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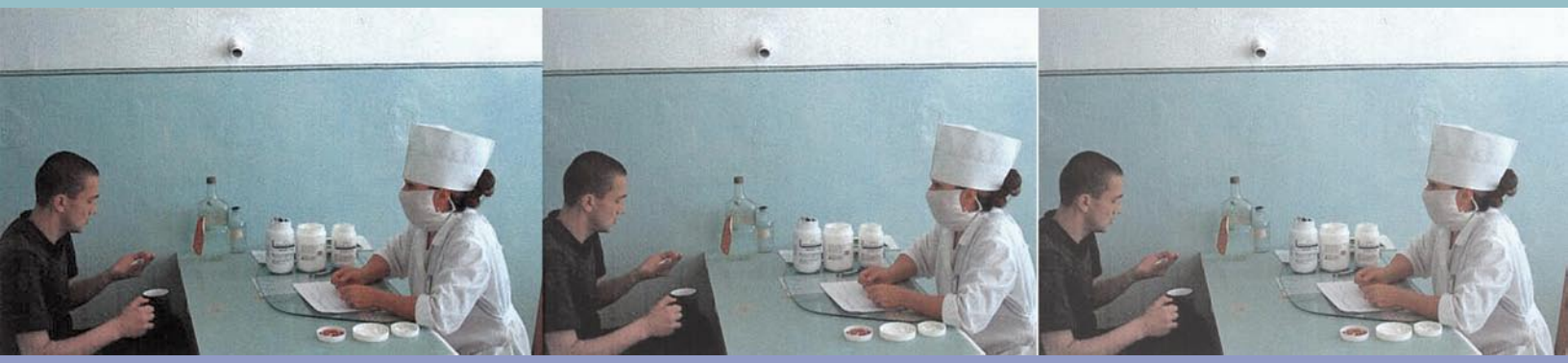
Tuberculosis Case Study



Tuberculosis Control in Karaganda Prison through DOTS: Lessons from Kazakhstan

March 2005

PROJECT HOPE
FOUNDED IN 1958

C.O.RE

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Tuberculosis Control in Karaganda Prison through DOTS:
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FOUNDED IN 1958

Project HOPE's mission is to achieve sustainable advances in health care around the world by implementing health education programs, conducting health policy research, and providing humanitarian assistance in areas of need; thereby contributing to human dignity, promoting international understanding, and enhancing social and economic development. Project HOPE conducts medical training and health care education programs on five continents, including North America. Project HOPE is a member of the CORE Group.

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Contents

Acronyms and Terms

CAR	Central Asian Republics
DOT	directly observed treatment or therapy
DOTS	WHO standard strategy for tuberculosis control
ESCM	computer-based electronic surveillance case management
FSU	former Soviet Union
MDR-TB	multi-drug resistant tuberculosis
MOH	Ministry of Health
NTBC RK	National Tuberculosis Center, Republic of Kazakhstan
NTP	National Tuberculosis Program
PHC	primary health care
S+, S–	smear positive, smear negative
SIZO	jail for pretrial holding of prisoners
TB	tuberculosis
TB03, TB07, TB08	standard DOTS reporting forms
USAID	United States Agency for International Development

Executive Summary

As part of its program to strengthen tuberculosis (TB) management and control in the Central Asian Republics (CAR), Project HOPE conducted a project in Kazakhstan from January 2002 through April 2004 to improve the effectiveness of TB treatment in the Karaganda Oblast penitentiary system by implementing directly observed treatment, short course (DOTS). The project's objectives through this pilot initiative were to:

- Improve the quality of TB case finding, diagnosis, and treatment;
- Improve management of the prison TB DOTS program; and
- Increase integration of penitentiary and civilian TB control systems.

Since the penitentiary system in Kazakhstan involves two Ministries and the TB program a third, this project entailed collaborative work with the Ministry of Health (MOH) in Karaganda Oblast, the Ministry of Justice (for prisons), the Ministry of Internal Affairs (for pretrial jails), and prison/jail administrators. Key interventions focused on establishing an effective TB policy framework, enhancing skills, implementing systems for monitoring and evaluation, and collaboration across Ministries.

Key interventions included:

- Education and improvement of clinical and laboratory staff skills and performance through training, monitoring, provision of equipment, and support of DOTS procedures;
- Education and support of prison TB managers in quality improvement based on use of cohort analysis to monitor progress and provide management information to detect and solve problems; and
- Use of results achieved, support for integration activities and communication inside the penitentiary system and between the penitentiary system and civilian TB treatment agencies relative to released prisoners.

Lessons Learned: Effective implementation of DOTS in a prison system largely depends on the standard approaches used in the civilian sector. Those approaches include bringing about clear, correct policies covering each of the critical areas for TB control and case management, flexible and responsive training in those policies, and following

Key interventions focused on establishing an effective TB policy framework, enhancing skills, systems for monitoring and evaluation, and collaboration across Ministries.

training by active monitoring and support of trainees; establishing clear responsibility and accountability for activities and for patients completing therapy; emphasizing microscopy for diagnosis; and providing tools needed to do the job effectively (e.g. microscopes, assessment instruments, forms). It is also important to actively manage the quality of implementation activities based on monitoring critical indicators, especially sputum conversion, and to respond to identified implementation problems with on-the-job training.

Particular aspects of the prison environment, however, demand responses specific to that environment. For example, non-medical persons (i.e., guards) who can move about readily in the restricted prison environment can be included in the treatment process. Also important are 1) increasing attention to early detection to reduce transmission to uninfected cellmates; 2) early assessment of drug resistance to guide treatment, especially among those who do not readily convert from positive to negative sputum and those who fail initial treatment; 3) vigorous emphasis on coordination – between units in the prison system, between Ministries with overlapping jurisdictions for prisons and prisoners, and between the prison and civilian system; and 4) active social support for ex-prisoners to enable them to successfully re-enter society and successfully finish their TB treatment.

Through careful adherence to DOTS implementation standards, coupled with adaptation to the unique prison environment, the project achieved many positive improvements in outcome indicators. Given a difficult prison setting with high levels of drug resistance and the probable presence of HIV, these results provide powerful evidence that high performance in the civilian sector in the CAR is also feasible.

Project Context

Kazakhstan is the ninth largest country in the world when measured by area—it is about the size of Western Europe. Located between Europe and Asia, it stretches more than 3000 kilometers from east to west and 1700 kilometers from north to south. With an area of 2.7 million kilometers,[2] it has a total population of about 15 million people and an average density of five persons per square kilometer. Ethnic Kazakhs make up 56 percent of the population and Russians 28 percent, with a wide range of other ethnic groups as well. The total fertility rate is 1.9 children per woman, slightly less than replacement level.

Kazakhstan gained independence from the Soviet Union in 1991. It has a democratically elected president and a prime minister who is responsible for the executive branch. The economy contracted following independence, but since 1995, gradual economic growth has taken place, with a substantial shift of assets into the private sector. Kazakhstan has rich deposits of oil and natural gas, as well as a variety of metals, especially iron and copper.

The health system retains its previous Soviet characteristics. The government provides almost all services through a highly specialized health care system. General and family medicine practices have only recently been initiated, stimulated by the U.S. Agency for International Development (USAID)-supported Zdrav Reform project.[1]

1. To learn more about the Zdrav Plus project for health system strengthening in Central Asia, consult http://www.zplus.kz/About_old.htm.

The Tuberculosis Situation

Tuberculosis (TB) began to rise in Kazakhstan following independence as new cases went uncured and continued to spread infection. As of 2001, the officially estimated incidence rate for all forms of TB was 163 per 100,000. Kazakhstan has nominally implemented a DOTS program throughout the country, yet TB rates continue to rise, probably in large part due to ineffective implementation of critical aspects of the DOTS system. Like the other four CARs, Kazakhstan has yet to achieve a consistent treatment success rate of 85 percent or greater among the infectious, new smear-positive type of cases.

A look at the five key components of the DOTS strategy reveals a mixed situation in Kazakhstan in 2004.

Political commitment: In 1998, the president signed a decree supporting nationwide DOTS but many aspects of the decree and associated documents do not provide clear direction for medical practitioners about diagnosing, classifying and treating the various types of TB cases.

Diagnosis and treatment: TB specialists and institutions in Kazakhstan, with tacit concordance from the National TB Program (NTP), have continued to pursue methods inconsistent with the WHO DOTS strategy, including mass x-ray screening for TB detection, using culture rather than microscopy for confirmation of infectious case diagnosis, and long-term, unnecessary hospitalization of all patients. HOPE monitoring staff continues to encounter incorrect case classifications, which lead to incorrect treatment, low cure rates and incorrect statistical reporting. Project HOPE's monitoring team frequently encounters ineffective performance of DOTS, though patients are in a hospital, and essentially no outreach effort by TB nurses to trace defaulters and facilitate their continuation of treatment after discharge from hospital. This latter problem has been and can be especially pronounced in the case of patient transfers between prisons and civil society TB care facilities. The lack of effective mechanisms to ensure the continuation of treatment by patients who are transferred leads to unnecessarily high default rates and treatment failures as well as transmission of TB in the community.

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As the country pursues health sector reform and shifts a substantial portion of care away from specialists to primary health care providers, the interaction between the primary health care (PHC) system and the TB system becomes increasingly important. This is true for both the detection of suspected TB cases and subsequent referral to the TB system for confirmation of diagnosis, and for continuation of treatment after discharge from the hospital, with

direct observation and support to ensure drug consumption. Yet current linkages between the PHC and TB systems are weak and relatively undefined, with inadequate communication regarding referrals and unclear responsibility and accountability by the PHC system for supervising TB care and ensuring adherence to the last 3–4 months of treatment. Many patients bypass the PHC system altogether, seeking care directly from TB facilities.

Laboratory: Simple smear microscopy laboratories do not receive good guidance and reinforcement of their work quality from a network of higher-level labs with capability to also help diagnose and define treatment for more difficult cases. The lower-level TB lab facilities display a wide range of workloads, in many cases too small for technicians to maintain their skills. HOPE monitoring staff frequently reports observing deviations from standard lab methods during on-site visits. Efforts to correctly diagnose and manage possibly resistant TB cases in these circumstances are nearly useless. Such a laboratory situation compounds the risk of serious treatment errors and furthers augmentation of drug resistance.

Drug supply: Kazakhstan is the only CAR country that does not depend on external assistance for its drug supply. Unfortunately, this has not ensured continuous availability of all the correct drugs at the treatment level. Both stockouts and inappropriate combinations of drug dosages and types are reported, adding to confusion in treatment. Also, clear quality control in the purchase of drugs from imported sources has been lacking. Moreover, the country has recently begun to decentralize the responsibility for purchasing drugs, further confounding these problems. Beyond problems with the standard first-line drugs, Kazakhstan has also begun to distribute second-line drugs for treatment of multi-drug resistant TB (MDR-TB). This has occurred prior to establishing clear treatment protocols, establishing effective drug sensitivity testing capacity in the labs, and providing adequate training in the use of these drugs, which are very expensive and frequently cause dangerous side effects.

Information system: Program management has been a major focus of Project HOPE's efforts. Training, mentoring, and demonstration (through modeling practices and systems) have only partially improved supervisory skills and practices among NTP managers as the policy framework has not been changed to support widespread and required use of the correct practices. Cohort analysis data is collected and reported internally to higher levels, but is not utilized for management and improvement of treatment and program activities, nor is it routinely shared with program staff. The information system continues to be plagued by the use of both the standard DOTS information system forms and, in some cases, former Soviet system forms. This results in duplication of effort, non-standardized reporting of results, and manipulation of data to produce results that look good to higher authorities. The U.S. Centers for Disease Control and Prevention (CDC) developed a computer-based electronic surveillance case management (ESCM) system for the CAR region to help make good DOTS recording and reporting data more accessible. It was first implemented in Kazakhstan. Subsequently, however, the government rejected the transparent computer-based system, with a return to a mixed pattern of completion of both DOTS and other forms and virtually no public reporting of the results.

Tuberculosis in Prisons

While the civilian TB system struggles to reach DOTS standards and targets, despite the problems described above, it far exceeds the prison TB system in functional quality and effectiveness. TB data from prisons are not reported as part of civilian statistics, because the Ministry of Justice, not the MOH, manages the penitentiary health system. Because of this, Kazakhstan TB rates officially reported by the MOH do not reflect TB rates in the prisons, which are reported to be very high. For example, in 2001, while the civilian case notification rate for all forms of TB was 156 per 100,000 and mortality 24.5 per 100,000, the corresponding rates in the penitentiary sector were 2210/100,000and 130/100,000—14 and five times higher respectively.

Moreover, Kazakhstan in recent years ranked third in the world for total number of prisoners per 1000 population, with only the United States and Russia having higher rates of imprisonment. With repeated releases of large numbers of prisoners in acts of general amnesty over the last decade, many prisoners with active TB reenter the community without treatment or follow-up support. And, while the general prison population has fallen over the past three years, and Kazakhstan now ranks only 18th worldwide, the total number of prisoners remains high. About 80 percent of prisoners are in the most productive age group of 25 to 45 years, and about 50 percent of prisoners abuse alcohol and drugs.

At the time Project HOPE initiated activities at the Karaganda prison (2001), tuberculosis was the second most frequently registered disease in the penitentiary system.

At the time Project HOPE initiated activities at the Karaganda prison (2001), TB was the second most frequently registered disease in the penitentiary system: 678 new TB cases were registered compared to 1443 cases of other lung disease, 217 nutrition-related diseases, 166 cases of urogenital disease and some 300 cases of "other" diseases. Deaths attributed to TB comprised 30 percent of all prisoner deaths. Treatment results for TB cases were poor: only 30 percent of new cases were reported as treated successfully in 2001, (compared to a target of 85 percent). Insufficient and ineffective treatment has also contributed to an increasing number of chronic (failed treatment) TB cases with drug-resistant TB.

In Karaganda Oblast, where the prison is located, too few qualified medical providers, too little funding, and inadequate laboratory equipment burdened the TB program. The existing Russian-style civilian TB control system offered little in the way of improvement for TB care in the penitentiary system. With knowledge of Project HOPE's experience and success elsewhere in Kazakhstan, the Ministry of Internal Affairs asked Project HOPE to begin a "tuberculosis in prisons" program.

The program started in the penitentiary facilities of Karaganda Oblast in January 2002 following signing of an agreement of cooperation between representatives of the MOH, the Ministry of Internal Affairs, the Ministry of Justice, and Project HOPE/USAID. Local partners in the overall effort included the Oblast Division of the NTP, the Oblast Department of Health, the Oblast TB Dispensary, and the Rayon TB Dispensary where the prison was located.

Initial Assessment of Karaganda Prison Tuberculosis Situation

Table 1 illustrates the magnitude and complexity of the penitentiary system. Karaganda Oblast has two pretrial prisons (SIZOs), eight peripheral prison colonies, and two TB prison hospitals, at considerable distance one from the other. Further complicating the situation, the Ministry of Justice is responsible for the eight penitentiary colonies and two TB hospital colonies, while the Ministry of Internal Affairs controls the two pretrial SIZOs. In 2003, these facilities housed a total of 8100 persons.

Outside the prison system, there was one civilian TB hospital in the oblast. This facility had, in addition to standard wards of beds for TB cases of all types, a special department for treatment of patients thought to have MDR-TB and another for civilian patients who had refused to take treatment and,

Table 1: Karaganda Penitentiary System Tuberculosis Facilities

Facility #	Type of Facility	Maximum Number of Prisoners	Number of TB Specialists	Laboratories	Number of Laboratory Specialists
AK 159\11	TB Hospital	1550	28 authorized staff 20 positions filled	One (joint) bacteriological	5
AK 159\17	TB Hospital	550	8 authorized staff 7 filled	lab for two TB hospitals	3
AK 159\5	Peripheral colony of Karagan v.	1510 general	2	Microscopy	1
AK 159\6	Peripheral colony of Dolinka v.	1050 high security	1	Microscopy	1
AK 159\7	Peripheral colony of Dolinka v.	1060 high security	2	Microscopy	1
AK 159\9	Peripheral colony of Koksun v.	1400 female	2	Microscopy	1
AK 159\18	Peripheral colony of Karabas v.	1100 general	1	Microscopy	1
AK 159\21	Peripheral colony of Balkhash v.	1300 general	1	Microscopy	1
AK 159\22	Peripheral colony of Karazhal v.	760 high security	1	Microscopy	1.5 *
AK 159\20	Colony-Settlement of Dolinka v.	770	1 Medical assistant 1 Medical nurse	No	No
AK 159\16	SIZO**, Karaganda city	1400	2	Microscopy	1
AK 159\24	SIZO**, Zhezkazgan town	420	1	No	No

* ½ salaried position, 1 fulltime position loaned from civil sector
** SIZO = jail for pretrial holding of prisoners

subsequently, were legally confined and required to take treatment. Though they are not criminals, patients in this special ward receive TB treatment 'under low requirement', that is to say confined with a low level of security.

Laboratory equipment, especially binocular microscopes, was lacking. In addition, there was no quality control system linking all of the laboratories within the prison system, nor was there a mechanism linking the prison laboratory system to the national reference laboratory and/or oblast civilian bacteriology laboratory.

Project HOPE staff assessed and identified problems with diagnosis and treatment and case-finding activities among the prisoners, with particular attention to the reporting and recording systems, the management of the diagnosis and treatment process, and the degree of communication and cooperation—called integration—between the civilian and penitentiary services.

On the basis of this assessment, Project HOPE, in collaboration with its partners from various ministries, prepared a two-year plan for improvements. Within the prison system, they formed and officially appointed a team of prison program coordinators. Members of the team took specific responsibility for implementing planned activities in the following areas: laboratory network performance, drug management, reporting and recording system, and integration of the penitentiary and civilian health services at the oblast level. Clinical coordinators were also appointed in each of the two prison TB hospitals. Project staff developed scope of work and determined main tasks in cooperation with each coordinator.

HOPE assessed problems with case finding, diagnosis and treatment in the prison system, with particular attention to reporting and recording systems, management of the diagnosis and treatment process, and the degree of integration between the civilian and penitentiary services.

Interventions and Activities

Education and Training: To set out a basic policy framework for DOTS and assure basic understanding of its diagnosis and treatment practices, Project HOPE provided a range of different types of training over a two-year period, from 2001 to 2002. Staff attended theoretical seminars related to DOTS, for varying lengths of time according to their specialty: TB specialists (basic, 5 days), lab specialists (basic, 5 days), medical nurses (basic, 3 days), oblast coordinators and curators of facilities (advanced, 3 days), and non-medical specialists (basic, 2 days). About 130 medical providers received overall training in TB control and DOTS.

For the training, Project HOPE used the TB curriculum it had developed in Kazakhstan as part of its TB program for CAR—a highly participatory curriculum for introducing basic procedures, with particular attention to the standardized DOTS forms for classifying patients and recording and reporting clinical data. Cohort analysis and management included both basic and advanced training and data from the prisons themselves to illustrate the analytic approach and how the results of the analysis could be applied to improve outcomes.

Laboratory specialists took related practical seminars to both enhance their laboratory skills and to reinforce their understanding of the importance of their work in relation to the DOTS policies and the monitoring and evaluation system.

A second level of training targeted specific issues in service quality. This 'training at work' aimed to transform theoretical knowledge into practical skills, using the workplace to ensure maximum proximity to real conditions.

As the quality of services began to improve, the project developed a second level of training to target specific issues in the quality of services: for example, mistakes in classification of patients that had led to use of the wrong treatment regimen and the use of inaccurate data for cohort analysis and consequent management planning. This second level, called 'training at work' (i.e., on-the-job training) was carried out over the next 18 months (2002–2003). This advanced training aimed to transform theoretical knowledge into practical skills, and utilized the workplace to ensure maximum proximity to real conditions. It pursued two topics:

1) Adherence to the correct diagnostic and therapeutic algorithm, including DOT methods and effectiveness by general practitioners, nurses, and TB experts. This training also covered the protocol for sputum collection, a

common area for errors that cause false negative sputum examinations. Topics were selected and materials designed to address specific problems observed during monitoring visits by Project HOPE staff and consultants.

2) Improved monitoring/supervision as quality improvement methods: This training introduced a new managerial approach to achieving ideal quality service. Managers and supervisors were trained to carry out monitoring visits using specific indicators and corresponding checklists which reflected the quality of case finding, diagnosis and treatment, the recording and reporting system, DOT, cohort analysis, and drug supply. According to the quality improvement approach, variations in indicators observed during monitoring visits help identify quality problems. This leads to discussion with the involved staff members and other managerial staff; subsequent actions to correct the problems would in turn lead to improved quality of services and thereby improved performance. Project HOPE developed the indicators and checklists used in this activity for the Kazakhstan civilian TB system. Approximately 90 TB experts received training in this set of issues. Their training included interactive brainstorming and discussion regarding activities needed to solve particular problems, identified by use of the indicators. TB specialists employed the checklists during initial, intermediate, and final assessment visits, as did the oblast coordinators who carried out internal monitoring of the penitentiary facilities. The Project HOPE prison coordinator used the completed checklists as the basis for 'training at work' sessions emphasizing the development of solutions as soon as problems were identified.

As these initial trainings led to new modes of operation, it became obvious that successful program implementation could not be achieved without active participation of certain non-medical personnel: prison guards are involved in sputum smear collection and DOT, and can move around the prison comparatively freely. As such, 17 non-medical staff, primarily prison guards, received training in the DOTS strategy with specific emphasis on sputum collection and provision of DOT, as well as safety precautions to be used in day-to-day work.

Laboratory: The usual emphasis in DOTS on case finding by microscopy to detect tuberculosis cases with positive sputum is especially important in the prison situation. In particular, the eight peripheral prison colonies and the two SIZOs were found to have minimal medical and laboratory facilities (Table 1). Since crowded living conditions favor transmission, the infectious person must be rapidly detected and isolated. In light of the limited access

The project gave close attention to improving microscopy, equipping the microscopy laboratories and the TB hospital bacteriological laboratory.

in the peripheral colonies to other more expensive and invasive diagnostic procedures including x-ray, bronchoscopy or thoracoscopy, the project gave close attention to improving microscopy. All of the microscopy laboratories and the TB hospital bacteriological laboratory received the necessary equipment.

Despite the apparent simplicity of the procedures for sputum collection, smear preparation and staining, and microscopic examination, getting personnel to strictly follow these procedures required major effort. Errors were common in the procedures for collecting sputum, in collecting the required number of samples for effective diagnosis and treatment control, and in preparing slides of adequate quality for reliable microscopic examination.

Nevertheless, the project achieved the following important tasks:

- Certification of the prison bacteriology and reference laboratory by the national reference laboratory;
- Standardization of the bacteriological and microscopy methods;
- Integration of the laboratory system into the civilian health service laboratory system; and
- Implementation of both internal and external (horizontal and vertical) quality control systems.

Within the prison system, the oblast penitentiary bacteriological laboratory controls the quality of all the laboratories in the prison colonies (horizontal quality control). At the same time, the national reference laboratory and the oblast civilian bacteriology laboratory control the quality of the penitentiary oblast bacteriological laboratory (vertical quality control).

DOTS information system and management including patient registration, sputum conversion, and cohort analysis: With the initiation of a strict DOTS-based patient care system, the TB patient registration system was redefined to eliminate double registration of TB cases, and was centralized for the whole oblast penitentiary system. Together with the prison authorities, Project HOPE developed protocols and a set of forms to be used for transfer of patients from one facility to another as well as from the penitentiary system to civilian TB care, so that prisoner patients who moved were correctly transferred, rather than being designated as 'lost' in the originating system and as 'newly registered' in the recipient system. Managers were introduced to the concepts of cohort analysis and smear conversion rate; these became standard tools for program managers. Percentage of relapses, smear

Heads of penitentiary facilities and specialists on prison regulations are trained on TB control in prisons, ensuring their understanding and support for project initiatives.

conversion rate, percentage of defaulters, and contact investigation became routine objective indicators for day-to-day analysis by prison colony TB experts and even became familiar to the non-medical administrative heads of the colonies.

Project HOPE partnered with and mentored program administrators as they carried out analyses, identified problems, developed solutions, took action, and reviewed results. This peer 'on-the-job' training addressed the variability of information that managers were required to analyze. In some cases, managers could be led through data analysis and identification of solutions as a group. For the HOPE program, these group interactions provided an efficient way of transferring skills to managers, but did not obviate the need for individual mentoring.

Integration: Project HOPE staff developed a special program to integrate civilian and prison/penitentiary services. Its purpose was to increase the number of released prisoners who were successfully transferred to civilian health care and who continued their TB treatment. Initiatives included the design and implementation of protocols and a special form for tracking both prisoners and ex-prisoners. Information materials for dissemination among the prisoners were developed based on an anonymous TB knowledge questionnaire administered to prisoners.

A special program to integrate the civilian and prison/penitentiary services aimed to increase the number of released prisoners who were successfully transferred to civilian health care and who continued TB treatment.

HOPE needed to develop a sequence of actions to link prison and civilian care, as follows:

1. A list of prisoners about to be released to the civil health care sector is compiled and distributed to district TB specialists.

2. The prison integration coordinator then meets with prisoners, informing them about available places for continuing treatment and providing information using the above-mentioned information materials.

3. District specialists visit addresses of prisoners to confirm where the prisoners will live and to discuss prisoner transition with the families.

4. The updated list (source of care, address where the prisoner will live) is returned to the penitentiary to allow them to update their lists.

5. When the specific date of release becomes known, the updated list is returned to the civil sector, and the patient is re-registered by district TB specialists as of the date of release.

While this system appears complex, such complexity is necessary in light of the heavily bureaucratic system.

The program coordinator responsible for integration was able to eliminate the double reporting within the penitentiary system, in which pretrial facilities reported to the Ministry of Internal Affairs and the prison facilities (post-trial) reported to the Ministry of Justice. This reporting had resulted in the past in many cases of missing information or double reporting of cases. The integration coordinator was able to track individuals by name and ensure that these problems did not occur, linking the coordinators of TB care from the pretrial facilities and the prison hospitals.

HOPE leadership and implementation management: Project HOPE trainers, monitoring team, and administrators took an active role in implementing this project. Monitoring of the process of improvement in prison activities was critical to the success of the intervention. The Project HOPE prison coordinator (Dr. Zhanna Zhandauletova) visited each site every two months for approximately one week each, typically spending 1–2 days at the TB hospital colony and the remaining time circulating among the peripheral colonies. The overall Project HOPE prison program director (Dr. Alexander Trusov) visited at intervals of 10 to 14 months. These visits allowed for the baseline assessment in 2001, intermediate monitoring in 2002, and a final evaluation at the end of the two-year program in 2003. Separate Project HOPE checklists were utilized to assess the following: laboratory performance, recording and reporting system, case finding, diagnosis and treatment, and drug management. These task-specific checklists allowed semi-quantitative assessments of program quality, helped to identify problems and facilitated the development of appropriate teaching materials and training courses, as described above.

Project Results

Program staff measured implementation of DOTS in the prison system in Karaganda in a number of ways. During the implementation, there was intense focus on outcome indicators as evidence that the total process was working, and as a source of information as to where problems were occurring. Process indicator measurements helped to pinpoint the location and nature of specific problems, so that managers and staff could take action to correct them.

Outcome indicators

The most important indicators in any DOTS system are the outcome indicators. When these indicators show good trends in case finding, high rates of sputum conversion at 2–3 months, high cure and treatment completion rates, and low rates of defaulters and failures, a program is running well.

Process indicators detected by observations during monitoring (e.g., the availability of basic laboratory supplies and equipment, appropriate methods to collect sputum, correct recording of patient information, evidence of true observation of medicine consumption during DOT) provide detail about the possible causes of a problem identified via the outcome indicators. With this in mind, HOPE placed priority attention on tracking the basic outcome indicators as primary evidence of effective interventions.

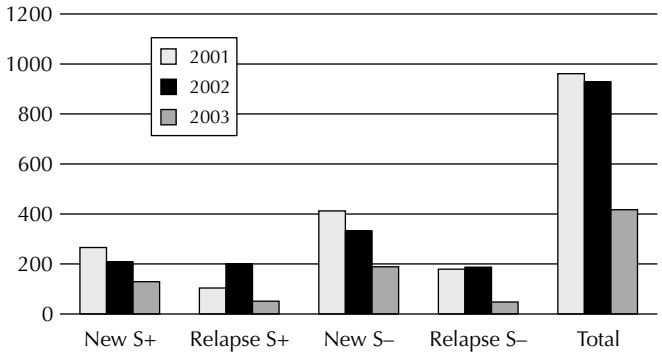
Case notification is an important outcome indicator to document both the laboratory network's functioning and its degree of cooperation with the treatment services. There are well known relationships that will exist among the types of cases found and the trends that can be experienced when the laboratory system and treatment services both implement their respective roles correctly. The proportion of new smear positive and negative cases found should be roughly equal over time. Previously treated cases should decline sharply if the population size is stable and those cases are being properly diagnosed and cured when treated.

In the case of the Karaganda oblast penitentiary system, the trends in case finding were positive, demonstrating improved performance and increasing cooperation between labs and medical services. The increasing and declining trends in the types of case notifications are consistent with improving practices (see Table 2 and Figures 1, 2 and 3 below).

Table 2. Case notification (# of cases): Karaganda oblast penitentiary system, 2001–2003

Year	New S+	Relapse S+	New S–	Relapse S–	Total
2001	266	104	412	179	961
2002	208	201	332	187	928
2003	129	51	189	48	417

Figure 1. Case registration (# of cases): Karaganda oblast penitentiary system, 2001–2003

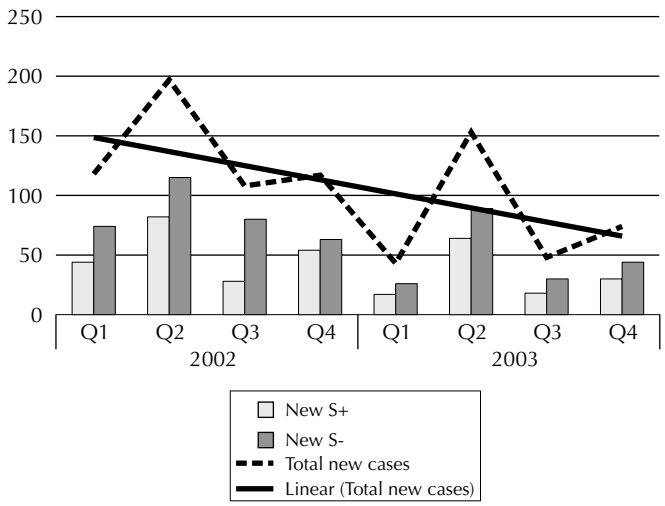


Previously treated cases should decline sharply if the population size is stable and those cases are being properly diagnosed and cured when treated.

The dramatic decrease in overall case numbers can be attributed to reduced numbers of relapse cases from 42% of all cases in 2002, to 24% in 2003 (Figure 1). This was due to on-the-job training to use the correct case definitions and follow correct policies for the case types.

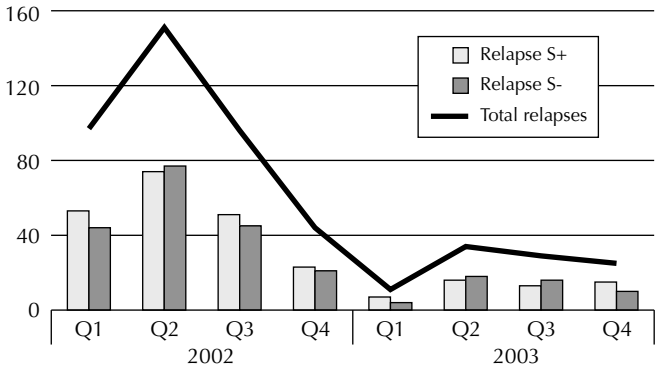
While overall trends are downward (Figure 2), case registrations also clearly show an increase of the number of tuberculosis cases in the second and fourth quarters of both years. This recurring bulge is a consequence of continued use of X-ray for tuberculosis diagnostic screening twice a year. This is based on the still active official policy (*prikaz*) of the Ministry of Justice and demonstrates continuing reliance of prison TB experts on X-ray diagnosis rather than smear microscopy. This activity influences the proportion of new smear positive (S+) and smear negative (S–) cases found, with an increase in the proportion of smear negative cases during the periods of X-ray screening. While local physicians argued that the X-ray diagnosis allows detection of tuberculosis at an early stage, case records did not support this assertion. Good results from effective microscopy will hopefully convince senior physicians over time to trust microscopy.

Figure 2. New cases registration by quarters (#): Karaganda oblast penitentiary system, 2002–2003



The high proportion of relapse cases initially being reported caused concern, leading Project HOPE experts to perform retrospective analysis of relapses reported in 2001. It was found that among 60 cases of relapse analyzed, only 24 cases (40%) were real relapses; 36 (60%) had been erroneously registered as relapses. Correcting mis-registration, and appropriately treating and curing the relapse cases that were found resulted in a sharp reduction in their numbers (Figure 3).

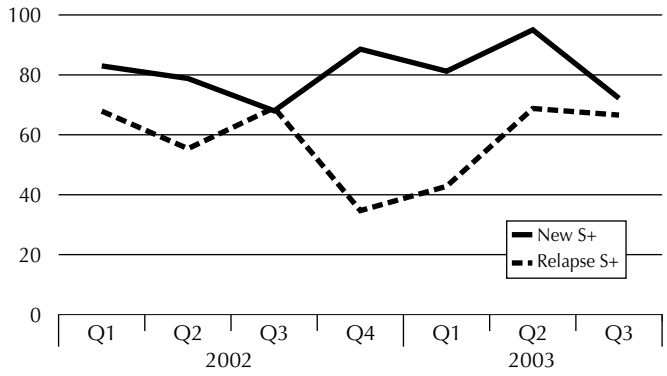
Figure 3. Relapses (S+, S–) (#): Karaganda oblast penitentiary system, 2002–2003



Correcting mis-registration of relapses, and appropriately treating and curing the relapse cases that were found resulted in a sharp reduction in their numbers.

Smear conversion rates, analyzed by quarter, for 'new sputum positive cases' in the Karaganda prison system showed good trends and averaged 81 percent in 2002 and 89 percent in the first three quarters of 2003 (Figure 4). As staff grew accustomed to using this indicator (which was new for this system), it tended toward the high rates that would be anticipated. In relapse cases, where resistance may be higher, the rate was 60 percent in 2002 and 63 percent in the first three quarters of 2003.

Figure 4. Smear conversion rate among new cases and relapses (%): Karaganda oblast penitentiary system, 2002–2003



It is likely that the earlier, lower rates were due to failure to collect sputum at 2–3 months.

Treatment outcome in 'new sputum positive cases' as determined by cohort analysis is shown in Table 3. From levels of 50 percent of new cases proven cured at the beginning of 2002, the results rose steadily and reached 81 percent in the first quarter of 2003, the last figures available at the time of this report. (Note: Figures for treatment outcome can only be assessed a full year after completion of treatment.)

The level of new cases proven cured (as assessed one year after completion of treatment) rose from 50% at the beginning of 2002 to 81% in the first quarter of 2003.

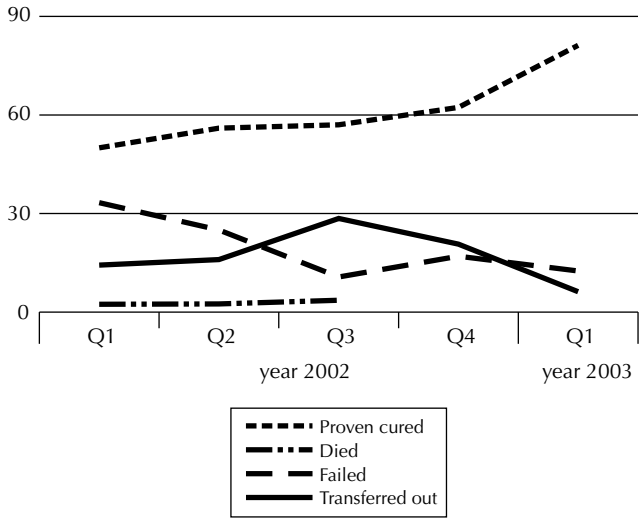
The percentage of patients who died is not an unambiguous indicator of the effectiveness of a TB control system. Deaths can be sharply reduced by ineffective antibiotic treatment, which leaves the patient still infectious and ill but which postpones death, often for many years, while drug-resistant strains develop. Nonetheless, declining mortality can also be a consequence of a good program, providing an easy-to-understand health gain, if other evidence confirms that the fall in deaths is due to good rather than poor treatment.

Table 3: Treatment outcome of new S+ cases: Karaganda oblast penitentiary system, 2002–1stQ 2003

	2002				2003
Outcome	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**
Proven cured	50%	56%	57%	62.3%	81.2%
Died	2.4%	2.5%	3.6%	0	0
Failed treatment	33.3%	25	10.7%	17%	12.5%
Transferred out	14.3%	16%	28.5%	20.7%	6.2%

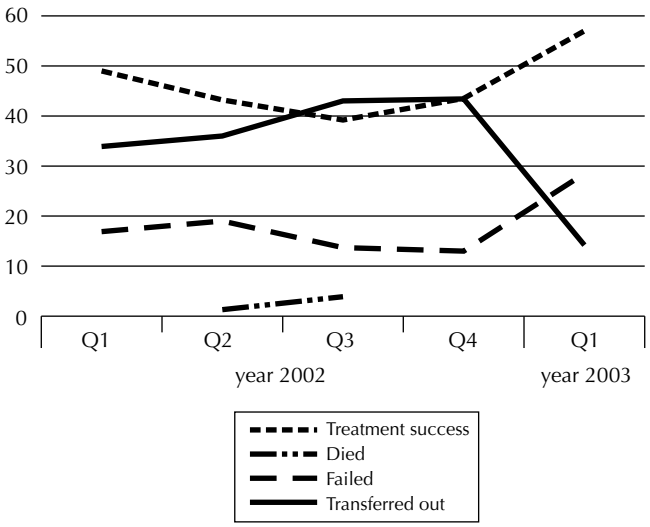
In this case, deaths fell from the 2–3 percent range in 2002 to no deaths at the end of 2002 and the first quarter of 2003. Over the same time period, the number of patients who failed treatment decreased almost threefold, from 33 percent to 12.5 percent. Finally, the percentage of transferred patients fell to 6.2 percent during the first quarter of 2003.

Figure 5. Treatment outcome, new cases (%): Karaganda oblast penitentiary system, 2002–1stQ 2003



These good results for 'new cases' were duplicated to some extent in the 'retreatment cases' (Figure 6 below). However, the rise in treatment failures, from 12 percent in Q4 2002 to 28 percent in Q1 2003, could be indicative of either drug resistance developing among a group of prisoners or a temporary lapse in some aspect of medical care. Observation of performance data for subsequent cohorts of retreatment patients and on-site monitoring and supervision will help to clarify the overall situation.

Figure 6. Treatment outcome, relapses (%): Karaganda oblast penitentiary system, 2002–1stQ 2003



From the changes in the outcome indicators achieved, one can conclude that the oblast penitentiary system successfully adopted the most important elements of the DOTS approach. Laboratory and medical service practices combined to detect and then cure the infectious TB cases at quite high rates. The performance was almost good enough to meet global TB program targets. This positive performance in a difficult prison setting, with high levels of drug resistance and the probable presence of HIV, is powerful evidence that high performance in the civilian sector in the CAR countries is feasible.

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Process indicators

As the above outcome results of the program improved, they provided evidence that the detailed elements leading to these outcomes were also improving. The process indicator data presented below, from direct assessment of these elements, confirmed that conclusion.

Training effectiveness: The formal training activities carried out by Project HOPE in the prisons were assessed using a pretest/post-test protocol. Physicians who underwent the basic DOTS training for physicians scored 82 percent overall in the post-test, up from 47 percent on the pre-test. Nurse training produced similar results, with a rise from 59 percent to 87 percent. In advanced training (on the methodology for increasing quality in a TB control program), the TB physicians showed a rise from 50 percent to 86 percent in their overall knowledge.

In addition to these measures of change in knowledge, the training's success in producing desired changes in behavior was assessed on-the-job. Observations during monitoring by both Project HOPE staff and prison managers documented the quality of provider actions. This data clearly showed a dramatic increase in the percentage of cases correctly classified, the quality of DOT being provided, the quality control methods used in the laboratories, and other indicators of improvements in the process of care.

Diagnosis and treatment procedures: The figures that follow provide quantitative evidence of the improvements in treatment procedures. Project HOPE employed its objective assessment checklists to measure the following key process indicators:

- % sputa collected correctly according to the defined procedure,
- % effectiveness of sputum smear exam,
- % of smear positive new cases,
- % patients with smear positive sputum exam which were registered in the TB03 reporting form,
- % patients whose treatment started within the first 3 days after clinical

diagnosis,

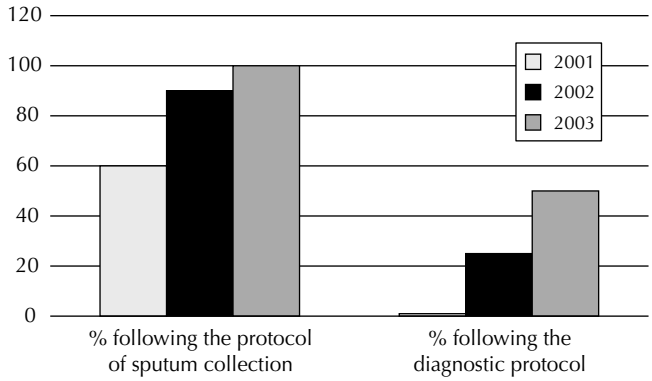
- % patients receiving reliable DOT,
- % concordance of the data in TB07 and TB 03 reporting forms,
- % concordance of the data in TB 08 and TB03 reporting forms,
- % medical charts filled out correctly,
- % time during which stockouts of the TB drugs took place,
- % patients whose diagnosis followed the diagnostic algorithm,
- % patients who have correct basic knowledge about the symptoms, treatment, and transmission and prevention of tuberculosis.

Some of these are provided as examples in the following paragraphs.

Figure 7 characterizes the percentages of patients for whom the desired protocols of sputum collection and diagnosis were carried out. These show dramatic rises from 60 to 100 percent in the percentage following sputum collection protocols, and essentially a doubling (from 25 percent to 50 percent) of the percent of patients for whom the diagnostic protocol was adhered to. Mistakes that occurred in following the diagnostic algorithm

Data clearly showed a dramatic increase in the percentage of cases correctly classified, the quality of DOT being provided, the quality control methods used in the laboratories, and other indicators of improvements in the process of care.

Figure 7: Percent of patients with protocols for sputum collection and diagnosis carried out correctly, Karaganda Oblast penitentiary system, 2001–2003

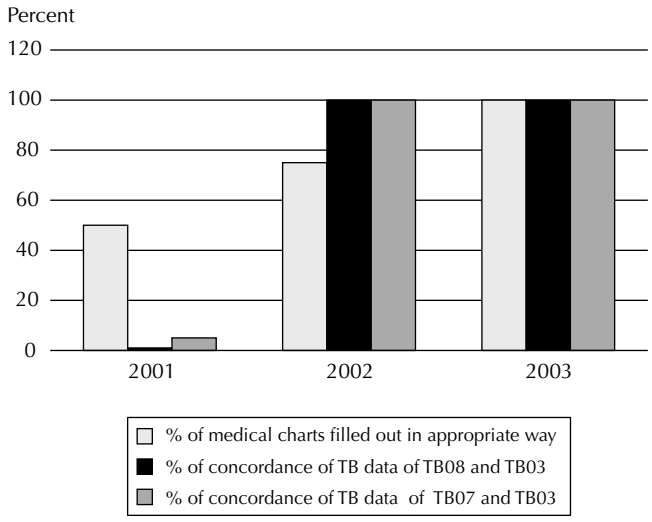


included: use of fluorography rather than microscopy, ignoring microscopy results, and failure to use a nonspecific course of treatment in cases not yet proven to be tuberculosis.

Substantial improvement was observed in the accuracy of data from the various DOTS forms, as demonstrated in Figure 8. Accurate completion rose from 50 percent in 2001 to 100 percent in 2003. This same function can be assessed by the concordance between different reporting forms. The percentage of concordance of data from TB 08 and TB 03 reporting forms rose from zero in 2001 to 100 percent in 2003. Similar concordance up to 100 percent occurred in forms TB 07 and TB 03. These good results indicate that the care providers were effectively implementing the details of treatment management as instructed during training. As already noted, accurate

Accurate records are critical to using the TB recording system as a management tool for improving the effectiveness of treatment.

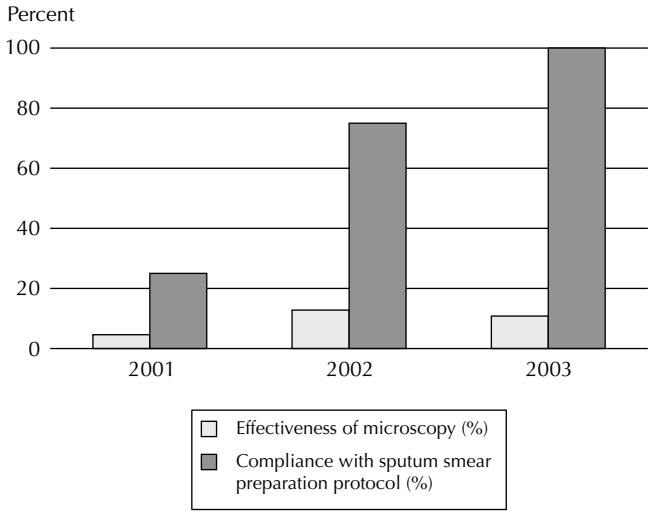
Figure 8: Accuracy of data in medical records and DOTS forms: Karaganda Oblast penitentiary system, 2001–2003



records are critical to using the TB recording system as a management tool for improving the effectiveness of treatment, hence these very positive results not only indicated the effectiveness of Project HOPE's training activities, but also allowed the management improvement activities to take place.

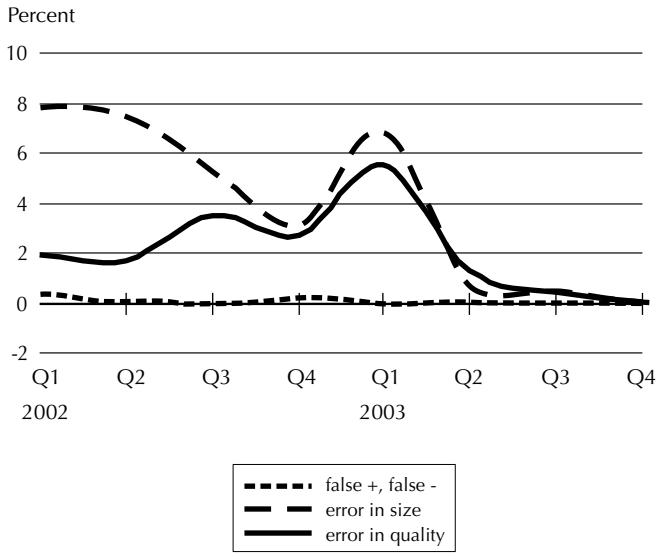
Laboratory: Due to more careful selection of the patients for diagnostic procedures (clinical screening of patients), the number of sputum smear examinations decreased from 5638 in the year 2001 to 4339 in the year 2003. At the same time the number of smear positive results in diagnostic microscopy increased from 258 cases in the year 2001 to 472 cases in the year 2003. This resulted in the percentage of positive sputa among diagnostic

Figure 9: Laboratory effectiveness and compliance with protocols: Karaganda Oblast penitentiary system, 2001–2003



sputum smear exams (effectiveness of microscopy) increasing more than twofold, from 4.6 percent in 2001 to 10.8 percent in the year 2003 (Figure 9). Greater compliance with the protocols for preparation of sputum smears facilitated these improved results.

Figure 10: Laboratory quality measures: Karaganda Oblast penitentiary system, 2002–2003



External quality control demonstrated substantial improvement as well. Figure 10 shows that the number of false positives and false-negative exams as well as mistakes in the size and quality of sputum smears prepared by the laboratories all dropped to zero in the last quarter of the year 2003.

Some data are available regarding drug resistance among the new TB cases prior to initiation of treatment. These data have been carefully checked to ensure that the sputum was collected prior to initiation of treatment and that the case was in fact new and had not previously been treated. The quality of the media and the use of clear substance TB drugs (not crushed tablets) were also checked carefully. Results appear in Table 4.

The results indicated that only 40 percent of cases exhibited complete sensitivity to the standard TB drugs. Sixty percent demonstrated resistance to

Table 4: Drug sensitivity: Karaganda Oblast penitentiary system

	Primary drug resistance	
Results of drug resistance test	**# of patients**	**% of patients**
Total number of isolates examined	112	100
Completely sensitive	45	40.2
Any resistance	67	59.8
Resistance to isoniazid and rifampin	21	18.7

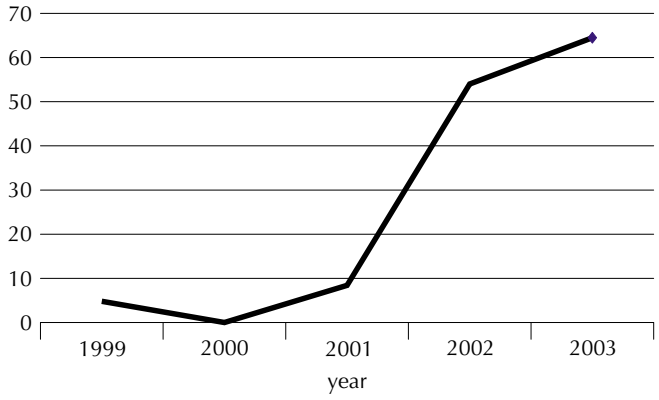
at least one anti-TB drug, and 18.7 percent showed multiple drug resistance (MDR), that is, resistance to both isoniazid and rifampin. Unfortunately, this high level of MDR-TB is not unusual for the penitentiary system. Such a high level of MDR-TB influences treatment outcome using the standard drugs, and has a major impact on the percentage of treatment failures. Further epidemiological investigations have been scheduled to trace the source of these MDR-TB cases (e.g., did they come from a pretrial facility or from one of the longer-term colonies?), and to assess the impact of MDR-TB on the observed treatment failures from the prison data.

Integration of the tuberculosis services: Two types of integration were supported by the intervention—integration of the prison and SIZO services between the Ministry of Justice and the Ministry of Internal Affairs, and integration of all the prison services with the external tuberculosis services run by the Karaganda oblast Ministry of Health. Project HOPE assessed these two processes largely through qualitative means, by observing that tools of integration were being utilized to move internal integration forward. These included coordination meetings, the appointment of specific coordinators from each Ministry, and the issuance of joint orders (prikaz).

With regard to the external integration, the integration coordinator made 12 visits to the tuberculosis hospitals within the prison system in order to

The percentage of ex-prisoner TB patients who were successfully registered in the civilian health sector for continued treatment following release from prison rose from 0 percent in the year 2000 to 65 percent in the course of 2003.

Figure 11: Percentage of ex-prisoners registered in civilian health sector for continuation of treatment after discharge from prison tuberculosis hospital



Success Factors and Lessons Learned

Effective implementation of DOTS in a prison system largely depends on the same standard approaches used in the civilian sector: 1) determining clear, correct policies covering each of the critical areas for TB control, plus flexible and responsive training in those policies, followed by active monitoring and support of those trained; 2) clearly defining responsibility and accountability for activities and for patients completing therapy; 3) emphasizing microscopy for diagnosis; 4) providing tools needed to do the job effectively (e.g., microscopes, assessment instruments, forms); 5) managing implementation quality by monitoring critical indicators, especially sputum conversion; and 6) responding to identified implementation problems with on-the-job training.

Particular aspects of the prison environment, however, demand responses specific to that environment. For example, including in the treatment process non-medical persons—guards—who can move about readily in the restricted prison environment. Other responses might include: 1) increased attention to early detection in order to reduce transmission to uninfected cellmates; 2) early assessment of drug resistance to guide treatment, especially among those who do not readily convert from positive to negative sputum and those who fail initial treatment; 3) vigorous emphasis on coordination – between units in the prison system, between ministries with overlapping jurisdictions for prisons and prisoners, and between the prison and civilian system; and 4) active social support for ex-prisoners to enable them to successfully re-enter society and successfully finish their TB treatment.

Improved collaboration was a key to success. At left, representatives from the Ministries of Health (NTBC) and Justice join Project HOPE and WHO staff during a roundtable on intermediate assessment results for the pilot project.

In addition, a number of lessons learned emerged from this project:

1. ***Flexible and responsive training:*** Project HOPE revised its training approaches, developing a new course (Quality improvement methods in TB control programs) for this program on the basis of needs and problems detected at the prisons. Training was modified even more actively from visit to visit in the 'training at work' program, which responded directly to observed issues and implementation problems. This responsive approach to training allows tailoring of program activities to the specific shortcomings or poor practices that occur in the care system. Such modifications can take place both in the curricula of more formally delivered courses, and in the types of training given during ongoing monitoring and correction of observed implementation problems.

2. ***Active monitoring of the implementation of training:*** Monitoring the results of training, identifying implementation problems, and providing ongoing support to trainees are all important. For many trainees, training alone is inadequate to bring about full mastery and implementation of new methods; no single training course can encompass the full range of problems and challenges that trainees will face in implementing new skills and methods. Intensive ongoing monitoring, with careful follow-up and support for the solution of selected problems, will overcome these deficiencies of stand-alone training.

3. ***Include all persons involved:*** Project HOPE observed that non-medical personnel were already somewhat engaged in the treatment processes. On the basis of that observation, specific training activities were developed to train prison guards in aspects of identifying suspected TB cases and in providing treatment (DOT) to confirmed cases, which they could very effectively carry out, particularly in a prison setting in which patients had limited freedom to move about. These considerations led to a critical and important innovation in the program, allowing prison guards to give and observe treatment (DOT) as well as collect sputum for microscopy using correct methods. Program implementers should be alert to the possibility for including relevant non-medical personnel in their program activities, and for providing training that will allow such participation to be effective.

   Program implementers should be alert to the possibility of including relevant non-medical personnel in their program activities, and for providing training that will allow such participation to be effective.

4. ***Clear responsibility and accountability:*** The establishment of coordinators in the various prison facilities with specific scopes of work enabled the allocation of clearly defined responsibility and accountability for results. These coordinators recognized that they were responsible for activities in the health services provided under their management. This brought about a certain degree of competition between coordinators,

which produced positive results. It also motivated the coordinators to take all of the activities seriously, and to follow up cohort analysis with active efforts to identify and solve implementation problems. Many civilian programs suffer from lack of a similar degree of clarity in responsibility and accountability. TB programs should attempt to establish systems that assign clear responsibility and accountability to individuals for effective completion of treatment by patients under their charge.

5. ***Enable medical providers:*** In addition to the incentive provided by clear responsibility, the program further enabled providers through access to effective and reliable tools to do their jobs: modern laboratory equipment, computers, communication mechanisms, gasoline for travel to monitor performance, etc. In addition, opportunities to present their work and to receive attention from authorities provided further incentive for effective work. All too often programs expect providers and managers to carry out their work effectively in the absence of adequate tools. Provision of such tools is a powerful enabler for committed professionals to do good work.

6. ***Case detection based on microscopy:*** Project HOPE was unable to completely overcome a major gap in penitentiary facilities—the emphasis on fluorography in the initial diagnosis of TB among prisoners. Use of this technique provides problems in itself; for example, it leaves no permanent film that could be checked for the reliability of the interpretation, and impedes the program if the fluorography machine is broken. For this reason, a well-functioning microscopy network with microscopic laboratories that have binocular microscopes in each peripheral colony becomes a critical element of an effective program. This network allowed for early detection of the infectious cases. This was particularly important in identifying for treatment the most serious cases and at the same time controlling tuberculosis transmission within the prison colonies, where crowded prison cells and close contacts between prisoners create a prime environment for transmission. Project HOPE concluded that the increased use of smear microscopy to detect cases played a critical role in reducing the absolute number of tuberculosis cases (who were alive and could spread infection further at any given time in the prisons).

A well-functioning microscopy network with microscopic laboratories in each peripheral colony allowed for early detection of infectious cases and was particularly important in identifying for treatment the most serious cases in the crowded prison environment.

7. ***Importance of early detection:*** A corollary to the above observation is that early detection of TB disease makes it much easier to achieve high

rates of cure as the disease can be treated when it is much less advanced and the patients' overall health conditions are much better. A side benefit is that early detection can help to reduce transmission of TB infection to any prisoners who are not yet infected. This may reduce the cases of disease among them that will occur either while they are in prison or at a later time in their lives. Investigation of contacts when a new infectious case was detected helped to identify other individuals who were infected (either recently or from many years previously); contacts could then be provided with appropriate health education, i.e., information about TB and what symptoms to look out for as signs of the development of active TB disease.

8. ***Use of smear conversion rate:*** Project HOPE introduced the indicator 'smear conversion', assessed at the end of the intensive phase of treatment, into the treatment monitoring procedures at the prisons. This provided a highly predictive early indicator of effective DOT, as well as of the possible presence of resistant organisms when conversion did not occur. The use of correlation between early smear conversion and cure rate at the end of treatment provided a powerful tool for picking up lapses in treatment procedures during the continuation phase of treatment, including when the prisoner transferred to care in the civil system.

9. ***Assessment of drug resistance:*** Because of early proactive assessment of the levels of drug resistance, the program became aware of and was able to deal with an unfortunately high level of drug resistance—a serious barrier to treatment success. The program identified several causative factors: insufficient control of drug intake (DOT) in pretrial jails (SIZOs), frequent and extended interruptions in treatment during trials, poor infection control practices such as housing apparently healthy prisoners and tuberculosis patients in the same cells, and insufficient knowledge of TB transmission among patients and other staff. A high rate of patient transfers from one facility to another or through discharge to civilian care also contributed to the rapidly rising rate of drug resistance. The program took active efforts to stop the conditions leading to the emergence of drug resistance, emphasizing in particular the role of carefully implemented DOTS using standard drug regimens (not second line drugs).

10. ***Improving inter-ministerial coordination:*** The designation of separate jurisdictions for the Ministry of Justice and the Ministry of Internal Affairs, responsible for the prisons and the pretrial facilities respectively, presented a major challenge to working in the prison system. This study described the role of clearly defined coordinators in facilitating communications and the specific attention to movement of individual patients that were both necessary to overcome problems associated with these overlapping jurisdictions. As the program was coming to a close, we were informed that a decision had been made to transfer responsibility for pretrial facilities to the Ministry of Justice. This should reduce the communication barriers and improve implementation of TB control in this mixture of facility types.

11. ***Civilian integration coordination:*** Project HOPE recognizes that there currently exists no formally defined personnel slot for the critical position of civilian integration coordinator. This problem will

significantly hamper the sustainability of the good results obtained in the program with regard to transfer of prisoners from prison care to civilian care. Project HOPE has strongly recommended that a permanent institutional employment position be created for this function.

12. ***Social support for ex-prisoners:*** Project HOPE quickly realized, through input from the integration coordinator for transfer of prisoners, that prisoners returning to civilian society frequently require significant social support to enable reentry, as do their families. While many TB patients require social support to enable them to continue treatment, this need is particularly severe for former prisoners. In this program, the civilian integration coordinator was able to provide some support for these prisoners as they entered civilian society. Thus for this reason as well, creating a permanent position to take on the functions of the integration coordinator is important to ensure the sustainability of the program's good results.

13. ***Improved monitoring and supervision:*** It seems clear that improvements in the frequency and regularity of monitoring and supervision, as well as in the procedures carried out during such visits, were important in bringing about the documented improvements in the treatment processes. The old system of curator visits had problems with both the frequency and content of monitoring: irregular and widely spaced visits and a lack of clearly defined details for observation during a visit. Project HOPE has found in this prison-based program, as well as its national TB programs in Central Asia, that monitoring and supervision carried out with well-designed objective checklists facilitates comprehensive and effective inputs to the treatment process. In this program, that the improvements in the checklist indicators corresponded to simultaneous improvements in the major program outcome indicators provides strong evidence of the usefulness of the checklists. The quantitative method based on the checklists allowed local medical providers to assess themselves effectively, in conjunction with the assessments made by monitors. The objective indicators also allowed for specific planning of activities and interventions in response to objectively identified problems.

Conclusion

The Karaganda Prison TB program demonstrated the effectiveness of detailed and careful implementation of standard DOTS in a closed system of prison facilities. While some unusual features inherent in the prison system required adaptation of standard approaches to address them, overall this program demonstrated that careful attention to the basic principles of DOTS could produce dramatic improvements in treatment success whatever the setting. Proven approaches in the civilian sector include clear, correct policy for TB control and case management; flexible and responsive training followed by active monitoring and support; clear articulation of responsibility and accountability for activities and for patients completing therapy; emphasis on microscopy for diagnosis with adequate tools provided; and active management of quality using critical indicators with appropriate response to implementation issues as identified.

The specific approaches used in this effort to adapt DOTS to the Karaganda prison setting should prove useful in prison settings in other countries and health systems. Successful adaptations included integrating non-medical persons (guards) into the treatment process; vigorous emphasis on coordination among ministries with overlapping jurisdictions for prisons and the civilian sector; and active social support for ex-prisoners needing to continue treatment. The interface between the prison and civilian systems will always be a challenge for tuberculosis control program implementers. Careful attention to reducing the possibility of transmission of tubercle bacteria from tuberculosis cases to healthy prisoners should reduce TB infections and ultimately reduce the number of new cases among the incarcerated. Finally, improvements in treatment resulted in higher rates of cure for those ill with TB while in prison and on release.