corrections could be ignored if the operator did not wish to correct it at once or if the apparent error was intentional. Data entry was readily performed by staff without previous keyboard skills or experience with computers, so that manual dexterity did not significantly influence the entry speed achievable; however, operators had to be familiar with the relationship between the items.

A total of more than 740,000 forms have been entered into the computer in this way to establish databases according to different forms, provinces and calendar years. Copies of the databases will be sent back to the original institutions. In order to undertake the management and analysis of the database, software for the system was developed through the cooperation of leprosy experts and computer programmers using C language. The system (Figure 2) is simple to use and has a series of multi-level menus for data entry, data check, sum-up, maintenance, communication, inquiry, statistics, graph and print. The data entry menu allows for addition, modification, or deletion of data. The data check menu can check for logical mistakes or duplications of registry numbers in the same area. The sum-up menu is used to collect data for the national level. The maintenance menu allows for duplication, deletion or restoration of databases, and for transformation of file formats. The statistics menu gives the descriptive epidemiological results at provincial, prefecture, or county levels. The graph menu produces the common graphs based upon epidemiological results.

Quality control is facilitated by the institutions at different levels and quality evaluation is undertaken by the National Centre for STD and Leprosy Control in Nanjing. Following implementation for almost 10 years, it has been found that data entry errors or logical mistakes are rare, occurring on less than 1% of forms, but coding or numbering errors occasionally occur in the follow-up patients, which leads to mis-connection of forms (<5%) if the errors cannot be found and corrected.

## Outputs

The outputs of the system include selective inquiry, statistics, graph and data print (Figure 2). The selective inquiry can search original forms, or it provides a tabulation of areas and item, according to the calendar year and item selected. The statistics provide the calculation of numbers of patients and rates if the relevant population data have been entered, which includes incidence, detection, prevalence and periodic numbers and rates with or without stratification by sex and age group. In addition, the system can calculate the statistics for demographic, epidemiological and clinical characteristics of newly detected and active cases, MDT regularity and coverage, disability rates and so on using 17 options for statistical analysis. The graph menu produces a series of statistical graphs such as bar, line or distribution map with an assistance of other software, for example, Epi-Map. The print menu prints a series of results generated by the system as well as the original data of individual forms.

## Application and dissemination

Data in the system can be used at national, sub-national or even county levels to describe the epidemiological and clinical profiles of leprosy. The annual national and provincial reports and statistics of leprosy can be automatically produced through the system. The national data can be used by the MOH or National Centre for STD and Leprosy Control, and the provincial and county data can be used by relevant leprosy institutions. Some scientific papers based upon data from the system have been or will be published in domestic or international journals.<sup>5-8</sup> In addition, the annual data summarized from the system not only provide feedback to sub-national or county levels, but provide useful information for policymakers, programme managers, leaders of the Leprosy Expert Committee and mass media. This is helpful in requesting expanded action or increased resources, to help increase the impact of control measures, to assist in designing effective control programmes and to influence beliefs about and attitudes to leprosy.

## Discussion

The target of basic eradication of leprosy, defined as a reduction of the prevalence rate to less than 0.1 per 10,000 and an average detection rate for the past 5 years of less than 0.5 per 100,000 by the end of this century, was set up in 1981. At that time, the Ministry of Health (MOH) and its Expert Committee decided that when China came to declare its achievement of that target, it would not be enough simply to present the two indicators, but there should be a national system for collecting the data necessary to calculate them. National leprosy control in China was initiated in the mid-1950s and is well organized. All the leprosy institutions,

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**Figure 1.** Registration forms for computerized system of leprosy reporting and recording in China. (a) Form 1. (b) Form 2. (c) Form 3. (d) Form 4. PDDS = previous DDS monotherapy; PB/MB = PB-MDT/MB-MDT; CC = clinical cure, \*\*SI = significant improvement; \*\*\*FUC = follow-up complete; FAC = follow-up after cure; ACT = active disease; LBC = lost before cure; DBC = died before cure; MBC = move out before cure; LAC = lost after cure; DAC = died after cure; MAC = move out after cure.

FORM 1. REGISTRATION FORM OF NEWLY DETECTED PATIENT

PATIENT'S NAME: REF. NO: FILLED BY: CHECKED BY: DATA: Y M D

A SEX	B BIRTH Y.	M.	C NATION	D JOB	E INFECT SOURCE	F ONSET YR.	MONTH	G DETECT Y.	M.	H MOVE-IN Y.	M.	I AREA CODE	II REG. NO.
<input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	0000	00	00	00		00	00	00	00	00	00	00000	000000
① M	1111	11	11	11	① With family	11	11	11	11	11	11	11111	111111
② F	2222	2	22	2	② Out of family	22	2	22	2	22	2	22222	222222
	3333	3	33	3		33	3	33	3	33	3	33333	333333
	4444	4	44	4		44	4	44	4	44	4	44444	444444
	5555	5	55	5		55	5	55	5	55	5	55555	555555
	6666	6	66	6		66	6	66	6	66	6	66666	666666
	7777	7	7	7		77	7	77	7	77	7	77777	777777
	8888	8	8	8		88	8	88	8	88	8	88888	888888
⑨ Unk	9999	99	99	99	⑨ Unk	99	99	99	99	99	99	99999	999999

I DETECT MODE	J CONFIRM UNIT	K NO. LESION	L NO. N DAMAGE	M REACTION	N DISABILITY	O BI	P TYPE	III CATEGORY	IV FORM
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	
① Voluntary	① Leprosy Unit	① None	① None	① None	① None	①①	① I	① Original	■ Form 1
① Skin Clinic	① PHC unit	① Single	① 1-2	① Type I	① Grade I	①①	① TT	② Correct	
② Notification	② Dept Dermatol	② 2-4	② ≥ 3	② Type II	② Grade II	②②	② BT	③ Suppl.	
③ Contact exam	③ Other Dept.	③ ≥ 5	③ Countless	③ Mixture	③ Grade III	③③	③ BB	④ Deletion	
④ Spot survey	④ Other	④ Countless		④ Type-less	④ Grade-less	④④	④ BL	⑤ Code change	
⑤ Group survey					⑤ Other	⑤⑤	⑤ LL	Original	Area Code Reg. No. <input type="text"/> <input type="text"/>
⑥ Clue survey						⑥⑥	⑥ T		
⑦ Mass survey						⑦⑦	⑦ B		
⑧ Other						⑧⑧	⑧ L		
⑨ Unk	⑨ Unk	⑨ Unk	⑨ Unk	⑨ Unk	⑨ Unk	⑨⑨	⑨ Unk		

Figure 1.

# FORM 2. ANNUAL FOLLOW-UP FORM OF ACTIVE PATIENT

PATIENT'S NAME: REF. NO: FILLED BY: CHECKED BY: DATA: Y M D

A FOL-UP Y. M.		B RELAPSE	C REGIMEN*	D DDS START Y. M.		E MDT	F MDT START Y. M.		G TR. PLACE	H REGULAR	I AREA CODE	II REG. NO.
<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
00	00	0 No	0 Un-treatment	00	00	0 None	00	00		0 Untreat	0000	0000
11	11	1 1st	1 Mono-DDS	11	11	1 1st	11	11	1 Hospital	1 Yes	1111	1111
22	2	2 2nd	2 PDDS+1/2 yr. PB	22	2	2 2nd	22	2	2 Home	2 No	2222	2222
33	3	3 3rd	3 PDDS+2 yr. MB	33	3	3 3rd	33	3			3333	3333
44	4	4 4th	4 PDDS+ MB→CC	44	4	4 4th	44	4			4444	4444
55	5		5 1/2 yr. PB	55	5		55	5			5555	5555
66	6		6 2 yr. MB	66	6		66	6			6666	6666
77	7		7 MB→CC	77	7		77	7			7777	7777
88	8		8 Other MDT	88	8		88	8			8888	8888
99	99	9 Unk	9 Others	99	99		99	99	9 Unk	9 Unk	9999	9999

  

I MDT COMPLETE		J REACTION	K DISABILITY	L BI	M TYPE	N EFFECT**	O STATUS***	P CURE Y. M.		Q FOL-UP COMPLETE		III CATEGORY	IV FORM
<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	
00	00	0 None	0 None	00	0 I	0 Cure	0 FUC	00	00	00	00		
11	11	1 Type I	1 Grade I	11	1 TT	1 SI	1 FAC	11	11	11	11	1 Original	
22	2	2 Type II	2 Grade II	22	2 BT	2 Improve	2 ACT	22	2	22	2	2 Correct	■ Form 2
33	3	3 Mixture	3 Grade III	33	3 BB	3 No change	3 LBC	33	3	33	3	3 Suppl.	
44	4	4 Type-less	4 G-less	44	4 BL	4 Worsen	4 DBC	44	4	44	4	4 Deletion	
55	5		5 Other	55	5 LL	5 Self-cure	5 MBC	55	5	55	5	5 Code change	
66	6			66	6 T		6 LAC	66	6	66	6	Original	
77	7			77	7 B		7 DAC	77	7	77	7	Area Code	Reg. No.
88	8			88	8 L		8 MAC	88	8	88	8	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
99	99	9 Unk	9 Unk	99	9 Unk	9 Unk	9 Unk	99	99	99	99		

Figure 1. (b) continued.

## FORM 3. REGISTRATION FORM OF RELAPSED PATIENT

PATIENT'S NAME: REF. NO: FILLED BY: CHECKED BY: DATA: Y M D

A RELAPSE	B ORIGINAL REGIMEN*	C ORIGINAL CURE		D RELAPSE Y. M.		E DETECT Y. M.		F MOVE-IN Y. M.		G DETECT MODE	I AREA CODE	II REG. NO.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
① No	① Un-treatment	①①	①①	①①	①①	①①	①①	①①	①①	① Voluntary	①①①①	①①①①
② 1st	② Mono-DDS	②②	②②	②②	②②	②②	②②	②②	②②	② Skin Clinic	②②②②	②②②②
③ 2nd	③ PDDS+1/2 yr. PB	③③	③	③③	③	③③	③	③③	③	③ Notification	③③③③	③③③③
④ 3rd	④ PDDS+2 yr. MB	④④	④	④④	④	④④	④	④④	④	④ Regular exam	④④④④	④④④④
⑤ 4th	⑤ PDDS+ MB→CC	⑤⑤	⑤	⑤⑤	⑤	⑤⑤	⑤	⑤⑤	⑤	⑤ Follow-up	⑤⑤⑤⑤	⑤⑤⑤⑤
	⑥ 1/2 yr. PB	⑥⑥	⑥	⑥⑥	⑥	⑥⑥	⑥	⑥⑥	⑥	⑥ Mass survey	⑥⑥⑥⑥	⑥⑥⑥⑥
	⑦ 2 yr. MB	⑦⑦	⑦	⑦⑦	⑦	⑦⑦	⑦	⑦⑦	⑦	⑦ Others	⑦⑦⑦⑦	⑦⑦⑦⑦
	⑧ MB→CC	⑧⑧	⑧	⑧⑧	⑧	⑧⑧	⑧	⑧⑧	⑧		⑧⑧⑧⑧	⑧⑧⑧⑧
	⑨ Other MDT	⑨⑨	⑨	⑨⑨	⑨	⑨⑨	⑨	⑨⑨	⑨		⑨⑨⑨⑨	⑨⑨⑨⑨
⑩ Unk	⑩ Others	⑩⑩	⑩⑩	⑩⑩	⑩⑩	⑩⑩	⑩⑩	⑩⑩	⑩⑩	⑩ Unk	⑩⑩⑩⑩	⑩⑩⑩⑩

  

H REACTION	I DISABILITY	J BI	K TYPE	L REGIMEN*	M STATUS**	N RELAPSE CURE		O STATUS Y. M.		III CATEGORY	IV FORM
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	
① None	① None	①①	① I	① Un-treatment	① FUC	①①	①①	①①	①①	① Original	
② Type I	② Grade I	②②	② TT	② Mono-DDS	② FAC	②②	②②	②②	②②	② Correct	
③ Type II	③ Grade II	③③	③ BT	③ PDDS+1/2 yr. PB	③ ACT	③③	③	③③	③	③ Suppl.	■ Form 3
④ Mixture	④ Grade III	④④	④ BB	④ PDDS+2 yr. MB	④ LBC	④④	④	④④	④	④ Deletion	
⑤ Type-less	⑤ Grade-less	⑤⑤	⑤ BL	⑤ PDDS+ MB→CC	⑤ DBC	⑤⑤	⑤	⑤⑤	⑤	⑤ Code change	
	⑥ Other	⑥⑥	⑥ LL	⑥ 1/2 yr. PB	⑥ MBC	⑥⑥	⑥	⑥⑥	⑥	Original	
		⑦⑦	⑦ T	⑦ 2 yr. MB	⑦ LAC	⑦⑦	⑦	⑦⑦	⑦	Area Code	Reg. No.
		⑧⑧	⑧ B	⑧ MB→CC	⑧ DAC	⑧⑧	⑧	⑧⑧	⑧	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
		⑨⑨	⑨ L	⑨ Other MDT	⑨ MAC	⑨⑨	⑨	⑨⑨	⑨		
⑩ Unk	⑩ Unk	⑩⑩	⑩ Unk	⑩ Others	⑩ Unk	⑩⑩	⑩⑩	⑩⑩	⑩⑩		

Figure 1. (c) continued.

# FORM 4. REGISTRATION FORM OF PATIENT CURED, DIED OR MOVED OUT BEFORE 1990

PATIENT'S NAME: REF. NO: FILLED BY: CHECKED BY: DATA: Y M D

A SEX	B BIRTH Y. M.		C INFECTION	D ONSET Y. M.		E DETECT Y. M.		F MOVE-IN Y. M.		G DETECT MODE	H REGIMEN*	I AREA CODE	II REG. NO.
<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
	0000	00		00	00		00	00	00	0 Voluntary	0 Un-treatment	00000	00000
1 M	1111	11	1 In family	11	11	11	11	11	11	1 Skin Clinic	1 Mono-DDS	11111	11111
2 F	2222	2	2 Out fam.	22	2	22	2	22	2	2 Notification	2 PDDS+1/2 yr. PB	22222	22222
	3333	3		33	3	33	3	33	3	3 Contact exam	3 PDDS+2 yr. MB	33333	33333
	4444	4		44	4	44	4	44	4	4 Spot survey	4 PDDS+ MB→CC	44444	44444
	5555	5		55	5	55	5	55	5	5 Group survey	5 1/2 yr. PB	55555	55555
	6666	6		66	6	66	6	66	6	6 Clue survey	6 2 yr. MB	66666	66666
	7777	7		77	7	77	7	77	7	7 Mass survey	7 MB→CC	77777	77777
	8888	8		88	8	88	8	88	8	8 Other	8 Other MDT	88888	88888
9 Unk	9999	99	9 Unk	99	99	99	99	99	99	9 Unk	9 Others	99999	99999

  

I DDS START Y. M.	J MDT START Y. M.	K BI	L BI NEGATIVE Y. M.	M DISABILITY	N TYPE	O RESULT**	P RESULT Y. M.	Q STATUS**	III CATEGORY	IV FORM
<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
00	00	00	00	00	00	0 None	00	0 FUC		
11	11	11	11	11	11	1 Grade I	11	1 FAC	1 Original	
22	2	22	2	22	2	2 Grade II	22	2 ACT	2 Correct	
33	3	33	3	33	3	3 Grade III	33	3 LBC	3 Suppl.	
44	4	44	4	44	4	4 Grade-less	44	4 DBC	4 Deletion	■ Form 4
55	5	55	5	55	5	5 Other	55	5 MBC	5 Code change	
66	6	66	6	66	6		66	6 LAC	Original	
77	7	77	7	77	7		77	7 DAC	Area Code	Reg. No.
88	8	88	8	88	8		88	8 MAC	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
99	99	99	99	99	99	9 Unk	99	9 Unk		

Computerization of leprosy records

Figure 1. (d) continued.

Data Entry	Data Check	Data sum-up	Maintenance	Communicate	Data Inquiry	Statistics	Graphs	Print
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AREA CODE & POPULATION

LEPROSY INFORMATION

NOTE:  
  
WHEN YOU  
YOU SHOULD  
AND THEIR C  
ESTABLISH T  
DATANASE O  
THEN YOU C  
FORMS AND  
OF THE DATA.

FORM 1: NEWLY DETECTED CASES

FORM 2: ANN. FOLLOW-UP CASES

FORM 3: RELAPSED LEPR. CASES

FORM 4: <'1990 RELEASED CASES

POPULATION BY SEX, AGE GROUP

10:28:28

PROMPT:   【↑↓←→】 FOR SELECTION   【Enter】 FOR CONFIRM   【Esc】 FOR EXIT

STATUS:   DATE 【August 10, 1999】   PROVINCE 【Guangdong】   PRESENT MENU   【First Page】

Figure 2. Screen display of computerized system of leprosy reporting and recording in China.



usually called institutes of skin disease control at provincial level or leprosy hospital or village at county level, have good storage of medical records for all leprosy patients. In order to tap this source of useful information further, it is important and necessary to establish a national system to collect these data using the structured forms. This will allow the data from different regions not only to be used to express the epidemiological trend and its relation to leprosy control strategies, but also to be compared with each other, thereby increasing their epidemiological value. It is obvious that the establishment of this system is a massive project covering the whole country. Financial support is vital to initiate the system. However, leprosy control in China is vertically implemented by a well organized programme, and therefore extra money for the system is only provided to cover the training courses at different levels, printing of recording forms and establishment of computer at national level and annual working meeting/training course as well as logistic expenses.

The OMSLEP system in the recording and reporting of leprosy patients was developed in cooperation between the Unit of Epidemiology, University of Louvain, Belgium, and WHO, and introduced into leprosy programmes in 1980.<sup>9</sup> On the basis of technical developments as well as the feedback received from the field, a newer edition of OMSLEP was developed in 1987.<sup>10</sup> With reference to the OMSLEP system and in the light of the leprosy programme in China, the individual patient forms for our system were designed and tested in the pilot areas. From the start, the system was also designed to facilitate the entry of data onto computers through an automated, optionally scanned machine. After some modifications, the system was approved by the Ministry of Public Health to be introduced nationwide in 1989. The system has been implemented in leprosy programs in China for 10 years, and the results have generally been very gratifying.

The uniform system for data recording and reporting offers considerable benefits for a leprosy programme. It facilitates standardization of data collection, whereas computerization of the data can motivate the full utilization of data that were previously stored or locked in wooden or metal drawers. The sophistication or subtleties of data analysis required can only be achieved by computerization. The present system can provide 17 analysis options on epidemiological and clinical aspects, covering most indicators used in a leprosy programme. More complex or detailed analysis of the data can be achieved by using a pre-programmed statistical package, such as SPSS 8.0. Although the system has worked well for years in China, some obstacles or problems have been encountered during its implementation. Firstly, the items in recording forms may be complex for leprosy workers at local levels, particularly in remote areas. Secondly, mis-recording of the area codes or registry numbers in some patients caused a mis-connection between different forms. Thirdly, incompleteness of or delay in reporting may influence the annual statistical report. Fourthly, a few logical mistakes in records or incomplete records have occurred in some patients; these can be found by OMR and immediately sent back to the original institutions for correction.

The automated, optionally scanned data entry mode is not only more efficient, rapid, accurate and cost-effective than the manual mode, but also able immediately to find logical mistakes in the records. This entry mode has played an important role in facilitating the transfer of data onto computers, particularly at the initiation of the system, because there were a huge number of backlog records (more than 500,000 forms) to be entered, which is time-consuming work by manual entry. However, in recent years there are fewer than 20,000 individual forms annually, half of which are entered by manual entry at provincial level using the program of the system in some areas (Figure 2). The database under the standardized structure is sent to the National Centre for STD and Leprosy Control by mail in form of 3·5-in

floppy disks or by e-mail in the form of attachments. In these areas, medical staff prefer to enter the data by themselves because: (1) manual entry avoids blurring of digits in data collection, which is a major task for local leprosy workers and one of the reasons causing optical entry errors; (2) logical mistakes in the forms can be found and corrected at once by themselves, so as not to waste time in mailing the wrong forms between local institutions and the Centre. Therefore, for data entry the system can be implemented flexibly.

The system has been widely accepted throughout China, mainly due to its feasibility and ease of operation; and the rapidly rising popularity of computers at local level as well as extensive training on the system. This acceptance would facilitate introduction of computer analysis to other leprosy projects and other disease control programmes, such as STD, for which a national computerization of STD epidemiological and clinical records has been established in our centre in recent years.

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