

## Increasing tuberculosis case detection through intensive referral and tracing in Hunan, China

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### SUMMARY

**OBJECTIVE:** To explore a feasible approach to increase case finding of tuberculosis (TB) through intensive referral and tracing of TB suspects and patients.

**METHODS:** A quasi-experimental study was conducted in three Chinese cities. A strategic referral and tracing system was developed for the local situation in Hunan, China. Data from a 1-year monitoring of referral, tracing and diagnosis of TB suspects/cases were used to assess outcomes.

**RESULTS:** Among 126 public general hospitals and clinics in 38 project counties, the 124 (98.4%) health facilities that participated referred an average of 10 TB suspects and cases to the TB dispensary every month. A total of 6364 suspects and 5759 cases were referred. Compared to the previous year, the number of TB sus-

pects increased by 102.1%, from 25 719 to 51 967; the referral of TB suspects increased five-fold; 10 596 new smear-positive pulmonary tuberculosis (PTB) cases were identified; and the notification of new smear-positive PTB increased by 112.9%, from 27.1/100 000 before the project year to 57.7/100 000, a significantly higher percentage than that of non-project areas, which had a notification rate of 38.8/100 000.

**CONCLUSION:** Intensive referral and tracing of TB suspects/patients is a feasible and effective method of increasing case finding. Strengthening administrative interventions and incentives is essential to achieve project objectives.

**KEY WORDS:** tuberculosis; pulmonary; case finding; referral; prevention

LOCATED IN the southern part of China, with a population of 65.3 million in 2002, Hunan Province has been implementing the DOTS strategy by utilising the World Bank loan and local governmental counterpart funds since 1992. The cure rate of new smear-positive cases was 87.7–91.2% during 1992–2002, according to the yearly reports, and had reached the global target of 85%.<sup>1</sup> However, the case detection rate remained lower: the notification of new smear-positive pulmonary tuberculosis (PTB) cases was 6.6–25.6 per 100 000 population, compared to the new smear-positive PTB incidence of 59/100 000 estimated by the World Health Organization (WHO). Approximately 93% of tuberculosis (TB) suspects initially attended hospital/clinics and <5% of them reported to the local TB dispensaries directly.<sup>2</sup> According to routine unpublished data, only 24.3–40.2% of TB patients were reported and referred, and case tracing was not carried out effectively in the previous years.

We successfully applied for a FIDELIS (Fund for Innovative DOTS Expansion through Local Initiatives to Stop TB) project in 2003 to 'increase case de-

tection through strengthened referral system of TB suspects and cases from hospital to TB dispensary'. The data discussed in the present article are the results of implementing the FIDELIS project from October 2003 to September 2004 in Hunan Province, China.

### METHODS

#### *Case definition*

Based on the official website giving information on disease control,<sup>\*</sup> the case definition of TB in China is divided into the following categories: 1) laboratory diagnosis: clinical specimens, including sputum, body fluids, bronchoalveolar lavage and tissue biopsy, etc., smear-positive for acid-fast bacilli and/or culture-positive for *Mycobacterium tuberculosis*; 2) clinic diagnosis: clinical and radiographic manifestations compatible with TB, but not confirmed bacteriologically, and comprehensive clinical evaluation has ex-

<sup>\*</sup> <http://202.106.123.35/>

cluded other diagnoses; 3) TB suspects: patients with cough, expectoration for >3 weeks or haemoptysis and radiographic manifestations of suspected TB.

#### *Study population*

Non-randomised sampling was used to select study sites. A non-probability criterion-based technique was used to select three prefectures (Shaoyang, Changde and Huaihua) from among 14 prefectures and 38 jurisdiction counties: a sample population of 18.3 million was involved in the project. Notification of new smear-positive TB was 26.8–27.3/100 000 in the project prefectures in the previous year, close to the provincial average level of 27.1/100 000, with a cure rate among new smear-positive cases of 87.4–89.7%.

#### *Development of the work plan*

According to the Chinese National Communicable Disease Control Law, the notification of all suspected and confirmed TB cases is mandatory. A work plan was developed based on the official document issued by the provincial health bureau, stating that as the nodal point of TB control, county TB dispensaries were responsible for diagnosis and treatment of TB patients. Hospitals/clinics should refer all TB suspects/patients who do not need hospitalisation to TB dispensaries. Patients who have been admitted to hospitals should be referred to TB dispensaries after they have been discharged. TB dispensary staff should visit hospitals/clinics twice a week to ensure that referrals are correctly implemented. If referred patients fail to go to the TB dispensary in a timely fashion, case tracing activities are initiated by the TB dispensary staff.

#### *Training and health promotion*

Training workshops were held at the start of the project. Staff, including physicians, communicable disease reporters, laboratory and radiograph technicians at hospitals/clinics and TB dispensaries, were trained in TB diagnosis, registration, notification and treatment, as well as in referral and tracing procedures. Staff at provincial level worked as trainers for county staff. Likewise, county staff ran regular courses for hospital/clinic staff. Intensive information, education and communication activities about TB were initiated through radio, television, posters and brochures for the general population.

#### *Referral of TB suspects/patients*

All TB suspects/cases were registered and referred to the TB dispensaries by doctors in all departments of hospitals/clinics. A referral slip (three copies, one for the patient, another to be presented at the TB dispensary by the patient and the other kept in the hospital/clinic) was specifically designed for the project with patient information, detailed addresses and phone numbers, and was promptly filled in after diagnosis.

Patients were asked to present the slip at the TB dispensary for further sputum examination and/or ambulatory treatment. Full-time designated staff at the hospital/clinic were responsible for collecting information on PTB cases in all departments, and reporting it within 24 h via an internet-based system to the TB dispensary. Financial incentives were given to encourage medical staff to perform referrals: US\$2.4 (equivalent to 20 RMB [Chinese yuan]) was provided for each smear-positive PTB case, US\$1.2 (10 RMB) for each smear-negative PTB case and US\$0.7 (5 RMB) for each TB suspect.

#### *Tracing of suspects/cases*

A designated full-time employee of the TB dispensary was responsible for collecting information on PTB cases from hospitals/clinics by checking the official website on disease control every day. If referred TB suspects or patients failed to attend the TB dispensary, case tracing activities were carried out within a week using telephone calls, letters and home visits. Home visits were carried out by town and village doctors. All referred and traced TB suspects were offered diagnostic services free of charge. Both smear-positive and smear-negative PTB cases received treatment free of charge and were managed under DOTS.

#### *Data analyses*

All monthly and quarterly data collected from the FIDELIS project were processed using Microsoft Excel version 10.0 (Microsoft, Redmond, WA, USA) and analysed using SPSS software version 11.0 (SPSS Inc, Chicago, IL, USA). Population figures were obtained from Hunan provincial statistical yearly books.

The project was approved by the Ethics Committees of the Hunan Institute of TB. Informed consent was obtained from all participants.

## RESULTS

#### *Hospital/clinic participation*

There are 126 public general hospitals/clinics in the 38 project counties. Of these, 46 (36.5%) had ever referred at least one TB suspect/patient before the project year (October 2002–September 2003, pre-project year). The number of hospitals/clinics referring TB suspects/patients increased to 124 (98.4%) over the project period (October 2003–September 2004, project year), with a mean (standard deviation [SD]) of 10.0 ( $\pm 1.6$ ) TB suspects and cases referred per month.

#### *Case referral and tracing*

A total of 14 130 TB suspects/cases were notified by hospitals/clinics (Table 1) during the project year. Of these, 11 391 (80.6%) attended TB dispensaries with referral slips, 1334 (9.4%) had duplicate notifications and 1405 (9.9%) did not attend the TB dispensaries. Of the 1405 cases, 732 (52.1%) were successfully

**Table 1** Referral and tracing during the project year (October 2003–September 2004)

Prefectures	Shaoyang n (%)	Changde n (%)	Huaihua n (%)	Total N (%)
Notified by hospitals/clinics	5872	5387	2871	14 130
TB suspects	3012	3631	1169	7812
TB cases	2860	1756	1702	6318
Referral successful	4859 (82.7)	4217 (78.3)	2315 (80.6)	11 391 (80.6)
TB suspects	2322	2718	896	5936
TB cases	2537	1499	1419	5455
Duplicate reporting	392 (6.7)	611 (11.3)	331 (11.5)	1334 (9.4)
TB suspects	285	497	139	921
TB cases	107	114	192	413
Default from TB dispensaries	621 (10.6)	559 (10.4)	225 (7.8)	1405 (9.9)
TB suspects	405	416	134	955
TB cases	216	143	91	450
Traced by TB dispensaries	343 (55.2)	287 (51.3)	102 (45.3)	732 (52.1)
TB suspects	199	191	38	428
TB cases	144	96	64	304
Total referred and traced	5202 (88.6)	4504 (83.6)	2417 (84.2)	12 123 (85.8)
TB suspects	2521	2909	934	6364
TB cases	2681	1595	1483	5759

TB = tuberculosis.

traced. Overall, 12 123 (85.8%) cases, including 6364 TB suspects and 5759 patients, reached the TB dispensaries by referral and tracing. Shaoyang had the highest success rate of referrals (82.7%,  $\chi^2 = 35.89$ ,  $P < 0.001$ ) and tracing (55.2%,  $\chi^2 = 6.7$ ,  $P = 0.035$ ) compared to the other two project prefectures (Changde and Huaihua).

#### Initial consulting and sputum examination

Registers of TB suspects' initial consultation at the TB dispensary usually include cases who presented spontaneously (self-referral) and those referred by hospitals/clinics (health facility referral); the former are in the majority. As shown in Table 2, the number of initial consulting TB suspects registered increased by 102.1%, from 25 719 to 51 967; of these, health facility referrals increased significantly, by nearly five-fold, from 2030 to 12 123, compared to the pre-project year. Sputum examination was performed on 15 226/25 719 (60.5%) TB subjects on initial consultation before the project year compared to 37 028/51 967 (71.3%) during the project, a clear improvement ( $\chi^2 = 1134.78$ ,  $P < 0.001$ ).

#### Case detection

A total of 10 596 new smear-positive PTB cases were identified during the project year: 6640 (62.7%) were male and 3956 (37.3%) female, with a mean age (SD) of 46.7 years ( $\pm 13.1$ ). Compared to the pre-project year, the detection of new smear-positive PTB increased by 113.8%, from 4956 to 10 596; a significantly higher proportion of new smear-positive PTB cases (42.9%) was due to referral (Table 2). Notification of new smear-positive cases increased by 112.9%, from 27.1 to 57.7/100 000, and was significantly higher than in the non-project area (38.8/100 000) ( $\chi^2 = 1085.1$ ,  $P < 0.001$ ) (Table 3).

## DISCUSSION

DOTS is the internationally recommended strategy for TB control. The implementation of DOTS has greatly improved treatment outcomes among TB patients worldwide. However, according to the 2003 WHO report, the case detection rate was less than half (43%) of all estimated new smear-positive TB cases in 2001 globally.<sup>1</sup> (For China in the same year, the rate

**Table 2** Case detection before and after the project year in 38 counties

	Pre-project	Project	Difference	Increase %	$\chi^2$	P value
Consultation	25 719	51 967	26 248	102.1		
Self-referral	23 689	39 844	16 155	68.2		
Health facility referral	2 030	12 123	10 093	497.2	2751.09	0.0001
Sputum examination	15 226	37 028	21 802	143.2		
Self-referral	13 685	25 545	11 860	86.7		
Health facility referral	1 542	11 483	9 941	644.7	2515.02	0.0001
Smear-positive	4 956	10 596	5 640	113.8		
Self-referral	4 380	6 050	1 670	38.1		
Health facility referral	576	4 546	3 970	689.2	1495.85	0.0001

**Table 3** Case detection between project and non-project area

	Project area	Non-project area	$\chi^2$	P value
Population/100 000	1836.1	4831		
Consultation	51 967	107 567		
Self-referral	39 844	92 574		
Health facility referral	12 123	14 993	2189.86	0.0001
Sputum examination	37 028	71 291		
Self-referral	25 545	53 239		
Health facility referral	11 483	18 052	397.86	0.0001
New smear-positive cases	10 596	18 731		
Self-referral	6 050	12 774		
Health facility referral	4 546	5 957	362.74	0.0001
Notification/100 000	57.7	38.8	1085.1	0.0001

was 33% of all estimated new smear positive TB cases.<sup>1</sup>) This indicates that a substantial proportion of TB patients lack access to or do not make use of services offered by National TB Programmes.

The WHO has been promoting and assisting countries in initiating and scaling up public-private mix for DOTS (PPM DOTS), the aim being to engage all public and private health care workers involved in national TB control.<sup>3,4</sup> Studies in several countries have shown that intensive referral of TB suspects by private practitioners or village doctors can substantially increase case detection rates.<sup>5,6</sup> In this project, we initiated a PPM DOTS model to improve case finding and reached our targets, with the notification of 57.7 new smear-positive TB cases per 100 000 population in the project area. This is exactly compatible with the principal objective of the FIDELIS project, which is to increase case detection of new smear-positive cases whilst maintaining high cure rates within the DOTS strategy, particularly among individuals with limited or no access to modern TB services, i.e., reaching the unreached.

Apart from efficient administrative intervention, we were fortunate to have received financial support from donors, which encouraged referrals among medical staff in hospitals/clinics, as their role was appreciated and valued. Other studies have described the positive impact of incentives on staff working in TB and human immunodeficiency virus (HIV) care.<sup>7</sup> We believe that strengthening administrative interventions and providing incentives were essential in achieving the project objectives.

However, case tracing did not meet the study expectations; although default patients were informed by telephone or were visited at their homes by town and/or village doctors, >40% still did not attend. Several factors, including the non-verification of patients' names, addresses and telephone numbers, insufficient funds and inconvenient local transport probably contributed to default, as well as inadequate communication between referral doctors and patients. It is necessary to further investigate the reasons why so many TB suspects/patients were unwilling to attend TB dispensaries.

A limitation of this study was that non-randomised sampling was used to study sites, although efforts were made to select sites with similar notification of new smear-positive PTB cases. The next step is to generalise this feasible and strategic experience throughout the province.

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#### RÉSUMÉ

**OBJECTIF :** Explorer une approche réalisable d'augmentation du dépistage de la tuberculose (TB) grâce à la référence et à la recherche intensives des suspects et des patients atteints de TB.

**MÉTHODES :** On a mené dans trois villes une étude quasi-expérimentale. Un système de référence et de recherche

stratégique a été élaboré en tenant compte de la situation locale de Hunan en Chine. On a utilisé, pour évaluer les résultats, le suivi à un an des données de recherche et de diagnostic des suspects et des cas de TB.

**RÉSULTATS :** Sur les 126 hôpitaux généraux publics ou cliniques dans les 38 comtés du projet, 124 (98,4%) ont

participé en référant mensuellement une moyenne de 10 suspects ou cas de TB au dispensaire de TB. Au total, 6364 suspects et 5759 cas de TB ont été référés. Par comparaison avec l'année précédente, le nombre de suspects de TB a augmenté de 102%, passant de 25 719 à 51 967 ; la référence de suspects de TB a augmenté de cinq fois avec une identification de 10 596 nouveaux cas de TB pulmonaire (TBP) à bacilloscopie positive des frottis. La déclaration des nouveaux cas de TBP à bacilloscopie positive a augmenté de 112,9%, passant de

27,1 à 57,7/100 000 entre l'année précédant et celle suivant le projet, une augmentation significativement plus importante que celle des zones de non-projet, dont le taux de déclaration a été de 38,8/100 000.

**CONCLUSION :** Pour augmenter le dépistage des cas, la référence et la recherche intensives des suspects et des patients TB sont une approche réalisable et efficiente. Pour arriver aux objectifs du projet, un renforcement des interventions administratives et des incitants est essentiel.

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## RESUMEN

**OBJETIVO :** Explorar una estrategia factible con miras a aumentar la detección de casos de tuberculosis (TB) mediante la remisión y el seguimiento intensivos de personas con presunción clínica y con diagnóstico de TB.

**MÉTODOS :** Se llevó a cabo un estudio semi-experimental en tres ciudades. Se concibió un sistema estratégico de remisiones y seguimiento según la situación local de Hunan, China. Las variables de evaluación se analizaron mediante la supervisión de los datos de un año de remisiones, seguimiento y diagnóstico de los casos presuntos y de los casos de TB.

**RESULTADOS :** De los 126 hospitales generales y consultorios del sector público en 38 condados del proyecto, participaron 124 (98,4%) y remitieron mensualmente un promedio de 10 casos presuntos y casos de TB al dispensario. Se remitieron 6364 personas con presunción clínica

y 5759 casos de TB. En comparación con el año anterior, la cantidad de casos presuntos de TB aumentó un 102,1%, de 25 719 a 51 967 ; la remisión de casos presuntos de TB aumentó cinco veces más ; se detectaron 10 596 casos nuevos de TB pulmonar con baciloscopia positiva y la notificación de este tipo de casos aumentó un 112,9% de 27,1 a 57,7/100 000 antes y después del año del proyecto, notificación significativamente más alta que la de una zona por fuera del ámbito del proyecto : 38,8/100 000.

**CONCLUSIÓN :** La remisión y el seguimiento intensivos de las personas con presunción clínica y de los pacientes con TB constituye una estrategia eficaz a fin de aumentar la detección de casos. Con el propósito de lograr los objetivos del proyecto se precisa el fortalecimiento de las intervenciones administrativas y de los incentivos.

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