HARVARD MEDICAL SCHOOL
BRIGHAM AND WOMEN'S HOSPITAL

CASES IN GLOBAL HEALTH DELIVERY

GHD-002
APRIL 2011

The Peruvian National Tuberculosis Control Program

As the end of 1997 drew near, Pedro Suarez, director of Peru's Tuberculosis (TB) Control Program, began preparing for the annual National Tuberculosis Control Program (NTP) meeting and program evaluation. Suarez had accepted the position of director in 1990 as a young, local-level physician motivated to serve his country. He had worked hard to overhaul TB care quickly, bringing in resources and new energy. With his team, he built a strong national program in the midst of widespread economic struggles and health sector reform. The NTP offered directly observed, standardized, short course therapy (DOTS) to all TB patients for free. The World Health Organization (WHO) recognized the TB program as a model by 1994.

In 1995 WHO encouraged Suarez to offer additional treatments beyond a single regimen. The additional treatments were more complex, more costly, and somewhat controversial. By 1997 several regimens had been added for different patient groups. Suarez had to decide how he would address the small percentage of patients who continued to fail the program's treatment protocols. Though the national meeting was normally a time to reinvigorate those working in the program, Suarez was unsure what the message would be that year and whether he could forge a consensus among the country's physicians about how to move forward.

Overview of Peru

Located in western South America, Peru was bordered by the South Pacific between Chile and Ecuador, neighboring Colombia, Brazil, and Bolivia to the east (see **Exhibit 1** for map). It was divided into 24 regional administrative departments, 192 provinces, and 1,828 districts.

Peru's ethnic composition was 45% Amerindian, 37% mestizo (mixed Amerindian and white), 15% white, and 3% other ethnicities. Eighty-one percent of Peruvians identified themselves as Roman Catholic. About 11% of Peruvians lived in the jungle region and 22% in the highlands.[1] Eight percent of Peruvians worked in agriculture, 54% in service, and 21% in industry.[2]

Julie Rosenberg, Joseph Rhatigan, and Jim Yong Kim prepared this case for the purposes of classroom discussion rather than to illustrate either effective or ineffective health care delivery practice.

In 1997 Peru had 10.2% unemployment and 50.8% underemployment. Gross Domestic Product (GDP) remained relatively stable. Twenty percent of the population controlled over 54% of the national income.[3] There were 7,000 *comedores populares* (soup kitchens) in poor urban communities by the mid-1990s,[4] and over 50% of families received food aid from the government. Forty eight percent of homes had sewage disposal, and 67% had electricity.

Thirty-three percent of the population was under 15 years old.

Basic Socioeconomic and Demographic Indicators [1]

INDICATOR		YEAR
UN Human Development Index ranking	80 out of 174	1997
Population (thousands)	23,943	1995
Urban population (%)	77	1995
Drinking water coverage (%)	75	1990
Poverty rate (% living under USD 1.25 per day)	9	1996
Gini index	46	1996
GDP per capita in PPP (constant 2005 international dollar)	5,604.00	1997
GDP per capita in constant 2000 USD	2,083.00	1997
Literacy (total, female, male)	87.2, 81.7, 92.9	1993

History

The Incan Empire, the largest empire in pre-Columbian America, ruled Peru until 1532 when Spanish conquistadores, led by Francisco Pizarro, defeated and executed Emperor Atahualpa. Within a century, Peru's population declined by 80% due to forced labor, malnutrition, and the introduction of diseases such as smallpox and measles. An uprising of landowners, led by Simon Bolívar and José de San Martin, led to Peruvian independence in 1821.[5] Political instability plagued Peru over the next century as military leaders struggled for power. After 20 years of dictatorship, the first free election was held in 1945. Power changed hands quickly over the next decades with a series of coups and civilian revolutions. The country had 18 presidents in the first half of the twentieth century.

By the 1980s Peru faced considerable external debt, ever-growing inflation, a surge in drug trafficking, and massive political violence. During this period, a Maoist guerrilla movement, *Sendero Luminoso* (Shining Path), became increasingly active, launching attacks against villages and small towns. The armed forces and police reacted with widespread and undifferentiated repression. In July 1985 Alan García Pérez won the presidential election on a populist platform with promises to improve conditions and stop the violence. He also promised that no more than 10% of Peru's income from exports would go towards servicing the USD 12 billion external debt.[6] In time, however, García's image became tarnished, corruption grew, and the situation worsened as guerrilla violence increased and inflation soared.[7]

As inflation reached 3,000% per year, Peru elected Alberto Fujimori to replace Garcia in 1990. Fujimori promised to end the violence and institute economic policies sensitive to the poor.[6,8] One of Fujimori's first meetings was with officials from the International Monetary Fund (IMF), the World Bank, and other international institutions. Fujimori decided that IMF and World Bank help was Peru's best option for

[1] This data was comprised from the following sources: UN, UNICEF, World Bank, UNESCO.

recovery. The government quickly enacted a structural adjustment program with drastic economic reforms aimed at reducing Peru's budget to pay back its external debt. The government slashed food and fuel support, devalued the currency, caused a deliberate recession, and implemented a 14% sales tax on all domestic purchases. Government-owned industries, including telecommunications, fisheries, banks, factories, and mining, were sold to increase cash holdings. Health coverage was privatized as well, and many previously employed by the state lost their employer-sponsored health insurance. The cost of health care increased 8,400% as the number of "poor" people rose from 7 million to 12 million.[6] These policies in Peru became known as "Fujishock," and they disproportionately affected the poor.[6]

The *Sendero Luminoso's* strong presence in rural areas and the shifting job market had forced many citizens living in small provinces to move to the city out of fear and hunger. Families hacked out level plots further and further up the rocky hillsides on the outskirts of Lima, saturating the shantytowns with straw and cardboard dwellings. While the density of Metropolitan Lima was one person per hectare, the density of the Northern Cone on the outskirts of the city was 140 per hectare.[9] A 1991 law gave legal status to *rondas* (citizen-led self-defense groups) throughout the country, and the military armed them with shotguns. There were eventually over 7,000 *rondas*.[10]

Citing the continuing terrorism, drug trafficking, and corruption, Fujimori dissolved Congress and suspended the constitution in April 1992.[11] In September 1992 police captured *Sendero Luminoso* leader Abmael Guzmán, calming guerilla activity. Estimates of deaths attributable to the 20-year internal conflict reached as high as 77,000.[10] In 1993 Fujimori amended the constitution to allow himself to serve as President for consecutive terms, and he was re-elected in 1995.[7] By the end of that year, external debt was estimated at USD 32 billion.[12]

Health in Peru

The five leading causes of death in 1998 were acute respiratory infection (16.3%), intestinal infectious diseases (7.7%), diseases of pulmonary circulation and other forms of heart disease (5.4%), tuberculosis (5.0%), and cerebrovascular disease (4.0%; see **Exhibit 2** for top causes of mortality).[13]

Health System

The *Ministerio de Salud* (MINSA; Ministry of Health) was the regulatory entity of the health sector. MINSA provided 81% of the health infrastructure in the country, including 54% of hospital beds and 87% of all primary care services.[13, 14] Patients accessed primary care services through a network of health centers, each of which had a physician on staff and a pharmacy, as well as through smaller health posts staffed by nurses with occasional physician visits and limited pharmacies. Health posts triaged complex cases to health centers or hospitals. Hospitals preformed all complex procedures and provided inpatient services. MINSA provided some services, such as vaccinations and TB care, free of charge, and had nominal fees that could be waived through an application process for others.

In addition to MINSA, the public health care sector included the social security system, *EsSalud*. All employers paid 9% of their payroll to the state for *EsSalud* coverage for employees and their dependents. *EsSalud* members could access services exclusively in *EsSalud* facilities free of charge. Starting in 1993, employees could opt out of *EsSalud* coverage in favor of private providers that charged co-payments. Employers continued to pay 6.75% of payroll to *EsSalud* even when using alternative insurance. *EsSalud* services were primarily hospital-based and concentrated in urban areas. Those without coverage could not utilize the facilities.

Additional public health care providers included the health services of the armed forces and the police. The public sector accounted for 99% of the health posts in 1997. Three-quarters of the population went to a public sector facility for medical attention, with around 10% relying on private health providers (see **Exhibit 3** for quantitative data about health service delivery and organization in Peru). More urban residents than rural residents relied on private providers. The richest 20% of the population spent four times as much on health services as the poorest 20% of the population.[15]

The guerilla warfare of the 1980s destroyed many of the rural health centers. The government began rebuilding them after international press showcased a three-year-old boy who had contracted the last case of polio in the Americas due to lack of childhood immunization and health center access.[16] Social security coverage decreased from 40.7% of the economically active population in 1987 to 23.4% by 1995.[3] Of those who reported having disease symptoms or an injury, 58% failed to seek medical attention in 1997 (51% of the urban population and 69% of the rural population); in 65% of these cases, the reason cited for not seeking care was a lack of economic resources.[13] The health disparity between the rural and the urban populations was great. The risk of dying was three times higher in Huancavelica, a rural district (13.0 per 1,000), than in El Callao, near Lima (3.6 per 1,000). There was a 21-year difference in life expectancy between the districts: 56.8 years in Huancavelica and 78.0 years in El Callao.[3]

El Instituto Nacional de Estadística e Informática (INEI; the National Institute of Statistics and Information) performed national data collection and analysis. Each facility processed information on morbidity from outpatient care and hospitalizations and sent it to a central facility periodically. MINSA was responsible for processing mortality information. It was estimated that nearly 50% of deaths in Peru went unregistered.[13]

Health System and Epidemiologic Indicators [2]

INDICATOR		YEAR
Average life expectancy at birth (total, female, male)	72, 74, 70	2000
Maternal mortality ratio (per 100,000 live births)	240	2005
Under five mortality rate (per 1,000 live births)	58	1995
Infant mortality rate (per 1,000 live births)	48	1995
Vaccination rates (% of DTP3 coverage)	90	1997
Undernourished (%)	20	1996
Adult (15-49 years) HIV prevalence (per 100,000)	480	2005
HIV antiretroviral therapy coverage (%)	42	2006
Tuberculosis prevalence (per 100,000)	324	1997
DOTS coverage (%)	100	1997
Malaria cases (per 1,000)	8	2006
Government expenditure on health as a % of total government expenditure	11.3	1997
Government expenditure on health per capita (international dollar, USD)	134, 57	2000
Total health expenditure per capita (international dollar, USD)	229, 96	2000

[2] This data was comprised from the following sources: WHO, UNICEF, UN.

INDICATOR		YEAR
Physician density (per 10,000)	12	1999
Nursing and midwifery density (per 10,000)	7	1999
Number of hospital beds (per 10,000)	9	2004

Tuberculosis in Peru

From 1980 to 1985, MINSA diagnosed 129,498 cases of TB (see **Exhibit 4** for information about TB and **Exhibit 5** for more on TB cases diagnosed and treated over time). In 1981 and 1982 fewer than 25% of people diagnosed with TB received treatment. In 1983 TB was the fifth-leading cause of death in the country,[4] and some estimated that it was the top killer among 15 to 44 year olds.[17] At best, only 60% of those who received treatment were cured (see **Exhibit 6** for TB mortality in Peru over time). Of those initiating treatment, up to 47% abandoned treatment prior to completing the six-month regimen.[18] Through the 1980s, Peru was one of the 20 countries with the highest TB burden in the world.

By 1990 the national incidence was 175.9 per 100,000 people, higher than rates seen in the 1960s.[19] Morbidity was estimated at 190.6 per 100,000 people. In 1991, 42,763 cases were identified. Incidence was down to 173.1 per 100,000 that year, and 94.1% of all cases were pulmonary cases; over half were smear positive. The age group most affected by the disease was 15 to 44 year olds, and 48% of all registered cases were in Lima and nearby urban Callao. Of patients receiving treatment between July and December of 1991, 78% were declared cured, 3.8% failed treatment, 11.3% abandoned treatment, 2.8% transferred sites without confirmation, and 4.1% died. Incidence was recorded as 243.2 per 100,000 people in 1992 and steadily declined over the next five years to 158 per 100,000 by 1997.[20] The annual risk for TB infection in children ages five to six fell from 2.0-2.5% at the beginning of the 1990s to 0.9% in 1997. The gap between cases detected and cases treated diminished as well.[21] Treatment abandonment rates fell to 3.7% by 1997 (see **Exhibit 7** for patient outcomes). Though Peru's epidemic was brought under control, the country remained disproportionately affected by the disease as compared to surrounding countries (see **Exhibit 8** for comparison).

Tuberculosis Treatment and Policy

History of International Policy

The first medication for TB became available in 1943, and there were four drugs available by 1957. Standard treatment at that time was 18 months, but the number of different drug combinations, treatment durations, medication administration techniques and dosing schedules used by various countries and doctors was considerable. Projects in Tanzania and Mozambique demonstrated the effectiveness of a novel six-month treatment in the late 1970s and early 1980s, which led many to adopt short-course regimens.[22] In the mid-1980s the World Bank studied the cost effectiveness of TB treatment and determined that it was necessary to address TB aggressively. In 1989 WHO appointed Dr. Arata Kochi as head of the WHO TB unit to revamp its TB control efforts.[23] Beginning that year, the World Bank became the single largest source of funding for TB control programs in developing countries. In 1991 WHO and the World Bank announced that "in terms of costs per death averted and per year of life saved, chemotherapy for smear-positive TB is the cheapest health intervention available in developing countries,"[24] and WHO endorsed short course chemotherapy (see **Exhibit 9** for a summary of WHO treatment recommendations). In 1993 WHO went so

far as to declare TB a "global emergency" and set a goal of 70% case detection and 85% cure rates worldwide.

History of Tuberculosis in Peru

The first group of physicians interested in addressing TB in Peru united in 1930.[25] In 1940 the government established the National Anti-Tuberculosis Service. BCG vaccinations for children under 15 years old were deemed mandatory in 1943.[21] By the 1960s isoniazid (INH) and streptomycin (SM) had been introduced in the country for TB treatment, and by 1978 RIF and pyrazinamide (PZA) were introduced as well.

The country introduced a 12-month treatment regimen in 1980 that included daily supervised administration for two months, followed by daily self-administered medication or twice-weekly supervised medication.[26] A similar regimen of eight months soon replaced the 12-month regimen. Research studies were unable to present validated outcomes of the two regimens given the poor data management and rates of treatment abandonment.

Of those diagnosed with TB between 1980 and 1985, only 30% initiated any treatment.[21] Of those who initiated, 41% dropped out.[21, 26] All treatment was self-administered by the end of the period.[27]

Throughout the 1980s, two or three national-level TB program employees were responsible for overseeing all 24 departmental programs as well as ordering medications and supplies. Each department had a TB coordinator responsible for communication, for overseeing the program in the region, and for province-level human resource management. Most coordinators had other responsibilities in addition to those of the TB Control Program. There was minimal communication between the central, departmental, and provincial levels.

During the 1980s, three-quarters of all local health facilities did not offer TB treatment. When patients presented to health centers not participating in the national TB program with signs of the disease, they were referred to the district hospitals. Hospitals were also responsible for admitting TB patients too sick to remain at home. Hospitals were not under the jurisdiction of the national TB program and were often filled beyond their capacity. A few hospitals did sputum smears, and *El Instituto Nacional de Salud* (INS; the National Institute of Health) offered cultures and smears in a limited number of labs.

Local health centers offering TB care used handwritten medical charts and were responsible for developing any tracking forms they wanted to use. There was no central record system for TB. Centers that offered TB care offered it free of charge. When centers ran out of medication, physicians would write prescriptions for patients to purchase TB medications at commercial pharmacies. If patients could not afford a full prescription, pharmacies dispensed as many pills as the patients could afford. There were no TB infection-control measures in the health centers, and doctors knew they were at risk when caring for patients. Some local health centers took initiative to involve non-governmental organizations in obtaining nutritional support for patients in their district. Food support was not part of the national program.

A WHO mission to a Peruvian laboratory donated 1,000 sputum cups in 1989. The sputum cups ran out by 1990. That year the TB program was completely bankrupt. Those in MINSA focused their conversations on the lack of resources and blamed finances for the state of the epidemic. Cesar Bonilla, a pulmonologist at a Lima hospital, recalled, "TB wasn't really seen as an emergency in the daily work of most health workers. Many had a fatalistic view – believing that TB couldn't be cured as long as poverty persists – so what's the point of trying?"[7] People with very poor professional skills and a limited professional profile were usually sent to work with the TB Control Program. "The TB Control Program was the losing team," a physician

working at the local level said. The national government was focusing on primary care as the World Bank and others pushed for health sector reform.

Pedro Guillermo Suarez

Pedro Guillermo Suarez went to college and attended medical school at the *Universidad Mayor de San Marcos*, a public university in Lima. He worked during school selling and renting cars and then ran his own publishing business while completing medical school.

Upon graduation, he was placed in the largest health center in Lima, located in *Lima Norte (*Northern Lima). Suarez saw 50 patients per day, and the director of the center asked Suarez to manage the TB Program and the Maternal and Infant Health Program at the center on a voluntary basis. He engaged the town council, local nongovernmental organizations, and community organizations, including the government-sponsored nutritional program for children, *Vaso de Leche,* and the *comedores populares*, to improve the health of children, and he organized community vaccine campaigns. Because resources for TB were scarce, his role as TB Program manager was more challenging than his many other roles. The health center used small, empty drug bottles for sputum sample collection and treated over 200 TB patients per year.

The poor conditions offered to the patients, the quality of treatment, and the profound limitations in implementing basic services inspired Suarez to go back to school for public health. He completed a degree in management training and public health and became a professor. For six years he also continued his work in the health center in Northern Lima.

Suarez obtained feedback and ideas on how to manage the TB Program from his colleagues in the private sector and at the university. Professors of epidemiology, political health, bioethics, sociology, and management got together to discuss the situation. "It was like a puzzle, trying to match the ideas of people in big corporations with the ideas of people in public health with the ideas of managers. If you could put all the ideas in the right position, you could implement them," Suarez said.

As the 1990 presidential elections drew near, Suarez was invited by his former professor who had become Commissioner of Health to serve on a health advisory group for candidate Alberto Fujimori. When Fujimori won the election, many of the young advisors were invited to take formal positions. Suarez decided to direct the NTP.

The New National TB Program in Peru

In August 1990 Suarez assumed his position as director of the NTP. Fujimori's administration offered early retirement incentives to experienced government workers. Thousands of long-time employees left the government, including most department-level TB directors. Suarez was given a desk, six chairs, an old phone, a four-page document with basic information about TB, and a typewriter.

"We are broken," Suarez told the Minister of Health. "We have no money. Our budget can only treat 100 patients, and we have thousands." Suarez had the support of the Minister of Health but was competing with other health programs such as malaria, immunizations, and HIV/AIDS for limited funding.

The Association of Patients with TB (ASET), an advocacy group established in 1976, was angered by the lack of funding for TB treatment. As soon as the new administration took office, ASET, along with a sympathetic local nun, organized protests against the decision to cut TB funding. ASET was featured on the front page of local and national papers, and Suarez took the stories to government officials. "TB is not only a

public health problem; it's a social and political problem," he told them. A recent cholera epidemic linked to poor sanitation and living conditions had gained negative international press for the Peruvian government.[4] According to one program official, Fujimori was motivated to "give the impression internationally that he was concerned about poverty and health." Money from *Fondo de Cooperación para el Desarrollo Social* (FONCODES; Peru's Cooperative Fund for Social Development), aimed at fighting poverty, was earmarked for the NTP.

Human resources from local health centers were leveraged to support the national program. Suarez used contacts at professional membership associations – the Association of Social Workers, the Association of Nurses, and the Medical Association – to advertise positions with the NTP. Hundreds of resumes from local health workers poured in for the national positions. While the NTP did not offer as much money as the private sector or a substantial increase in salary for government employees, the positions represented an opportunity for those at the local level to gain job security. Suarez looked for people who met three conditions: un-bureaucratic, able to work well with others, and highly motivated. To each applicant who met these criteria, he asked one question: "Why do you want this job?" He hired three candidates—a social worker, a nurse, and a physician—to become assistant directors of the NTP. They had told Suarez that they wanted the job because they wanted to serve their country. The social worker was responsible for community and familial issues; the nurse was responsible for data-collection systems, administrative logistics, and drug procurement; and the doctor was responsible for diagnostics, including setting up the laboratory network. The team worked from 8 a.m. until 11 p.m. daily. Their salaries continued to come from the local health centers where they had been employed prior to joining the national team. Suarez had obtained MINSA's approval to use local monies at the national level because he had no budget for adding staff.

Departmental-level TB Control Program coordinators were selected to work within each department's Ministry of Health on TB activities, using criteria similar to those used at the national level. The new coordinators were primarily young nurses and physicians who replaced the large cohort that had taken early retirement. They appointed the coordinators for province- and district-level programs. Many local-level health workers were hired on a contract basis to fill the roles of early retirees as well. Their contracts were renewed every three or six months if they performed well, as measured by standard program data on case detection, cure rates, and compliance, as well as reviews from their supervisors.

In November 1990 Suarez invited all the health officials working for the NTP at the departmental and intermediate (district) level to a two-day meeting in Lima. He explained:

> It was our first contact with the people who worked at the intermediate level. We asked everyone to just come and share their information. We wanted to see the epidemiological and operational information. We knew we wouldn't be able to reach everyone or get one agreement, but we just wanted to hear about what people wanted and where they were.

Doctors from every department and most provinces came to see the fresh young national leaders. "At the end of the two days, we saw that every person at the intermediate level had a different approach," Suarez said. When they arrived, the doctors were all using case definitions differently. There was no agreement on what it meant to be a "treatment failure," "case relapse," or "to abandon treatment." But, by the end of the meeting, "We felt there was finally a consensus that TB could be cured," Suarez said.[4]

Half of Suarez's time was spent in the field, assessing the situation and getting to know every district of the country. Local health workers demanded support during his visits. "We are looking for a solution, but you must participate in the process," Suarez told them. Suarez requested that MINSA support the installation of uniform TB control standards across all health facilities. He advocated for space dedicated only to TB patients in every local health center and hospital to promote infection control.

The Pan American Health Organization (PAHO), an affiliate of WHO, supported the Peruvian NTP. Suarez recalled:

> The first time that PAHO doctor Alvaro Yañez came to Peru, I remember he asked me what I wanted to do. I said, "We need to find a solution for the problem." He then asked, "What kind of advice and support do you want?" And I said, "I want real advice and support, not bureaucratic advice and support – not the typical international-style advice, that you stayed, spent three or four days and made a nice report to put on the desk." I also said I wanted to have a consistent and open relationship. He said, "Okay, we'll work on it."

From that day on, Yañez visited at least every two months to help Suarez develop a program that would meet international guidelines. He provided ideas for the NTP guidelines, primarily in the way of technical guidance.

The physician Assistant Director, Jaime Portocarrero Celiz, immediately began working on the laboratory diagnostic capacity for TB with PAHO laboratory expert, Dr. Pedro Valenzuela. "We didn't have any criteria to make any decisions at first," Suarez said. The NTP worked closely with labs to help them improve smear microscopy quality while aiding several labs in developing the ability to perform cultures and drug susceptibility testing (see **Exhibit 10** for growth of MINSA TB facilities by year). Lab technicians became more precise in their methods, and the accuracy of routine tests done by INS improved. Labs became certified in many new tests after working with the NTP. Suarez helped oversee the selection of the labs as well as the construction of new labs in many districts. As he explained, "I'm not an expert, but it was common sense. We provided more technical and management decisions than details. We had to support the local people. We built the teams, we provided leadership, we provided the guidelines, but we believed in the capacity of the people to make good decisions."

A second short-term consultant from PAHO, Dr. Ramón Cruz, helped develop the reporting system, the forms, and the data collection system. "We … designed things with them to meet our needs. It was a good working relationship. They told us what to do, and we had to figure out how to do it," Suarez said. PAHO also worked with the NTP's nurse assistant directors, Doris Velasquez (1990 to 1994) and Edith Alarcon (starting in 1994), to improve the national drug purchasing and procurement system that department coordinators carried out after it was implemented.

The National TB Guidelines

The NTP developed its first set of guidelines with assistance from PAHO as well as with input from numerous Peruvian groups including physicians, universities, national associations, and nonprofits. The 45-page document had large print, pictures, and diagrams, and it focused on delivering the agreed-upon treatment, especially to the poor. The document defined the responsibilities of everyone involved and which activities would be conducted at each level to prevent, diagnose, detect, and treat TB (see **Exhibit 11** for guideline table of contents).

The guidelines were ready for dissemination in April 1991, around the time that drug procurement mechanisms were secured. The NTP disseminated them over several months through training sessions. PAHO had recommended a small pilot project before making the program national, but the team decided to roll it out nationally.

The NTP directors and the central team spent three days per week in Lima and three days per week in the field, training the TB Control Program team members and conducting Training of the Trainer (TOT) sessions for 50 to 100 people. The agenda for every session was standard. The first day consisted of a presentation on the new program, the guidelines, and how to record data; the next day was a session on how to train the smaller, local team in implementing the guidelines; and the third day was spent allowing

smaller health center teams to discuss how they would implement the new program in their facilities. Lab managers, social workers, physicians, and nurses who would be part of the TB Control Program participated in the sessions. Suarez hoped that bringing them all together would enhance teamwork and help each person define his or her specific role. Because most of the health workers had responsibilities in addition to TB, they had to be motivated to treat TB. The national team worked to make people feel proud to be part of the program and to make them feel they had ownership. Suarez explained:

> The idea was simple: now you have the materials and now you can go ahead. Everything was ready at once. Usually people go district-by-district or step-by-step, but we had decided to implement the program across the country with one clear message: the responsibility to implement the program is your responsibility.

After completing training, coordinators received the new NTP "package" that included patient tracking and other centralized data forms. The national team conducted the departmental trainings together and broke up to support the smaller trainings at the district level, conducting them with the departmental coordinators. Suarez remembered, "There were some people with different ideas, but we sent a clear message: We are a public health program, and we must implement a national standard."

The Program Structure

The NTP leadership made technical, social, and political management decisions. It advocated for the program and made sure local human resource, financial, and technical needs were met. Finally, it provided guidance in training, coordination, and evaluation. The regional teams included a doctor, a nurse, a social worker, a trainer, a nutritionist, a lab technician, a nurse technician, and a logistics coordinator. Their functions were to carry out the national strategy in their regions; to manage the social and technical aspects of the program; to implement regular program evaluations; to supervise diagnostics and other local activities; to train community personnel; to ensure distribution of supplies (e.g., sputum collection containers, treatment enrollment triplicate forms from the national level); to contribute to the development of the local health system; and to be accountable for the operations and activities at lower levels in their regions. The directors of local health facilities —health posts, health centers, or hospitals—led the local teams. Health centers were responsible for managing the social aspects of the program, evaluating the program monthly and annually, providing case notification and technical and logistical help, strengthening the health system, and being accountable to the community and patients for developing comprehensive action plans. Hospitals were responsible for differentiating between extrapulmonary and pulmonary TB cases, detecting smear-negative cases, admitting those too sick to remain at home, coordinating the laboratory network, and notifying local jurisdictions of cases in their catchment area.

Suarez created subcommittees composed of representatives from hospitals, field sites, and various levels of government to address specific aspects of the NTP. Iván Sabogal, a national lab expert, Demetrio Molero, a bioethics and pharmacovigilance specialist, and Cesar Bonilla, a pulmonologist, contributed to subcommittees in their areas of expertise, to the annual report, and to the development of the NTP. The subcommittees opened up channels of communication between the interest groups they represented and the central NTP management.

Every Thursday from 9 a.m. to 1 p.m. Suarez's office door was open. Anyone working in the NTP could come discuss concerns, issues, or complaints. The first session had twelve participants, and the open sessions grew to mandate a larger conference room in the Ministry of Public Health. PAHO remained closely involved with the NTP and helped resolve any technical issues that Suarez could not adequately address, including how to classify patients and define cases. Though there were always some who disagreed with national or management decisions, Suarez reiterated that the NTP was a public health

program and that everyone must act together. As long as there was consensus, Suarez considered the decisions final.

Local Activities

Community organizations and social workers aimed to help people understand TB and change their attitudes about the sick through workshops and outreach. They aimed to shift the blame from the patients to poverty and social injustices. They referred people with cough and phlegm for more than 15 days as well as their family members to health posts for smear inspection (see **Exhibit 12** for number of smears done per case detected over time). All TB patient contacts under five years old received chemoprophylaxis of INH for six months. The immunization and vaccination program was responsible for BCG vaccinations, which all children were required to get at birth. Local health centers had to coordinate the sputum collection, culture preparation, and transport to the appropriate lab depending on the testing needed. Every patient had two sputum samples tested to confirm a clinical diagnosis. The laboratory network that did the testing was part of the INS. The NTP relied on doctors to identify the cases that were smear negative and extrapulmonary – about 30% of cases -- and other health workers were trained to complete diagnostic tasks for smear-positive cases.

Once a case was confirmed, the health center coordinated a home visit to ensure that the patient was residing in the jurisdiction he or she claimed. As some health centers gained better reputations, this became increasingly relevant. Nurses and social workers were responsible for returning to the patients' homes when they failed to attend the centers for their medication.

The NTP developed mechanisms to support patient-organized micro-enterprises, workshops, and occupational trainings to align with the FONCODES mission. It initiated agreements between the Ministry of Human Resources, city governments, and other institutions that would support patient activities. When patients were employed at the time of diagnoses, the NTP provided legal support to ensure that their rights were not violated.

Treatment

The NTP guidelines prescribed all patients the same treatment, *esquema único* (unique regimen), that lasted for six months and was divided into two phases: two months with four recommended drugs, including ethambutol (EMB) and pyrazinamide (PZA), followed by four months with only isoniazid (INH) and rifampin (RIF; see **Exhibit 13** for more on treatment regimens over time). At a minimum, patients received three medical and nursing consultations: initiating treatment, completing the first phase of treatment, and finishing the complete treatment. If patients experienced adverse events or if their conditions worsened, they received additional medical attention, including home visits by doctors who understood it was part of their responsibility to attend sick patients in their homes.

Those who failed treatment – defined as those who finished treatment with a positive smear (see **Exhibit 14** for treatment definitions) – were given *retratamiento* (retreatment regimen), which was not predefined or specific. Each region had a doctor assigned to assess failure cases and determine the course for these patients. A national director of consults was also assigned to address any questions from the field that arose around this issue. He was given a mailing address, phone, fax, and radio to reply to correspondence. The NTP mandated that the national director of consults work closely with the field doctors when needed. The national guidelines defined severe and minor adverse events, and doctors had instructions on how to proceed in each case. The 1992 NTP report acknowledged that resistance could occur through various means, including "inadequate drug regimens, abandonment, inadequate dosing, treatment

irregularity, unavailability of the needed quantity of medications, insufficient training of program personnel, self-medication, or drug addiction." The report stated, "Treatment failures should not occur because with an efficient control program, it is easier to avoid them than to cure them."[28]

If TB patients went to a private practitioner, they were almost always transferred to a MINSA facility. The number of people able to afford private practice was limited, and most TB patients were unable to pay privately for the full course of TB treatment. Private practitioners often supplemented their income by working part time in the public sector, so they were well connected to the local health facilities. Local health workers contacted private physicians who were treating TB patients when they found out private treatments were occurring. Treating a TB patient privately could jeopardize a physician's standing if he or she was also employed by MINSA given the known strength and efforts of the new NTP.

Information Management

For every person newly diagnosed with TB, a "case notification card" was created on a triplicate form. This was the method for documenting new cases. Local health facilities had to send a copy to the appropriate jurisdiction. Once enrolled, an attendance card and a medication administration card were also created for the patient. Health workers used this intricate system of patient identification cards to track each patient's progress and attendance. The national-level administration stocked copies of all data and registration forms. Health workers recorded treatment failures and patients who abandoned treatment in the local registry book, but their case notification cards were not included in the regional notification reports.

Health facilities collected and analyzed epidemiological data every trimester; districts and the central program, every semester. They checked data for accuracy and to ensure they were realistic. Each health facility also provided an annual report to the district-level manager with its programmatic accomplishments and goals. National goals for each program area were 100% cure, diagnosis, and training coverage; zero duplicate reporting; and adequate supervision at every level.

The NTP held a National Evaluation Seminar for health workers every February and August to showcase accomplishments and discuss barriers. Every health center was encouraged to compare its epidemiological indicators with other health facility indicators and the national averages. The districts were very competitive with one another, and there were loud cheers when each region's numbers were announced. Hundreds of people attended every meeting, which ended with the release of new goals and records. The meeting in February contributed to a comprehensive report. The report contained all the statistics that each center had collected, analysis, new research, information, and program goals. After several years, the report spanned over 300 pages. The NTP always released the report in time for World TB Day. All health centers, all directors at the local and national levels, and all directors at other health facilities—including private sector, army, and social security facilities—received copies of the report, as did WHO, PAHO, universities, and public libraries.

Working for the Health System

Working for the TB control program became professionally respected. As patient volume grew and treatment became more efficient and widely available, an increasingly large percentage of health services were geared toward TB control. Every health center with a TB control program had a space dedicated solely to TB with a desk and a window. Offices were refurbished. "We tried to improve working conditions," Suarez said. "It makes a big difference."

If a district or center showed good results, the local TB control team was recognized. Many health center coordinators were promoted to district coordinator roles, and district coordinators moved up to

coordinate departments. Working in TB control became known as the fastest way to get promoted and achieve job security if you performed well. Other health programs—burdened by a broad array of health problems and caught in the midst of complicated restructuring—did not have comparable data collection and recording systems that allowed health workers to become noticed. The annual report provided a forum for publication and dissemination of research. The national program encouraged operational research and trained those at the local and district level to conduct studies so that programs could be improved. Suarez did not feel it was hard to convince people to comply with the program guidelines. As he described, "When you work at the local level, you see the problem. You know what exists. You are always trying to look for the solution to the problem."

Despite the enthusiasm around attaining good results, there was some fear of infection among the health workers that had to be calmed. In Suarez's words:

> We sent a simple message: the risk of TB infection is from non-diagnosis. The problem is not the patients in treatment because you know they are taking their medication, but the problem is the patients that are not in treatment and not diagnosed. We sent this message over and over, that if they organized a good program and controlled TB in their patients, their risk went down. We tried to convince them that good work on the TB control program, good organization, was the best way to protect themselves.

Some health workers did get the disease, as did cleaning personnel and other hospital staff inadvertently exposed to patients. They were treated quietly, often in different health centers from the ones in which they had been working.

Funding

In the first year, 37,000 patients enrolled in the NTP. The Ministry of Health provided 74% of the funding for treatment and diagnosis; FONCODES provided 18%; the Emergency Program for Drought, 4%; UNICEF, 3%; and Spain, 1%. The TB program was officially touted as part of the government's struggle against poverty. MINSA invested an additional USD 95,000 in strengthening the basic health infrastructure in critical zones, while MINSA's National Institute for Food and Nutrition invested USD 306,700 in buying food supplies for 20,000 patients. Most of the money went directly to the departments, which took care of the operations and carried out the mandates. In addition, two local nongovernmental organizations offered in-kind donations to patients and their families for several years.

Between 1990 and 1996, FONCODES provided 27.6% of the total NTP budget; international organizations contributed 1.4%, and the public treasury, 71% (see **Exhibit 15** for sources of financing for medications). The NTP received support from the World Bank, the World Food Program, and WHO. The government of Japan gave USD 290,000 for laboratory development in 1994. The budget for the TB program increased annually until 1996 when funding reached a plateau. Over time the cost of administering *esquema único* decreased (see **Exhibit 16** for cost of WHO-recommended treatment regimens in 1993 and 1997).[29]

Results

The new NTP released its first data in 1992. The total number of NTP establishments offering TB treatment had increased from 977 in 1991 to 2,774 by 1992. The number of laboratories able to culture had increased from 13 to 24. Cure rates were almost 80% (see **Exhibits 8** and **10**). Suarez and the Minister of Health went to the annual WHO meeting in Geneva; there Suarez met WHO TB Division Director Kochi. The Peruvian NTP requested a formal, international evaluation from WHO. "It was somewhat hard to convince him to come because no one knew me. It was my first trip to Geneva, and I was just a young manager," Suarez said. "They didn't believe we could have done so much without their support. They

thought maybe it wasn't true." WHO evaluated the NTP the next year. The evaluation confirmed the positive results and cemented the relationship between Peru and WHO.

WHO Framework

By 1994 WHO had produced a Framework for Effective TB Control, outlining policy on how to treat and control TB. Condensing ideas from the six-month treatment introduced in Tanzania and Mozambique in the late 1970s into five key components, the organization named the strategy DOTS, short for Directly Observed Therapy Short-course. The DOTS strategy included:

1. Government commitment to a TB program aiming at nation-wide coverage integrated into the existing health structure with technical leadership from a central unit
2. Case detection through predominantly passive case finding with confirmation of diagnosis by quality-assured microscopy
3. Administration of standardized short-course chemotherapy to at least all sputum smear positive cases of TB under proper management conditions
4. Establishment of a regular drug supply of all essential anti-TB drugs by an effective procurement system
5. Monitoring and evaluation system based on individual patient information used for program evaluation and supervision[30]

The standard WHO-DOTS treatment eliminated the need for individual clinical management of the disease; it assumed that adherence would prevent development of drug resistance. WHO set up a worldwide TB surveillance and monitoring system that year.

WHO raised funds for the disease and worked to promote its strategies in developing countries through widespread advocacy. Advocacy, one WHO member argued, "is not an analytical undertaking; unlike the academic process, in advocacy, you start with a simple, clear message to grab attention and work down from there, filling in explanations and gaps later."[31] At the international level, multilateral donors such as the World Bank and bilateral agencies such as USAID still provided most of the resources. On the ground, programs were implemented through government partnerships.

World Bank loans for health sector reform became tied to the implementation of WHO-DOTS. In October 1995, WHO's Global Tuberculosis Control Program convened for a workshop to discuss the guidelines for TB treatment. It focused on the "operational problems" that had arisen in implementing the original guidelines and possible revisions for the next edition.[32]

International Recognition

WHO touted Peru's NTP as a model DOTS program the following year. WHO, PAHO, and many country managers visited Suarez to learn from him. Suarez usually did not accept invitations to visit other programs. He felt his job was to attend to Peru. He allowed his team and intermediate-level workers to travel to other sites if they wished.

Around that time, MINSA was restructured. Public health goals shifted to focus on primary care and integrated programs. MINSA wanted the TB program to merge with other infectious diseases and to exist independently only on the national level. "We suggested that if they could show us an example of where this worked in other countries [with TB control], then we would do it, but it wasn't possible. We had a lot of

discussions with people about this approach. It was a stressful time," Suarez recalled. The NTP remained one of the only programs unchanged by health sector reform.

Among those who had been treated by 1995, between 12% and 25% failed treatment.[21] Some doctors prescribed additional second-line drugs as part of *retratamiento*, and some thought that keeping patients on INH for life would suffice in suppressing the disease. Often doctors told patients they were "chronic." Some patients did not accept the "chronic TB" diagnosis and turned to private practitioners. Though they rarely could afford a full course of the costly second-line drugs prescribed, they bought what they could and hoped that the occasional doses would keep them alive. Pharmacies stocked and distributed the second-line drugs casually.

Pedro Suarez and his national team were members of a working group that contributed to the WHO and International Union Against Tuberculosis and Lung Disease (IUATLD) global project on anti-tuberculosis drug resistance, a survey done between 1994 and 1997.[33] Half of the 38 participating countries surveyed had 100% of patients tested during the observation period. PAHO helped carry out surveillance in Peru between October 1995 and March 1996 using a proportionate cluster method. A total of 1,958 new and previously treated patients diagnosed in 814 health establishments in 31 regions and sub-regions were tested. WHO and IUATLD published the results in 1997. Among 1,500 new cases tested in Peru, over 15% had some resistance, and 2.5% had MDR. Among the previously treated patients, 36% had some resistance, and 15.7% had MDR.[27] Peru's drug resistance rates were well above the mean.

Socioeconomic Concerns

Funding from USAID for the *Proyecto de Desarrollo Integral con Apoyo Alimentario* (PRODIA; the Integrated Development and Food Assistance Project) ended in 1995. Of about 1,600 *comedores populares* (soup kitchens) funded through PRODIA, only about 400 remained open. Funding was provided for these remaining *comedores populares* through a new project by CARE Peru. The network of soup kitchens decreased from 7,000 in 1993[33] to under 1,000 by 1997.[34] Some patients in Lima reported receiving food supplements only twice in 1997 despite the program's aim to provide them at least monthly, and one third of patients received no nutritional support.[29]

Patients reported that they could not attend the clinic for medications because they had to work, had to care for their children, or could not pay the transportation costs.[29] "The Ministry battles the bacillus, but it's the socioeconomic conditions of the people that cause TB," a MINSA physician said. One and a half million jobs had been lost over the course of the 1990s. In the words of one researcher, "At the base of the [TB] problem is unemployment."[4] One patient further explained, "At month's end, [my smear] came out negative. After the second month, negative again. If I don't have [TB] any longer, why should I come [to the clinic]? … I said to myself 'I'm wasting time.' So, I went back to work."[35]

Revising the Guidelines

The NTP updated its guidelines in 1995, incorporating WHO as well as national recommendations "to improve the efficacy of treatment and prevent the occurrence of resistance," as the guidelines explained. Suarez further explained, "We assumed that in terms of the clinical expertise, qualified human resources, and lab support, we had enough support to move to this second step…. If the system is working, you can implement a more complex approach."

Esquema único became known as *esquema uno* (regimen one), and addendums were added to adjust dosing for those under 15 years old or under 50 kg. The medications used for this initial treatment remained

the same. *Esquema dos* (regimen two) was indicated for patients previously treated, relapses, or patients who had abandoned treatment and returned.[36] The regimen for the first month included SM in addition to the four first-line drugs in *esquema uno*, followed by two months with the four first-line drugs, then five months of twice-weekly treatment with INH, RIF, and EMB, for a total of eight months. *Esquema tres* was indicated for new smear-negative extrapulmonary cases and for infants. It was a five-month treatment: two months of daily RIF, INH, and PZA and three months of twice-weekly RIF and INH. Those who failed both *esquema uno* and *dos* or who relapsed after completing both were considered for *retratamiento* with no structured regimen (see **Exhibit 13**). The revised guidelines included expanded information about when to use cultures and how to treat HIV co-infection. The new set of guidelines was enacted in January 1996 through a training and dissemination process similar to that for the first set.

After the launch of the updated guidelines, the cure rate went up to 92.1%, and the rate of patients abandoning treatment went down to about 3%, as measured by the NTP. The cure rate for those taking *esquema dos* was 68.8% among those who had previously abandoned treatment and 82.6% among those who had relapsed. Between 4.5% and 6.0% of patients on *esquema dos* died, and up to 4.1% completed treatment without a cure (see **Exhibit 17** for outcome of patients receiving *esquema dos*).

Additional Updates

In 1997 WHO revised the treatment guidelines to address the potential for drug-resistant cases and released *Guidelines for the Management of Drug-Resistant Tuberculosis*. The NTP added *esquema dos reforzado* (reinforced regimen two), which extended the time patients took SM by an additional three months. *Esquema dos reforzado* was used only for *esquema uno* failures, while *esquema dos* was indicated for relapses and patients who had abandoned treatment and returned. *Esquema dos reforzado* eventually reached failure rates of 70%.[20]

After October of 1997, another revision was made. *Retratamiento estandardizado* (standardized retreatment regimen) was added. It included three medications never previously included in NTP regimens. *Retratamiento estandardizado* lasted 18 months and was indicated for patients who had failed *esquema uno* and *esquema dos reforzado*. *Esquema uno* cost MINSA about USD 50 per patient. R*etratamiento estandardizado* cost over USD 1,000 per patient (see **Exhibit 18** for MINSA expenditure per patient).[20]

Suarez established an independent evaluation committee, *Comité de Evaluación de Retratamiento Nacional* (CERN; national retreatment regimen evaluation committee), to review cases and approve each patient before he or she began r*etratamiento estandardizado*. Suarez allowed each health center director to select an expert for the committee and invited laboratory and *EsSalud* physicians. As he said:

> My role was director, not physician. The physicians made the decisions, and all the cases needed the signatures of the committee. If you see the files of this committee, all the decisions, you will see I never put my signature on anything. I allowed them to make the decisions because I respected the professional decisions of my colleagues.

CERN received hundreds and hundreds of requests. The meeting frequency increased from monthly to every two weeks until intermediate groups called *Comités de Evaluación de Retratamiento* (CERs; retreatment regimen evaluation committees) were formed in each district.

Undefined Needs and Disease Prevalence

Estimating the number of patients with TB and those who did not respond to treatment was a challenge. Some researchers complained that the NTP's reporting methods, which combined statistics from zones with disparate incidence of TB, tended to mask the concentration of TB in poor shantytowns and

masked the epidemics of drug-resistant disease and deaths.[37] In order to provide the treatment they deemed fit, many pulmonologists attempted to bypass NTP protocol by not reporting all of their patients. In particular, many began to put their patients who had failed *esquema uno* directly on *retratamiento estandardizado*. A study also found that some physicians, unable to recall old records, started new charts for patients who returned for a second round of treatment. The reported treatment failure rates were therefore never fully accepted.

Suarez's open-door meetings, in which he had always been able to resolve complaints or reach a consensus among attendees, grew more complex. Program staff disagreed over policies and debated the data, while the costs of the program were growing. Suarez was faced with a decision about how to approach the national evaluation meeting and inspire physicians and TB workers to continue their efforts and enthusiasm in spite of the growing skepticism and uncertainties. How could he explain the plateau that they were seeing in successful cure rates? How could he ensure cooperation and consistency among NTP physicians?

Exhibit 1 *Map of Peru*

Source: United Nations. Available at http://www.un.org/Depts/Cartographic/map/profile/peru.pdf.

Exhibit 2 *Top Causes of Mortality (as % of total), 1992*

National Statistics		Wealthiest quintile		Poorest Quintile	
Communicable diseases	27.5	Circulatory system	22.1	Communicable diseases	44.0
Circulatory system	19.4	Communicable diseases	21.5	Circulatory system	10.2
Malignant neoplasms	15.2	Malignant neoplasms	19.3	Malignant neoplasms	4.6

Source: Pan American Health Organization (PAHO), *Country Profile: Peru*, in *Health of the Americas* 1998, Pan American Health Organization. p. 413-427.

Exhibit 3 *Health Service Organization and Delivery in Peru, 1994*

	HOSPITALS		CENTERS		POSTS		UTILIZATION DATA
	#	% beds	#	% beds	#	% beds	
MINSA	130	53	752	74	2909	92	31.9% of eligible population makes 2.3 visits per year;[3] 45% of all ambulatory and 70% of inpatient services
EsSalud	22	15.6	96	9.5	45	1.4	35.9% of eligible population makes 4.3 visits per year; 25% of inpatient and 20% of outpatient services
Armed Forces	14	8.8	74	7.3	72	2.3	n/a
Private	187 (small)	19.6	n/a	n/a	n/a	n/a	Unknown, provides 30-40% of ambulatory services; less than 10% of inpatient care
Totals	368	100	912	100	3141	100	

Source: Pan American Health Organization (PAHO), Country Profile: Peru, in Health of the Americas 1998, Pan American Health Organization. p. 413-427.

[3] Of the population covered by the Ministry of Health, 31.9% of people utilized services, each an average of 2.3 times; low utilization may be due in part to overlapping benefits, i.e. those covered by the army or private insurance are also covered by MINSA. MINSA provides 45% of all ambulatory and 70% of inpatient care in the country.

Exhibit 4 *Brief Overview of Tuberculosis*

Tuberculosis

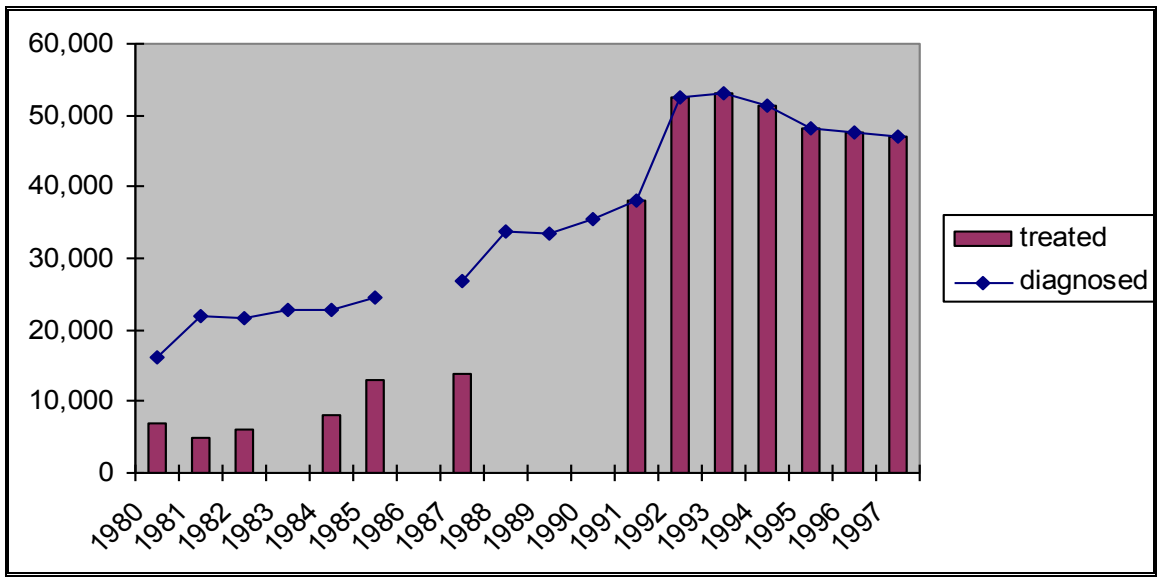
TB is an infectious disease caused by *Mycobacterium tuberculosis.* Only 10% of people carrying the bacteria develop active TB over the course of their lifetime, and only those with the active form are contagious. TB is spread through the air in microscopic droplets by coughing, spitting, talking, or sneezing. Malnourished or HIV-infected people are at a greater risk for developing active disease because of their weakened immune systems. TB bacteria can spread to any organ of the body but most commonly attack the lungs and produce a common set of symptoms: cough with phlegm, fever, night sweats, fatigue, weight loss, and pain in the back or chest. A skin test called a PPD and an x-ray usually can suggest a TB diagnosis. Examining a patient's sputum under a microscope or culturing it in a laboratory can confirm the diagnosis.

The basic treatment is a six-month course of multiple medications, but drug-resistant strains are more difficult to treat. Multidrug-resistant TB (MDR-TB) is caused by TB bacilli that are resistant to two first-line anti-TB drugs, isoniazid (INH) and rifampin (RIF). MDR-TB can be contracted directly or can develop with inconsistent or partial treatment of drug-sensitive TB. It requires a course of chemotherapy lasting at least eighteen months with more expensive medication and requires additional tests and laboratory supplies for diagnosis.

Worldwide, TB killed more adults in 1997 than any other single infectious disease. WHO estimated that TB would kill 30 million people during the 1990s. One third of the world's population was already infected with the TB bacillus. Though the incidence rates per capita were declining, the total worldwide number of new cases arising each year was still increasing. In 1997 for every USD 10 spent on health care, only USD 0.02 went toward TB control.

Sources: World Health Organization. Fact Sheet on Tuberculosis. 2005; Available at http://www.who.int/mediacentre/factsheets/fs104/en/index.html. Accessed July 11, 2007.
World Health Organization. *Life in the 21st Century: A Vision for All.* Geneva: WHO;1998.

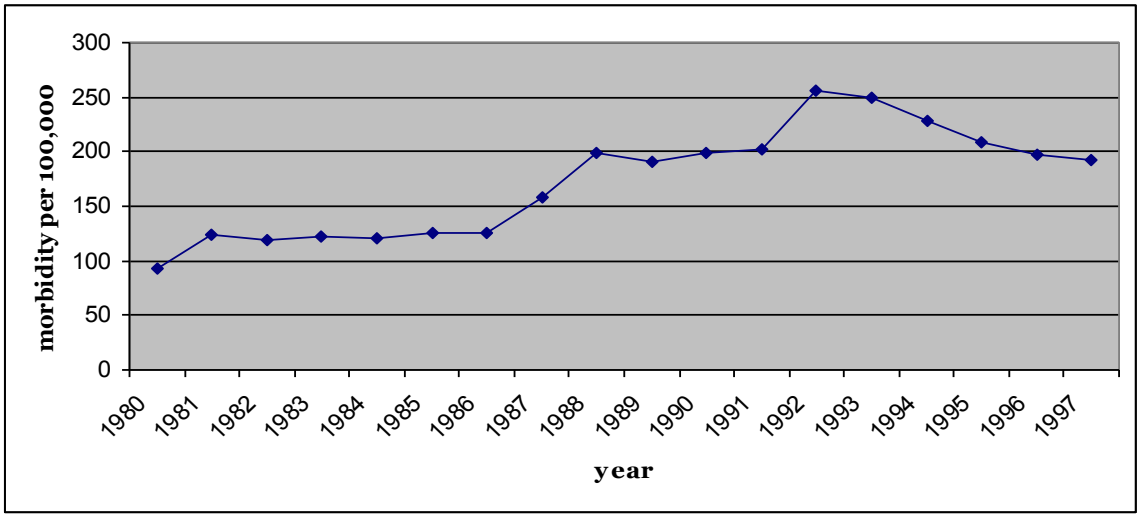
Exhibit 5 *TB Cases Detected and Treated in Peru, 1980–1997*



Note: diagnosed cases data missing from 1987 and treated cases data missing from 1983, 1986, and 1988-1990.

Source: Ministerio de Salud, Informe 2000, in Tuberculosis en el Perú, República del Perú, Editor. 2000, Dirección General de Salud de las Personas: Lima.

Exhibit 6 *TB Morbidity in Peru, 1980–1997*[25]



Source: República del Perú, Seminario Taller Nacional: Evaluación del Programa de Control de Tuberculosis Ano 1991, in III Seminario Sub Regional Andino de Evaluación y Control de Tuberculosis. 1992, Programa Nacional de Control de Tuberculosis: Lima.

Exhibit 7 *Outcome of Patients Starting* Esquema Uno

	1991	1992	1993	1994	1995	1996	1997
Percent cured from *esquema uno*	76.8	82.5	85.3	86.2	87.7	91.3	92.1
Percent abandoning treatment	12.1	9.2	7.7	6.9	5.9	4	3.7
Percent dying	4.1	3.3	3.0	3.1	3.1	2.6	2.2
Percent transferring without confirmation	3.4	2.4	1.9	1.7	1.2	1.1	0.5
Percent failing	3.6	2.6	2.1	2.1	2.0	1.0	1.3

Source: Ministerio de Salud, *Informe 2000*, in *Tuberculosis en el Perú*, República del Perú, Editor. 2000, Dirección General de Salud de las Personas: Lima.

Exhibit 8 *Tuberculosis Control Data from Surrounding Countries Implementing DOTS in the Americas, 1995*

Country	Population (in millions)	Cases reported, total no.	Rate of all types of cases	% case detection of new ss+ cases[4]	Cured % (1994)
Bolivia	7.4	9,614	129.7	62.7	52.9
Cuba	11.0	1,607	14.6	83.9	90.0
Guatemala	10.6	3,368	31.7	45.0	67.9
Nicaragua	4.4	2,842	64.1	71.5	64.6
Peru	23.8	45,310	190.5	120.0	70.2
Uruguay	3.2	625	19.6	121.6	47.2
US	263.3	22,860	8.7	67.6	--
Venezuela	21.8	5,554	25.4	70.7	66.2
Regional total	774.7	238,372	33.0	65.7	66.5

Source: World Health Organization. Global Tuberculosis Control. 1997, WHO: Geneva, Switzerland.

[4] The value for "% case detection of new ss+ cases" is determined by dividing the number of smear positive cases detected by the number of smear positive cases assumed to be in the country. In some cases, this estimated number of cases in the country may be lower than the actual number, therefore leading to percentages over 100.

Exhibit 9 *Brief Summary of WHO TB Treatment Guidelines, 1991-1997*

1991 The World Health Assembly adopted Resolution WHO 44.8, recognizing "effective case management as the central intervention for tuberculosis control," and recommending the strengthening of national tuberculosis programs by introducing short course chemotherapy and improving the treatment management system.

1993 *Treatment of Tuberculosis: Guidelines for National Programs* published, categorizing patients according to their priority for treatment (highest to lowest), and providing recommended regimens:

Category I: newly diagnosed cases of smear-positive pulmonary tuberculosis and other newly diagnosed seriously ill patients with clinically severe forms of tuberculosis.

Recommended treatment regimen: 2HRZS (E)/4H_3R_3 or 6HT[5]

Category II: relapse and smear-positive treatment failures suspected of having INH-resistant and or S-resistant disease.

Recommended treatment regimen: 2HRZES/1HRZE/5 H_3R_3 E_3

"… If patient is not smear negative by the end of 12 weeks, the initial phase can be extended by 4 weeks. If patient is still smear positive at the end of the fourth month, all drugs should be stopped for two to three days and a sputum specimen tested for drug susceptibility testing (DST). The patient should then start the continuation phase. If pre-treatment DST showed patients fully susceptible to all the drugs, then the continuation phase of Category I patients should follow the initial phase. If the pretreatment studies showed resistance to H or R, then the patients should start continuation under close supervision. If the pretreatment studies showed resistance to both H and R …. the chance of achieving sputum conversion is limited. If the patient remains smear positive after the completion phase, he or she is no longer eligible for the re-treatment regiment."

Category III: pulmonary smear negative tuberculosis with limited parenchymal involvement and extra pulmonary tuberculosis (this category usually includes children for whom pulmonary disease is almost always smear negative).

Smear negative pulmonary cases that will eventually become smear-positive are a higher priority than those with more benign forms of extrapulmonary tuberculosis.

Recommended regimen: 2HRZ/2H_3 R_3

Category IV: chronic tuberculosis

"Management of these patients who have a high likelihood of MDR-TB is highly problematic. Even with optimal therapy, cure may be possible in only half of such cases. Second-line drugs are very expensive, are generally more toxic and are significantly less effective than conventional regiments in drug-susceptible cases. More over, the patients must remain in the hospital for several months. If possible, the drug sensitivity of the bacilli should be established and a re-treatment program should

[5] Treatment regimens for TB have a standard code. Each anti-tuberculosis drug has an abbreviation: isoniazid (H), rifampicin (R), pyradinamide (Z), streptomycin (S), ethambutol (E), thioacetazone (T). TB treatment consists of two phases; the number before a phase is the duration of that phase in months. Letters in parenthesis represent fixed-dose combinations. Subscript numbers indicate the number of doses per week of the letter they follow. No subscript number following a letter represents daily (six times a week) doses of that drug. For example, 2HRZS (E)/4H_3R_3 represents two months of some dose of isoniazid, rifampicin, pyradinamide, and streptomycin with a fixed dose of ethambutol daily followed by four months of isoniazid and rifampicin three times a week.

be attempted with second line and experimental drugs. However, in countries with limited resources, treatment of patients with chronic tuberculosis should be given the lowest priority and should not divert resources from higher priority patients. One option, available to programs with limited resources, is to prescribe lifelong isoniazid for such patients, in the hope that this will diminish their infectivity and reduce the transmission of resistant organisms."

1995 WHO Tuberculosis Control Workshop held in Geneva discussed simplifying the patient treatment categories and the use of second-line drugs. Participants "recommend that a country prepared to go to this expense should only provide these second-line drugs for a specialized unit (or units in large countries), in close connection with a laboratory able to carry out cultures and reliable susceptibility tests."

1997 *Treatment of Tuberculosis Guidelines for National Programs 1997, second edition* published "to update the guidelines in the light of the experience gained since the first edition in assisting NTPs." The same basic regimens remained in place with some alternatives and flexibility to acknowledge variations in resources and circumstances across countries.

Guidelines for the Management of Drug-Resistant Tuberculosis published to advise "more economically prosperous" countries with "resources for second-line drugs" on how to "give some hope of cure" to patients who remained sputum smear-positive following a fully supervised WHO retreatment regimen.

Sources: World Health Organization, Treatment of Tuberculosis: Guidelines for National Programmes, 1st and 2nd Editions. 1993, 1997, and Guidelines for the Management of Drug-Resistant Tuberculosis. 1997, WHO: Geneva.

Exhibit 10 *Growth of MINSA TB Program by Year, 1991–1997*

	1991	1992	1993	1994	1995	1996	1997
Total health establishments	4,021	4,460	4,464	4,980	5,789	6,263	6,349
Establishments offering NTP	977	2,774	3,016	3,487	5,272	6,009	6,293
Labs doing smears	425	514	579	651	823	987	1,072
Labs doing culture	13	24	31	42	46	57	65
Sputum samples collected	978	2,460	2,369	3,238	4,441	5,022	4,964

Source: Ministerio de Salud. *Informe 2000*. Lima: Dirección General de Salud de las Personas;2000.

Exhibit 11 *Table of Contents from First NTP Guidelines* (Doctrina, Normas y Procedimientos Para el Control de la Tuberculosis en el Peru)

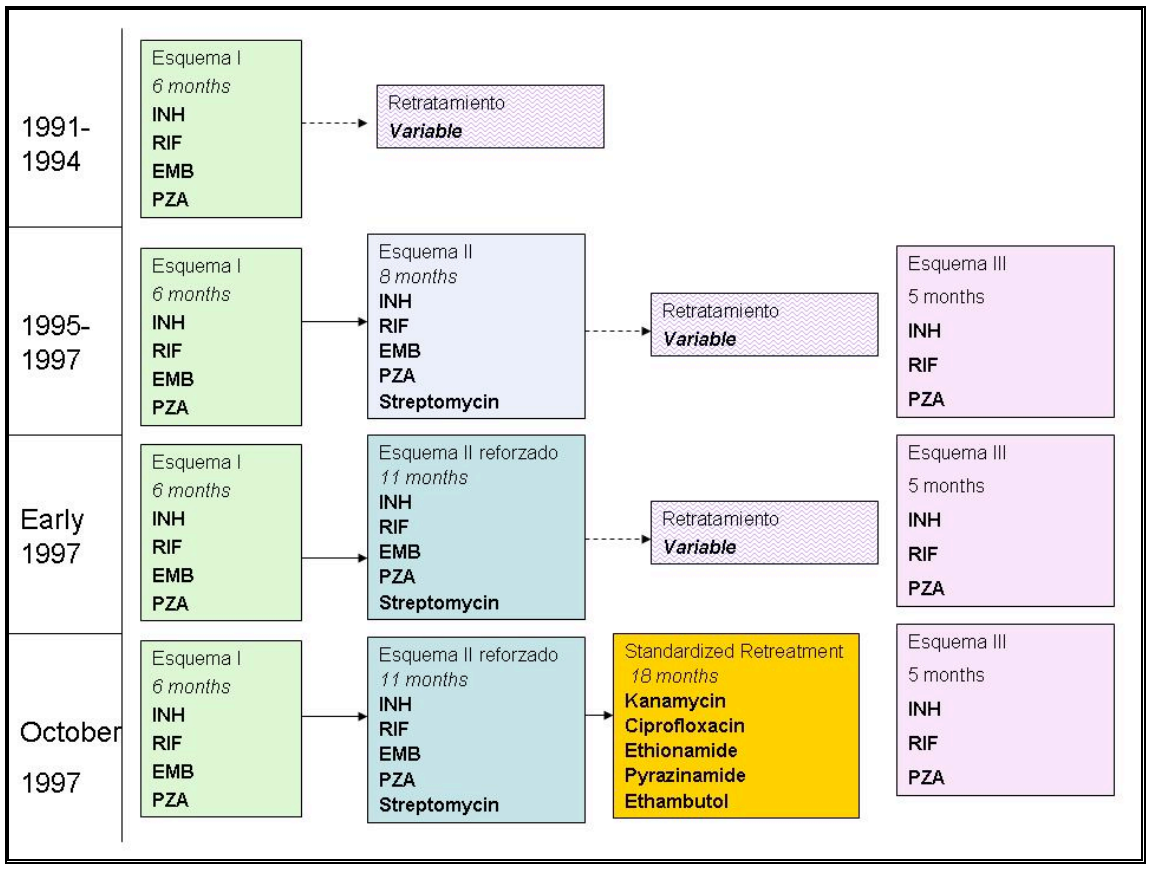
Source: Programa Nacional de Control de la Tuberculosis. *Doctrina, Normas y Procedimientos Para el Control de la Tuberculosis en el Peru*. Lima: Republica del Peru; April 1991.

Exhibit 12 *Number of Smears Done to Detect Each New Smear-Positive Case over Time*

	1990	1991	1992	1993	1994	1995	1996	1997
Number of smears per case found	9		14	17	20	25	35	
Total smears done	210,905	290,647	466,460	602,444	664,055	847,036	1,164,198	1,407,624

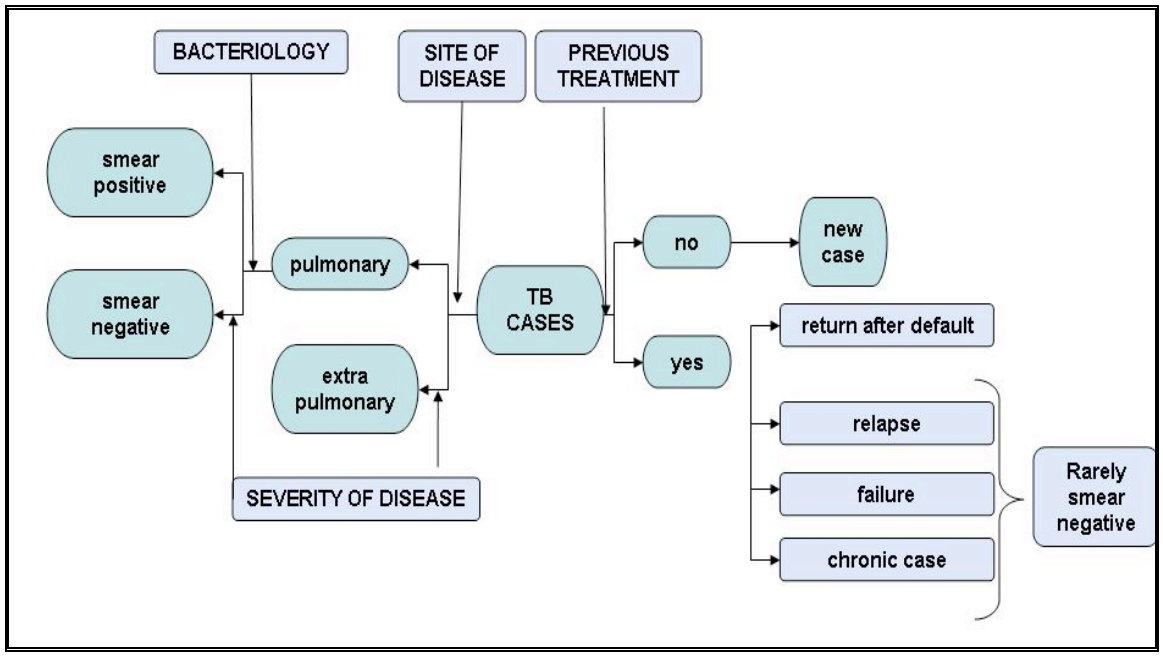
Source: Ministerio de Salud. *Informe 2000*. Lima: Dirección General de Salud de las Personas;2000.

Exhibit 13 *NTP Treatment Regimens in Peru, 1991 to 1997*



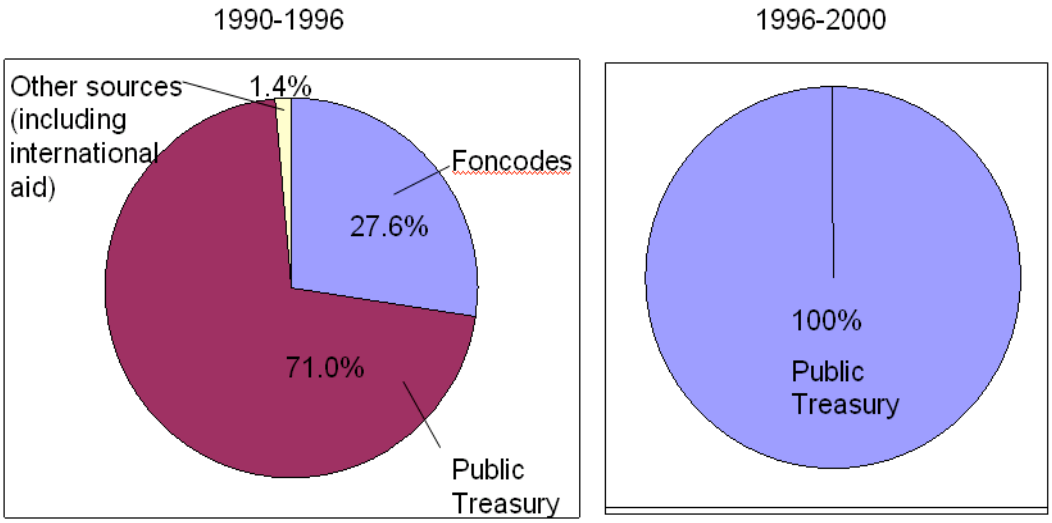
Source: Compiled by case writers.

Exhibit 14 *WHO Determinants of TB Case Definitions*



Source: World Health Organization, *Treatment of Tuberculosis: Guidelines for National Programmes, 3rd ed.* 2003: Geneva.

Exhibit 15 *Sources of Financing for NTP Medications, 1990–1996 and 1996–2000*



Source: National Tuberculosis Control Program.

Exhibit 16 *WHO Cost of Recommended Treatment Regimens per Patient in USD, 1993 and 1997*

Category	Regimen	Cost (USD) 1993	Cost (USD) 1997
I	2HRZS/4HR	73	34.7
	2HRZE/4H_3 R_3	42	39.1
II	2HRZES/1HRZE/5HRE	109	73.6
	2HRZES/1$H_3R_3Z_3E_3$	78	56.9
III	2HRZ/2 H_3R_3	31	17.8

Sources: World Health Organization, Treatment of Tuberculosis: Guidelines for National Programmes, 1st and 2nd Editions. 1993, 1997, and Guidelines for the Management of Drug-Resistant Tuberculosis. 1997, WHO: Geneva.

Exhibit 17 *Outcome for Patients (Relapses/Previously Abandoned) Entering* Esquema Dos

	Relapsed patients 1996	Previously abandoned 1996	1997*
Cured	82.6	68.8	--
Abandonment rate	20.1*	--	21.7
Death rate	6	4.5	5
Failure rate	4.1	2.4	4.6

* Not calculated independently for relapses and previously treated patients.

Exhibit 18 *Expenditure on Diagnosis and Treatment per Patient for MINSA in USD, 1999*

Activity	Cost per patient (USD)	Distribution (% of total expenditure)
Treatment		56
Esquema unico	61.36	29
Esquema 2	107.40	11
Esquema 3	49.56	6
Esquema 2 reforzado	136.92	1
Esquema MDR estandardizado	1121.55	8
Treatment for HIV/AIDS co-infection	75.47	1
HIV/AIDS prophylaxis	24.07	1
Symptom identification	0.45	8
Control checkup	0.38	1
Culture	1.62	3
Talk	1.18	9
Referrals	0.45	No data
Interview	0.28	1
Receipt and analysis of smear		16
Vaccine	0.26	3
House visit	1.19	2

Source: Ministerio de Salud. Impacto economico de la tuberculosis en el Perú 1999. Lima, Peru 2001.

Appendix *Useful Acronyms*

ASET	*Asociación de Enfermos de TB* (Association of TB Patients)
CER	*Comité de Evaluación de Retratamiento* (Committee for Evaluation of Retreatment Regimen)
CERN	*Comité de Evaluación de Retratamiento Nacional* (National Retreatment Regimen Evaluation Committee)
DOT	directly observed therapy
DOTS	DOT-shortcourse (internationally recommended strategy for TB control)
DST	drug susceptibility testing
DTP3	Third dose of diphtheria toxoid, tetanus toxoid, and pertussis vaccine (used as a proxy for a fully immunized child).
EMB	ethambutol
FONCODES	*Fondo de Cooperación para el Desarrollo Social* (Fund for Social Development)
GDP	Gross domestic product
GTB	WHO's Global Tuberculosis Control Program
IMF	International Monetary Fund (IMF)
INEI	*El Instituto Nacional de Estadística e Informática* (The National Institute of Statistics and Information)
INH	isoniazid
INS	Instituto Nacional de Salud
IUATLD	International Union Against of TB and Lung Disease
MDR-TB	multidrug-resistant tuberculosis
MINSA	*Ministerio Nacional de Salud* (Ministry of Health in Peru)
NTP	National Tuberculosis Control Program
PAHO	Pan American Health Organization
PPP	purchasing power parity
PZA	pyrazinamide
RIF	rifampin
SM	streptomycin
STR	standardized treatment regimen
TB	tuberculosis
UN	United Nations
USD	United States' dollar
WHO	World Health Organization

Glossary

General Terms

BCG (Bacille Calmette-Guérin) – vaccine for TB named after French scientists Calmette and Guérin often given to infants and children in countries with high rates of TB; the protective effect may be greater for extra-pulmonary TB and has been found to be absent in some pulmonary TB studies.

DOT (directly observed treatment) – health personnel observe patients taking each dose of medication to ensure medications are taken in the right combination and for the correct duration.

DOTS (Directly Observed Therapy Short-Course) – brand name given to the WHO-recommended TB control strategy involving five components:

1. **Sustained political commitment** to increase human and financial resources and make TB control a nation-wide activity and an integral part of the national health system.
2. **Access to quality-assured TB sputum microscopy** for case detection among persons presenting with symptoms of TB, screening of individuals with prolonged cough by sputum microscopy and special attention to case detection among HIV-infected people and other high-risk groups, e.g. people in institutions.
3. **Standardized short-course chemotherapy to all cases of TB** including direct observation of treatment; and proper case management conditions with technically sound and socially supportive treatment.
4. **Uninterrupted supply of quality-assured drugs** with reliable drug procurement and distribution systems.
5. **Recording and reporting system enabling outcome assessment** of each patient and assessment of the overall program performance.

Drug resistant tuberculosis – TB caused by an isolate of *Mycobacterium tuberculosis* resistant to one of the five first-line drugs.

Extensively Drug Resistant TB (XDR-TB) – a form of MDR-TB resistant to isoniazid and rifampin as well as to fluroquinolones and to any one of the three second-line injectable drugs (amikacin, kanamycin or capreomycin).

Extrapulmonary tuberculosis (EPTB) – TB of organs other than the lungs, (e.g., pleura, lymph nodes, abdomen, genitourinary tract, skin, joints, and bones).

First-line drugs (FLDs) – the five main drugs used to treat drug-susceptible TB: rifampin, isoniazid, ethambutol, pyrazinamide, and streptomycin.

Infection control—measures that help prevent the spread of infection and reduce the concentration of infectious droplet nuclei in the air. Three types:

1. Administrative controls: policies and procedures intended to promptly identify infectious cases so that additional precautions can be taken. Examples include the separation of patients known or suspected to have TB from other patients, shortening the length of time that patients spend in the hospital, and educating patients about avoiding contact with others at risk.
2. Environmental controls: natural or mechanical ventilation, ultraviolet germicidal irradiation, and high-efficiency particulate air filtration.
3. Personal respiratory protection: masks or other respiratory gear.

Multidrug-resistant TB (MDR-TB) –TB caused by an isolate of mycobacterium tuberculosis resistant to at least isoniazid and rifampin and possibly to additional chemotherapeutic agents.

MDR-TB treatment – involves at least three additional drugs beyond FLDs to which the isolate is susceptible, including an injectable agent and a floroquinolone in the first six months, and at least three of the most active and best-tolerated drugs in the continuation phase of 12-18 months.

Pan sensitive (pan susceptible) TB – TB that responds to treatment with first line drugs.

Primary resistance—drug resistance in a patient with no previous anti-tuberculosis therapy.

Pulmonary tuberculosis (PTB) – bacterial infection caused by the organism *Mycobacterium tuberculosis* that infects the lung parenchyma; the most common form of TB.

Second-line drugs (SLDs) – a second set of drugs that are less effective, more toxic, and costlier than first line-drugs; required for MDR-TB treatment. TB bacteria are less likely to have resistance to SLDs. SLDs include amikacin, capreomycin, ciprofloxcacin, cycloserine, ethionamide, kanamycin, levofloxacin, ofloxacin, para-aminosalycylic acid, and prothionamide.

Secondary resistance—development of resistance during or following chemotherapy, for what had previously been drug susceptible tuberculosis.

Sputum smear microscopy – examination of sputum with a microscope to determine if TB bacilli are present; the test involves smearing phlegm on a glass slide, staining the Acid Fast Bacilli (AFB) with the Siehl Neelsen method, and counting TB bacteria on the slide.

Case Definitions

New – never had treatment for TB or has taken anti-tuberculosis drugs for less than one month.

Relapse – previously cured patient diagnosed with tuberculosis.

Treatment after failure – started on a re-treatment regimen after failing previous treatment.

Treatment after default – returned to treatment bacteriologically positive following interruption of treatment for two months or more.

Transfer in – transferred from another TB register to continue treatment.

Retreatment – previously treated for at least four weeks, including failures, relapses, and defaulters who returned to the health service, with positive sputum smear examination.

Other - all cases that do not fit the above definitions, including **chronic cases** and patients who are sputum-positive at the end of a retreatment regimen.

Possible Treatment Outcomes

Chronic patient—remains sputum-positive at the end of a standard TB treatment regimen.

Cure – smear negative at one month or prior to the completion of treatment.

Treatment failure – smear positive case who remained or became again smear positive five months or more after commencing treatment.

Default – interrupted treatment for more than two consecutive months before completing treatment.

Died – died during treatment, regardless of cause.

Transfer out – transferred to another treatment center; treatment results are not known.

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