

China's Treatment of Tuberculosis: An Analysis on Program Control Efficacy, Government Role,
and Social Stigmas

by

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Dr. Malcolm Lowry

According to the World Health Organization's (WHO) Tuberculosis Annual Report of 2014, from the 9 million cases worldwide, China has about 11% of these cases. Although the control of TB has improved over the years, China still has the second leading highest Tuberculosis epidemic in the world. Using literature reviews and case studies, the aim of this research is to examine the following question: why is it that China is unable to cure and decrease the rates of TB, while the United States, as a comparison model, is able to decrease the number of cases? Majority of cases originate from rural migrant workers from each country respectively. While there are many aspects that contribute, results found three factors that impact China's ability to cure TB: access to Tuberculosis medical care, cost of medical care, and the effects of social stigmas.

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ACKNOWLEDGEMENTS

TABLE OF CONTENTS

CHAPTER 1 INTRODUCTION..... 1

**CHAPTERS – SIZE 14 FONT, ALL CAPS, CENTERED, DOUBLE SPACED TEXT, PAGE
BREAK BEFORE (I.E., STARTS A NEW PAGE, REGARDLESS OF SPACE LEFT ON PRIOR
PAGE), 30 POINT SPACING ABOVE, 12 POINT SPACING BELOW.....ERROR! BOOKMARK
NOT DEFINED.**

HEADINGS – SIZE 12 FONT, LEFT JUSTIFIED, DOUBLE SPACED TEXT, LEITURA NEWS ROMAN 2 FONT, 12
POINT SPACING ABOVE, 6 POINT BELOW..... **ERROR! BOOKMARK NOT DEFINED.**

CHAPTER 2 BACKGROUND/LITERATURE REVIEW 3

2.1 [PROCESS OF TUBERCULOSIS]..... 3

2.2 [DIAGNOSIS OF TUBERCULOSIS] **ERROR! BOOKMARK NOT DEFINED.**

2.3 [TYPES OF DRUG TREATMENTS]..... **ERROR! BOOKMARK NOT DEFINED.**

CHAPTER 3 METHODS 21

CHAPTER 4 RESULTS..... 23

CHAPTER 5 DISCUSSION/ANALYSIS 33

CHAPTER 6 LIMITATIONS/FUTURE STUDY 34

CHAPTER 7 CONCLUSION 36

BIBLIOGRAPHY 37

APPENDIX A..... 40

APPENDIX B..... 41

LIST OF FIGURES (page may be omitted if no figures and/or tables)

<u>Figure</u>	<u>Page</u>
1. Name of the figure.....	11
2. First sentence of the legend matches the text exactly	14
3. List only one page number	21
4. Keep numbers and words in separate columns	44

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Name of the table.....	9
2. First sentence of the table matches the text exactly	10
3. List only one page number	19
4. Keep numbers and words in separate columns	22
5. Tables and figures are numbered separately.....	34

CHAPTER 1 INTRODUCTION

Tuberculosis (TB) is a chronic infectious disease, caused by a bacterium called *Mycobacterium tuberculosis*. According to World Health Organization's (WHO) Tuberculosis Annual Report of 2014, approximately 1.5 million people have died in the past year from TB, while 9 million have developed cases, 11% of these cases are in China. China has currently the second leading highest Tuberculosis epidemic in the world. Multi-Drug Resistant Tuberculosis (MDR-TB) has become an occurring issue for China as well.

There are two forms of Tuberculosis, latent and active TB. Latent TB is when someone has the bacteria in their lungs but is not infectious while active TB is. Though Tuberculosis is a treatable disease, if people do not take their drug treatments on a regular basis, the TB bacteria may become drug resistant TB. There are two types of drug resistant bacteria TB, Multi-Drug Resistant Tuberculosis (MDR-TB), and Extreme-Drug Resistant Tuberculosis (XDR-TB). From 2004, one third of the world's population who had MDR-TB, 140,000 people were from China, currently having the highest rate of MDR-TB with a prevalence rate of 6.8% among the TB infected population. MDR-TB and XDR TB are both reoccurring issues in China, making it one of the world's 27 countries with the heaviest burdens in the world.

Although TB control has improved over the years China today still has the second largest epidemic in the world. Programs such as the Infectious and Endemic Disease Control Program, National Tuberculosis Control Programs in China list in their policies to provide free TB medical care for their residents, but why is it still one of China's leading public health issues today? People avoid treatment because of the long time treatment, the amount of drugs that are taken orally and injecting, and treatment costs. Even though TB drug treatments are supposed to be

free for patients, according to studies people in China report that they do pay for treatments, extra tests unrelated to TB, and therefore are unable to afford medical treatments. Many patients stop their course of treatments, which leads to development of drug-resistant TB, and spread of infection to the surrounding communities. It is also reported that government support has decreased since the change in government leaders when Deng Xiaoping came to power in 1978.

This research paper aims to answer the following questions: are programs in China being effective enough? Are they accessible enough to all of it's residents? Are all income and class groups in preventing *Mycobacterium tuberculosis* able to gain the treatment they deserve to be treated. In order to draw conclusions, the United States TB control programs will be used as an example to compare with China's programs, and the main focus population will be rural migrant workers as majority of cases originate from these groups. At the moment, the United States and China are considered two of world's superpowers, having two of the highest GDP per capita. China is reported to have the world's second largest economy after the United States, but yet also has the world's second largest number of poor people.

So if China is considered one of the world's superpower, why is it that China still cannot cure its population of Tuberculosis? This paper will examine the factors that prevents China from curing all its entire population from Tuberculosis, following factors are China's government role in TB program efficacy, and the effect of social stigmas on TB control.

CHAPTER 2 BACKGROUND/LITERATURE REVIEW

2.1 Process of Tuberculosis

Tuberculosis is transmitted by air droplets from one infected person to another. There are two different forms of TB, active and latent. Latent TB infection is when people have the bacteria in their lungs, a defensive barrier is built around the bacteria and is simply living in a dormant state.

[picture]

This level of infection is not contagious but depending on a person's immunological state, they may be at risk of developing active TB. Active TB is spread through air droplets, coughing the bacteria from one infected person to another. The longer a person is within contact of an infected person with TB, the higher risk of being infected.

Once a person becomes immunocompromised, the defense barriers fall and latent TB develops into active TB by spreading to the lungs or lymph glands, becoming pulmonary or intrathoracic respiratory TB. Approximately 50% of TB cases are developed from either reactivation of latent infection years later, or from the original infection years later. Children and young adults often develop TB from the original infection TB can develop into a non-resistant form when it undergoes genetic changes, acquiring chromosomal mutations known as genotypic resistance (<http://www.ncbi.nlm.nih.gov/books/NBK195973/>). Mutations can cause phenotypic resistance, causing bacteria to grow in the presence of the antibiotics. Phenotypic resistance can occur with clinical resistance, causing the patient to be unresponsive to the antibiotics as the bacteria has developed resistance.

2.2 Process of Tuberculosis

There are two main ways to diagnose for TB infected patients, the Mantoux Tuberculin skin test and blood testing. [images]. Positive results from these tests do not determine whether or not a person has a latent or active TB infection, only if a person has TB bacteria. Mantoux tests are administered by health care providers injecting a small dose of TB protein tuberculin under the skin. If exposed to TB, people will have a positive reaction to the skin test which is an immune response of a red, raised area around the injection site. Immune responses are shown after 2-3 days of injection, afterwards people are taken in for further TB testing. Changes in chest X-rays and tissue samples indicate TB presence, but confirmed diagnosis is made when TB bacterium from sputum or other samples are cultured. Culture tests can also show the types of drugs TB bacterium is sensitive to.

In order to determine the TB status after an initial positive skin or blood test, patients must undergo a chest x-ray and provide a sputum sample to determine their health status. Blood tests are usually given if people had the bacilli Calmette-Guerin (BCG) vaccine for TB as the skin tests provides false positives for vaccinated patients. 2.2.1 United States Diagnostic Tests

Blood tests, also known as interferon-gamma release assays (IGRAs), measures how strong a person's immune system reacts to TB bacteria. In the United States, there are currently two types of IGRAs that are Food and Drug Administration (FDA) approved, they are QuantiFERON®-TB Gold In Tube test (QFT-GIT) and the T-SPOT®.TB TEST (T-Spot). While in China, with a high prevalence rate of TB, there are no guidelines currently for the use of IGRAs for countries with high rates of TB. The only optional tool for TB diagnosis was the TBT test which provides false positives up until now. Phenotypic and genotypic resistance of TB are determined by culture-based and molecular testing methods respectfully.

By not giving proper diagnoses to patients, the amount of funding can go towards patients that do not need the medical treatment, or vaccinations can give patients a false sense of security of being protected from TB. If the patient has latent TB, debate on treatment options is discussed between the healthcare provider and patient on their chances for developing active TB.

In China, because there is a higher rate of TB, new technology has to be developed in order to keep up with this rate. A new rapid TB diagnostic test has been developed used in many Chinese TB clinical laboratories. This new technology is called the simultaneous amplification test (SAT), having higher sensitive by targeting 16S rRNA, allowing the test to perform on live bacterial detection. SAT has been quicker and simpler as it has low cross-contamination, performing rapid amplification in 40 minutes, completing the total procedure in two hours once the sputum is processed with clear results of positive or negative TB. SAT is also able to detect drug-resistant strains and has been made suitable for resource-limited laboratories (<http://www.ncbi.nlm.nih.gov/books/NBK195973/>).

2.3 Types of Drug Treatments

Most non drug-resistant TB patients can be treated with first-line drugs, the most powerful first line drugs are isoniazid and rifampin. To cure MDR-TB, healthcare providers use a combination of drugs that includes second-line drugs. Treatments for MDR-TB and XDR-TB drugs may have more side effects, longer drug treatment regimens, and costs may be up to 100 times more than first-line therapy. Strains of *M. tuberculosis* can grow resistant to second-line drugs.

MDR-TB is defined as isolates of *M. tuberculosis* that are resistant to first line drugs (FLD) used for treatment. Extreme-Drug Resistant (XDR-TB) is also resistant to any fluoroquinolone and to at least one of three injectable second-line anti-TB drugs. To treat MDR-

TB and XDR-TB, drug regimens requires less effective and more toxic second-line drugs, and longer duration of treatment. MDR-TB affects about 0.5-2 million people annually.

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2.4 United States TB Control System

In the United States, TB has not been an epidemic since the mid 1980's to 90s. Since 1992, TB incidence rates have decreased by 45% as the healthcare infrastructure and resources were reorganized and allocated. TB control in the United States is now in a state from low incidence to elimination according to current epidemiologic trends. The Advisory Council for the Elimination of Tuberculosis is currently focusing on improving strategies on the current 22 states with low-incidence rates, to improve rates of TB at the moment

(<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5105a1.htm>).

In Oregon, the health management system is called the Oregon Health Authority. The TB Control program in Oregon works with local health departments and private medical providers to:

1. Identify and treat TB disease
2. Identify, evaluate, and treat newly infected contacts to infectious TB cases
3. Screen high-risk populations for TB infection

Oregon's TB Control program provides lab testing, technical assistance, medications, and analysis of surveillance data to assist accomplishing these goals.

Regulations for TB control from Oregon Health Authority (333-018-00(00),(05),(10),(15) requires all health care providers and laboratories to report cases or suspected cases of TB infected patients within one working day to the Local Public Health Authority. Guidelines are followed in all health care facilities.

- 333-019-0041(3) School Rule dropped from admin rules (since 2005), public schools are no longer required to do TB screening on selected foreign-born students entering Oregon schools under state law.
 - o Local health authority may elect to mandate targeted TB testing on populations within their jurisdiction whom they determine are at high risk for TB
- **ORS 433. 121:** Isolation and Quarantine
 - o Addresses public health emergency administrative orders for isolation and quarantine

Oregon Legislature: Laws and Statues

https://www.oregonlegislature.gov/bills_laws/lawsstatutes/2013ors433.html

- **433.329 Reporting Known cases; records maintained:** any representative or having knowledge of pulmonary TB case existence, including infected person must report to Oregon Public Health Authority
 - o names and addresses of all persons reported having Pulmonary TB shall be recorded with the authority
- **433.332 Investigation and control of reported cases; rules**
 - o Oregon Health Authority shall, upon receiving report, investigate to determine whether or not person has communicable TB, control will be exercise over

affected person and contacts with other persons as may be necessary for the protection of the public health, pursuant to its rules and regulation

- Rules or orders governing person's conduct as are necessary to prevent spread of disease

- <http://public.health.oregon.gov/DiseasesConditions/CommunicableDisease/Tuberculosis/Documents/9989TBfactsheetfinal.pdf>
 - Local health departments are provided by TB Prevention and Control Program, with medications, payments for chest x-rays, and funds (as available) for housing, food or transportation for patients to adhere to treatment regimens
 - Funding: TB program receives \$ from CDC and state General Fund moneys

2.4.1 World Health Organization TB Management Guidelines

The World Health Organization has created a guideline for the management of MDR-TB for healthcare providers. It consists of many visits that are made monthly to ensure that patients have enough funding and medication in their care plan. If the treatment involves injections, the closest health care center is provided with the medication, and arrangements are made for the patient for visits to be giving injections daily for at least six months. Patients are also required to be arranged with a treatment supporter so at least one person in the patient's life has extensive knowledge of the treatment plan and the doses of the medication. Patients are supposed to be provided food packages, and transportation money so that they can fund the treatment supporter to take them to the designated healthcare center for medication. Treatment supporters are also required to attend all follow-up visits with the patient to ensure patient is receiving correct amount of medicine doses.

2.4.1 United States Management of Migrant Farm Workers

In the United States rural population, migrant farm workers (MFW) are considered high risk for being infected with TB. Majority of cases recorded between 1993 to 1997 were from Florida, Texas, and California as majority of the workers considered these their primary home bases. Work travels were done in the East Coast, Midwest, and West Coast. A migrant farm worker was defined as "a person whose primary job was in seasonal agricultural work anytime

in the two-year period preceding the diagnosis of tuberculosis.” Similar to China’s rural migrants, the MFW population must travel for their work and can have temporary housing, they were not considered homeless because they moved often but may become homeless while traveling. Workers who did not travel were not included. TB cases for patients born outside of the United States were classified as foreign-born cases (https://muse-jhu-edu.ezproxy.proxy.library.oregonstate.edu/journals/journal_of_health_care_for_the_poor_and_underserved/v012/12.3.schulte.pdf). TB infected farm workers were most likely to be male, Hispanic, and foreign-born rather than nonmigrant farm workers. No difference was seen between the two groups in the number of years workers reside in the United States for before TB was diagnosed. From the foreign born workers, 79% of the workers originated from Mexico while nonmigrant born workers, 21% were from Mexico.

Though it was seen in a case study that migrant farm workers sometimes may be undiagnosed because of their tendency to move and not seek medical care. In a case study (Poss), approximately 2/3 of migrant workers that were interviewed in the study stated they would seek out treatment either in the United States or in Mexico and had a general understanding that medication was a vital part of the treatment.

2.5 China’s Healthcare History

In 1978, Deng Xiaoping made many different reforms to China’s economy which included financial funding towards healthcare. Most of the central government’s investment in health care and public services were reduced, national health care spending decreased from 32% to 15%. To make up for the loss in health care funding, provincial and local authorities were required to make up for this by local taxation. These reforms affected rural areas greatly, as majority of China’s population lived in the poor region. Decreasing governmental support resulted in the development of private Chinese health care facilities and the way public hospitals

ran. Public hospitals became more like for-profit entities, while private health care facilities became dependent on private market sales to cover their expenses after governmental support decreased.

The prices that publically owned hospitals and clinics charged for services such as routine visits, surgeries, standard diagnostic tests, routine pharmaceuticals, and others were tightly regulated by the government. But this price regulation system allowed facilities to make a profit from new drugs, tests, and technology that had profit margins of 15% or more. Health care become increasingly more difficult to afford as the government also changed the salary systems to compensate hospital physicians to earn bonuses that would be determined based on the amount of revenues they would bring to their hospitals. Revenues were based on the profits from new drugs and technologies sold to their patients. Often, unnecessary medical services were provided which further forced patients to pay for unknowingly, and majority of health care spending was paid for by out-of-pocket as insurance programs collapsed.

2.5.1 Effect of China's Economic Changes to Insurance Programs

In rural areas, the CMS fell apart because of the governmental support decreased, SOE employment decreased because their employers were unable to provide insurance coverage from the LIS scheme. Not only the CMS fell apart, but the LIS did as well, and as a result majority of the population in rural areas became uninsured. While governmental support decreased, insurance coverage in both rural and urban areas decreased. Those who kept their insurance coverage, were required to pay-out-of pocket expenses for health care more frequently because of increasing health care costs from private health care facilities and public hospitals.

Barefoot doctors became unemployed and in order to continue working they had to become private health care practitioners, and start providing health care services that they were

previously untrained for which makes it doubtful whether to trust their quality of healthcare or not. These doctors also discovered that selling drugs provided a way to make a profit and survive economically. Therefore, drug sells also increased in not only urban areas, but rural as well.

Lastly, the Chinese government decreased funding for local public health efforts and programs from about 60% to 42%. To make up for the loss of funding, the central government allowed local public health agencies to deliver personal medical services and charge for specific public health inspection services. Inspecting services for sanitary conditions of facilities for example hotels and restaurants, and the compliance of industries with environmental regulation. This resulted in local public health authorities to focus generating profits through activities and less focus on health education, maternal and child health, and epidemic control.

Around the 1990s, some efforts were made in attempt to reform the CMS but were mostly unsuccessful. The Central Chinese government turned its focus to provide all urban formal-sector workers, not including their dependents health insurance, this plan was known as the Basic Medical Insurance (BMI), and attempts to control medical costs were made. But drug price regulations were changed, based on controlling certain retail drug prices. Only about 49% of urban Chinese, 7% of rural Chinese residents, and 3% of residents in China's poorest rural western provinces had health insurance by 1999. Having quality health care services and access to it became dependent on the consumer wealth. Also, in the rural areas, the quality and quantity of health care facilities and providers were low in comparison to urban areas. Providers in rural areas, who were previous barefoot doctors that were untrained in certain medical services, had to depend their income by selling drugs and providing intravenous infusion, known to cause many problems in China. Also adding further problems to health care in China, approximately one third of drugs sold in rural areas are counterfeit as well.

2.6 China's Current TB Healthcare Management System in Rural Areas

China's TB management system today is based on a centralized management system. If TB patients show symptoms, they should be referred to the county TB dispensary where free services like microscopy and WHO DOTS chemotherapy is provided. Outside the CTD, village and township hospital doctors should only supervise TB patients during their course of treatment.

In rural areas, the current health care service system is split into three-tiers based on level of services provided. In the primary tier, are the village clinics providing basic acute and preventative care. Secondary tier are township hospitals, providing public health services, and basic inpatient care, the center township hospitals are usually better equipped and staffed compared to China's other healthcare facilities, providing technical support to surrounding township hospitals. The third and last tier is the county hospitals, providing specialized outpatient and inpatient care. Compared with the east rural areas, the western rural areas are more poorly financed (<http://www.biomedcentral.com/1471-2458/11/103>).

The two main TB control programs implemented in China are the National TB Control Program, funded by the Ministry of Health (MoH) and the Infectious Endemic Disease Control Project (IEDC), funded by the World Bank Loans. Both programs followed WHO's 'directly observed treatment short course' (DOTS) strategy, containing the five elements: 1) political commitment with increased and sustained financing, 2) case detection through quality assured bacteriology, 3) standardized treatment with supervision and patient support, 4) an effective drug supply and management system, and 5) monitoring and evaluation system and impact measurement. As long as patients went and registered to these CDT dispensaries, regardless if they were smear-positive or negative, patients would be provided with free diagnostic and treatment services.

2.7 Cost Access, Contradictions in China's Free Tuberculosis Treatment Policies

Though free treatment is given, it is still difficult to decrease the TB relevance when detection rate of TB is low to begin with. According to 2000 survey, detection rate was recorded to be 30%, but in IEDC project areas, detection rate for new smear-positive cases was estimated to be 54% in 1998¹. With these numbers differing from each other, this implies there may be a larger group of infectious TB population who may not be diagnosed and treated appropriate and in a time efficient manner, resulting the patient to suffer because of the disease and continue to present as a risk factor to infect other people in society.

The costs of drugs and medical treatments has increased so much over the years, in Mongolia 70% patients have reported in a case study that while seeking out healthcare, they end up with debt as they could not afford treatment. In order to continue their treatment, patients had to stop the treatment regimen in order to earn more money for it as family savings were used up when paying for the treatment. Survey results showed that 98% of the 614 people surveyed did not have any kind of health insurance coverage. Approximately 65% of China's population lives in rural areas, 10% of rural population are covered by rural CMS. Majority of rural Chinese populations have to pay out of pocket². Because many people struggle to afford medical care, infected rural migrants tend to work and live in the urban areas³. The number of TB patients who are rural migrants are increasing and it is difficult for healthcare providers to manage the growing number of patients. These patients often live in poorer conditions, unable to afford medical insurance and have a smaller income than the typical urban resident. These migrants are known as the "floating population" (lecture

¹ Ibid. 98.

² Wagstaff, Adam, Winnie Yip, Magnus Lindelow, and William C. Hsiao. "China's Health System and Its Reform: A Review of Recent Studies." *Health Economics* 18, no. 2 (2009): S7-S23. Accessed January 10, 2015. <http://onlinelibrary.wiley.com/doi/10.1002/hec.1518/pdf>.

³ Wang, L., J. Liu, and D. Chin. "Progress in Tuberculosis Control and the Evolving Public-health System In China." *The Lancet* 369, no. 9562 (2007): 691-96. Accessed January 14, 2015. <http://www.sciencedirect.com/science/article/pii/S014067360760316X>.

notes). They move to many places and municipal TB control centers have found it difficult to monitor and treat these TB infected migrants.

Health care providers reported in a case study done in the Suzhou, Jiangsu province of China, that they are willing to treat these migrant workers as they see them as the major source of TB cases in the county. But they have found it difficult to reach and monitor these patients as they are very mobile and do not always give their exact addresses.

Though IEDC project policy states that smear-positive TB patients should receive free treatments and reimbursements for all expenditures, including diagnostic tests only if they received medical care from appropriate county TB dispensaries. If care was done at a non TB-related care at county general or township health centers (**look back to source**), patients had to pay for all tests and treatments without reimbursements. According to a 2002 nationwide TB epidemiologic survey, in IEDC project areas it was found that less than 20% of TB patients were able to obtain free treatment and were eligible for the reimbursements and expenditures related to TB diagnostic tests.

But in some studies that were done in some of the project provinces, some of the county TB dispensaries did not follow policies of providing free treatment to smear-positive TB patients⁴. Drugs were charge with fees, patients were asked to take extra unnecessary diagnostic tests to generate more revenue for health facilities⁵. When asked, health managers from these facilities stated that because they were unable to get sufficient funds for the IEDC projects, even when corresponding local governments stated they would receive funding before projects started, the only way to fund the costs of the project they had to start charging TB patients.

⁴ Ibid. 98.

⁵ Ibid. 98

In Wanzhou district of Chongqing, researchers found that when the IEDC project was first implemented in the 1990s, TB dispensaries tended to extend TB standard treatment from six up to nine to twelve months for new TB patients. IEDC project only provides six months of free treatments and for the extended treatments, patients must pay for. Physicians from this district reported that the reasoning for the extended treatment was to ensure patients were fully cured and prevent future relapse, not only the revenue would be used to fund TB control projects and facilities, but they would be used to fund health care workers as well.

Another factor in the healthcare treatment is that there is overall poor quality in TB health care provisions. About 70% of total TB patients would fail to complete their complete TB standardized treatments⁶. Majority of these patients would be people who did not register with their county dispensary⁷. But in comparisons, patients who did register to their county TB dispensaries versus who did not, the amount that received the recommended standardized anti-TB treatments were only 61% and 21% respectively⁸. Though there are many factors that may explain why patients fail to complete their complete TB standardized treatments, this will be further analyzed later in this paper when looking at social stigmas.

Even though through statistics it can be seen that China has made improvements decreasing TB mortality, when comparing to other neighboring countries their rates were much more rapid compared to those in China between the time period from 1990-2004⁹. According to TB epidemiology surveys taken nationwide, with China's increasing growth, the amount of smear-positive TB patients has increased as well from 1990 to 2002. The rate of TB detection rate remains low at 30%. These numbers indicate that there are more factors that must be

⁶ Ibid.99.

⁷ Ibid.99.

⁸ Ibid.99

⁹ Wang, L., J. Liu, and D. Chin. "Progress in Tuberculosis Control and the Evolving Public-health System In China." *The Lancet* 369, no. 9562 (2007): 691-96. Accessed January 14, 2015. <http://www.sciencedirect.com/science/article/pii/S014067360760316X>.

taken in account for in order to prevent the growth of infected TB patients. Not only the quality of the health care system can affect the treatment of TB, but the social stigmas can affect the motivations of TB infected patients choice in seeking medical care.

2.8 China's Registration System (戶籍/Hukou System)

Another difficulty that urban migrants and their families face when seeking healthcare in the cities is the restrictions of the hukou system, the household registration system. When moving to the city, everyone must register in order to be an official resident of the city they reside in. Often, urban migrants are not registered as official residents and therefore, are not entitled to housing, education, social security or medical benefits as an official resident would be. As a result, urban migrants would have lower social and economic class level, limited knowledge of TB and higher risk of contracting, lower access to TB care, poor treatment outcomes and higher drug resistance rates. In China's urban areas, migrants account for at least one third of TB cases since 2000.

2.8 Associated Social Stigmas in China

Besides financial difficulties, treatment from communities and lack of TB education can affect people's choices on seeking out treatment. Various social stigmas impact these choices as people fear their communities will discriminate them. Social stigmas that are associated with TB infected patients are that men or women will have difficulty in finding a marriage partner, their communities will exclude them and discriminate against them, the difference in importance of women versus men roles in the household, and elderly people's views of their age being a factor.

In Mongolia, China, twenty focus group discussions that included farmers, 614 randomly selected participants were surveyed on the perceptions of TB and how communities in these

areas sought out health care. It was found that a portion of the community were unaware of how the process of TB transmission works. According to the survey results, from the 590 respondents, 60% of people responded that they identified a prolonged cough as a main symptom of TB, while 40% responded that being within close interaction of a TB patient caused TB. These survey results implies that TB control education has not done enough to spread awareness. Contributing to the lack of knowledge of TB causes social stigmas, and results in discrimination, apprehension towards TB patients (**reread this article**).

2.8.1 Marriage and Family Status

In a case study conducted in the inner rural communities of Mongolia, China. It was reported that unmarried men felt that if diagnosed with TB they would have difficulty in finding a marriage partner, only if they were completely cured. While women who reported that they would be able to find a partner, but their parents would retrieve less betrothal gifts in comparison to women without TB. Many women feared (**reread this part to confirm**) that if their spouse knew they had TB, they would be divorced. Engaged men feared of a broken engagement if their future in-laws were informed of their health status. Families would not let their children marry a TB or ex TB patients because they would perceived that their offspring would not be as healthy as TB patients were seen as unclean and impoverish the family line.

2.8.2 Gender Role Association between Men and Women

Two of the main reasons people delay in seeking healthcare are poverty and lack of income. In a case study done in Shandong province, results showed that females delayed in seeking health care more compared to men (**reread article**). Those who went to the village clinic as their primary health care facility, experienced a longer health system delay. In age groups between 41 to 60 years, often delayed seeking health care as they saw themselves as

the providers for both children and parents economically with food and incomes. Providers felt that they did not have to leave their roles if their illness was not affecting their work, also they felt that they did not want to spend money on treatment until their illness becomes severe.

While in another case study done in rural Jiangsu Province, China, researchers covered areas with and without the National TB control program. Results showed that women, especially if their family had poor economic status hesitated more compared to men in seeking out health care. In a community perspective, men's health is viewed to be more important than a woman's as men are the primary care providers in income for families. So if a man was sick, communities view that they understood that it was more urgent that the man would seek out treatment, while women felt that they understood how difficult it is to earn money so they will not seek out treatment in order to save money. If women did receive treatment for their cough, they would go to the village health station first because of the distance convenience and medicine costs would be cheaper.

Similar in Shandong Province, China, women felt their value to contributing to the family was less important compared to the role of men, and felt that spending money on their health care would be a waste and would rather save it.

2.8.3 The Elderly

For elderly people, in Jiangsu Province, China. It was seen that elderly people would seek out health care much later compared to young people and they would also go to the village health station for treatment first. Majority of elderly people reported that they would drink warm water and rest more until their illness gets worse, and as a result according to health care providers, elderly patients would develop cavities on their lungs and hemoptysis, both being symptoms of late stage TB.

In Shandong Province, though in Chinese society their children would pay for their medical care, they felt that their needs were less than children, and that they did not want to use their children's money as their money should be used for higher priorities such as grandchildren's education. They did not see themselves as important and feel that they did not want to waste the money their children worked so hard for.

2.8.4 Community Discrimination

Lastly, in community interactions, TB patients often felt treated and excluded. In both case studies from Mongolia and Jiangsu, responses to surveys were very similar. In both areas, community members stated that they do not discriminate against TB patients, they do admit that they do not like patients visiting their homes, being within close contact of children and sharing food. Respondents reported that they would avoid visiting TB patients at their home, but if patients came to visit, host would still offer their guests snacks and meals, but take the time to wash the food and drink utensils that TB patients used separately and thoroughly.

CHAPTER 3 METHODS

What I did first for my research was decided that I wanted to study the efficacy of China's Tuberculosis program control, in order to do that I knew I had to first understand the functions and basics of China's health care systems. In different sections, I will discuss the different factors I researched, using literature reviews, research, and case studies I have found. Using government and school based databases, search engines I was able to find my sources for my research. How I wrote my paper I focused on three major factors that I believe affects China's healthcare system from being able to decrease the rates of Tuberculosis. The three main factors that are focused is the people's access to healthcare, the cost efficacy of healthcare, and the social stigmas associated with Chinese people's views of Tuberculosis

First Topic Researched: China's Healthcare System History

1. Key words: "China Healthcare" "Healthcare System" "Healthcare System Reform"

Second Topic Research: Background on Tuberculosis

2. Key Words: "Tuberculosis" "Tuberculosis Mycobacterium" "Multidrug-Resistant TB" "Multidrug-Resistant Tuberculosis" "MDR-TB" "Tuberculosis process"

Third Topic Research: United States Healthcare Policy and Tuberculosis Procedures

3. "United States Health Care" "United States Healthcare policy" "United States Tuberculosis Program" "United States Tuberculosis procedure" "Tuberculosis Policy United States"

Fourth Topic Research: China's Healthcare Policy and Tuberculosis Procedure

4. "China Tuberculosis Control Program" "China Tuberculosis Policy" "China Tuberculosis Medicine Access"

Fifth Topic Research: China's Social Stigmas and Access to TB Medicine

5. "China Tuberculosis Social Stigma" "China Rural Area Access Tuberculosis Medicine"
"China Rural Migrant Access Medical Care" "China Rural Area Access to TB" "China
Urban City Access Medical Care"

Sixth Topic Research: United States Access

6. "United States Rural Migrant Workers Access Tuberculosis" "United States Minorities
access to Tuberculosis Medicine" "United States minorities Medical Care Tuberculosis"
"Rural Migrant Workers United States Healthcare"

CHAPTER 4 FINDINGS

4.1 United States versus China Comparison of Government Role

While both countries had periods of TB epidemics, both countries had turning points in their government roles for action and funding allocation to their projects. In the United States, attention and action was not addressed until the mid 1990's, while in China the progress is slow and a turning point has been made after the SARS epidemic in 2000s.

United States Government role was not supportive until the late 1990s, now currently being one of the largest supporters in global TB control. Also in 2003, with the passing of the legislation that started the President's Emergency Plan for AIDS Relief (PEPFAR), this expanded global efforts to control to AIDS, made TB global control an important priority in the US today.

TB program control has become such a priority, money allocation has increased and assigned for bilateral and multilateral efforts. Another legislation, the *U.S. Leadership Against HIV/AIDS, Tuberculosis, and Malaria Act of 2003* was created to fund efforts, private institutions. The act was reauthorized in 2008 for a further five years of funding (<http://kff.org/global-health-policy/fact-sheet/the-u-s-government-and-global-tuberculosis/>).

Currently, the United States government also developed a five year plan called *USG TB Strategy 2015-2019*, outlining goals to treating and maintaining treatment for smear-positive TB, MDR-TB cases, and providing antiretroviral therapy to 100% of co-diagnosed HIV and active TB patients.

While in China, Tuberculosis is still one of its largest public health epidemics, having the second leading highest Tuberculosis epidemic in the world. After the SARS epidemic occurred, in the 2000's the Chinese government suddenly, along with IEDC and MoH, the central and local movements have been making political and financial commitment to make the fight

against TB a higher priority. Currently, China's political commitment to public health and Tuberculosis has increased, with the central government spending on TB control jump in 2001 to 2010, from 40 million Chinese yuan to 580 million yuan, approximately 6.5 million to 94 billion in USD. Though 31% of China's TB control funding was from external support, the two main supporters, the World Bank and Global Fund has either ended or decreased their funding which can affect China from further improving their health care

(<http://www.sciencedirect.com.ezproxy.proxy.library.oregonstate.edu/science/article/pii/S0140673612609428>).

4.2 Management of TB Control

Though both in the United States and China, policies state that TB patients shall receive free treatment and examinations towards TB, or provided with reimbursements, doctor and patients responses both differ how TB is managed. In the United States, as referred into the background, using Oregon as an example if a patient is diagnosed positive for TB, all healthcare providers, and facilities are required to report cases or suspected cases of TB within one working day to the Local Public Health Authorities. Cases are reported immediately to state level even if the case is suspected, healthcare providers are required to report cases and patients are required to be recorded with complete information.

4.3 United States Tuberculosis Epidemiology Data

According to most recent data, in the United States and district of Columbia there were about 9,582 reported TB cases, this trend has decreased by 64% since 1992 (Figure 1).

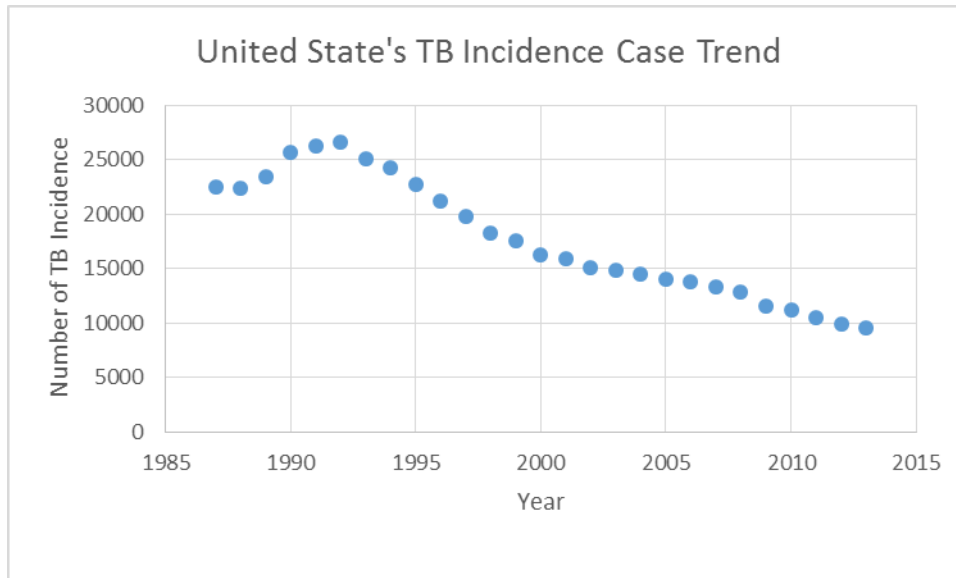


Figure 1. United State’s TB Incidence Case Trend from 1987-2013.

Compared to 2012, the number has decreased about 3.6%. The states that comprise 51% of the national case total are California, Texas, New York, Florida. According to Center of Disease Control data, out of all minority groups Asians are reported to be the minority group with the largest number of cases which is 31%, those that are born outside the United States, foreign-born, comprised 46% of foreign-born cases which contributes 30% of the national TB case total. CDC data shows Asians to have the highest rate case per 100,000 persons overall out of all minorities, while whites have the least amount of rate cases per 100,000 persons (Table 1).

Ethnicity/Minority Group	Rate of Cases per 100,000 Persons
American Indians or Alaska Natives	5.4
Asians	18.7
Blacks or African Americans	5.4
Native Hawaiians & Pacific Island	11.3
Hispanics or Latinos	5
Whites	0.7

Table 1. United States Tuberculosis Trend Data collected from Center of Disease Control Database.

While rates of MDR-TB cases have decreased since 1993 after the TB surveillance system has undergone changes to include drug-susceptibility results. Although the number of cases has increased slightly from 86 to 95 cases in 2012 and 2013 respectively with culture-positive TB cases with initial drug-susceptibility results. For foreign-born persons, the number of reported MDR-TB cases has increased from 30.8% to 89.5% which is 149 out of 484 reported cases to 85 out of 95 cases in 2013 respectively. The rate of foreign-born MDR-TB cases continues to increase since 1993, in 2013 the increase was 65% nationwide. Out of all the minority groups, Hispanics and Asians comprise 51% of the nationwide MDR-TB case total. The top five countries foreign-born TB infected people originally came from were Mexico, the Philippines, India, Vietnam, and China. From the total MDR-TB cases, 88% were reported to have positive HIV results, and 65% of TB cases were foreign-born person's case, the most the US has had in years since 2001 which is 13 times higher than US born people. Shown in a graph, the percentage of MDR-TB patients has decreased from 3% to 1% from 1993 to 1998, and has remained stable from 2009 to 2013 at about 1% (Figure 2).

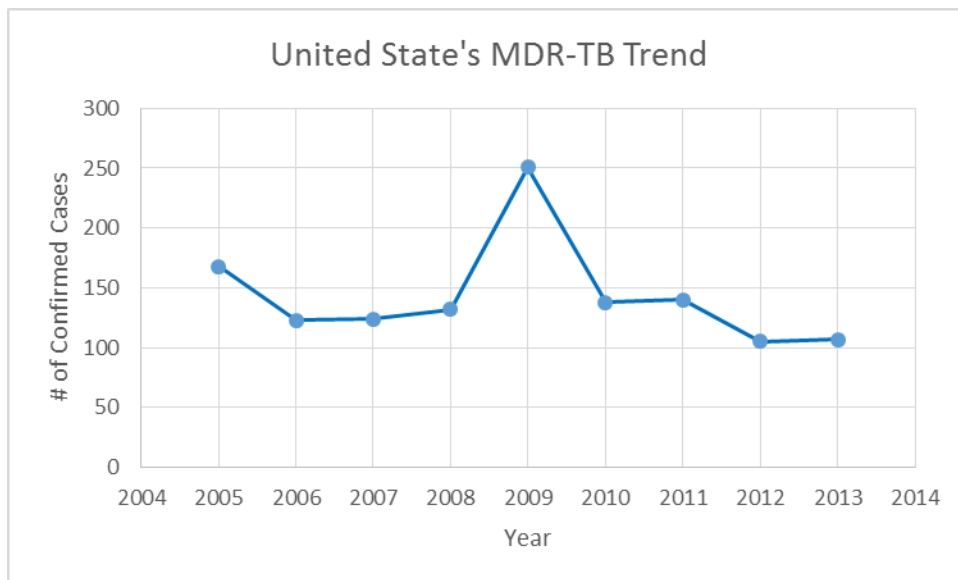


Figure 2. United State's MDR-TB Trend of Confirmed cases from 2005 to 2013 (World Health Organization).

In 2013, there were only four reported cases of XDR-TB and since 2009, the nation total has been 12 cases of XDR-TB, nine of the cases were from foreign-born people.

4.4 China Tuberculosis Epidemiology Data

In China, there is no exact numbers on the amount of TB incidences, MDR-TB, XDR-TB, or other Tuberculosis data. Only information that can be found are estimates, provided by the World Health Organization. There are about 120,000 new MDR-TB cases and 9,000 XDR-TB cases that occur annually. But while looking at trends, China's TB Incidence case trend has decreased since 1990 from estimate of 18,000,000 to an estimate of 1,000,000 cases in 2013 (Figure 3).

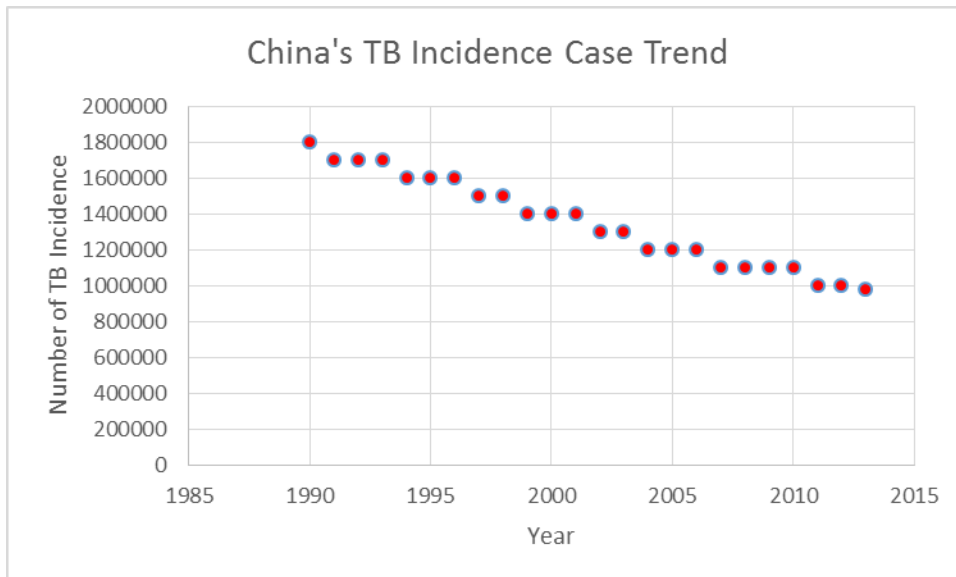


Figure 3. China's TB Case Incidence Trend from 1990 to 2013 (World Health Organization).

Although China's trend of new confirmed cases of MDR-TB cases has increased since 2005 to 2013, from 2 to 4,193 confirmed reported cases (Figure 4).

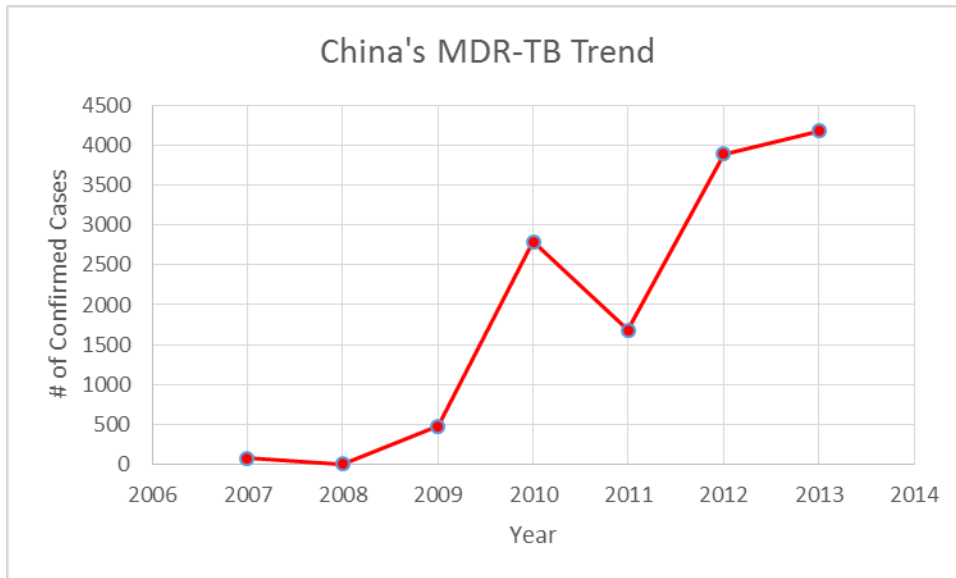


Figure 4. China's MDR-TB Trend of Confirmed cases from 2005 to 2013 (World Health Organization).

4.5 China and United State's Comparison Epidemiology Data

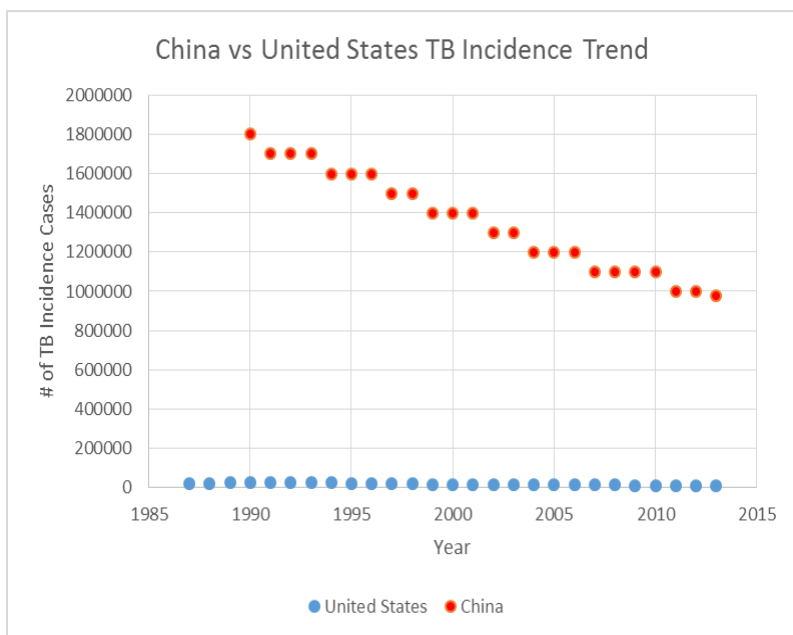


Figure 5. Comparison of China and United States number of TB incidence Cases (World Health Organization).

Number of TB Incidences		
Year	*United States	China (Estimates)
2013	9582	980000
2012	9945	1000000
2011	10517	1000000
2010	11163	1100000
2009	11520	1100000
2008	12895	1100000
2007	13282	1100000
2006	13727	1200000
2005	14061	1200000
2004	14498	1200000
2003	14835	1300000
2002	15055	1300000
2001	15945	1400000
2000	16308	1400000
1999	17499	1400000
1998	18287	1500000
1997	19751	1500000
1996	21210	1600000
1995	22727	1600000
1994	24205	1600000
1993	25103	1700000
1992	26673	1700000
1991	26283	1700000
1990	25701	1800000
1989	23495	
1988	22436	
1987	22517	

Table 2. Raw Data comparison of United States and China’s number of incidence cases. United State’s data is from CDC database, while China’s data is from WHO database.

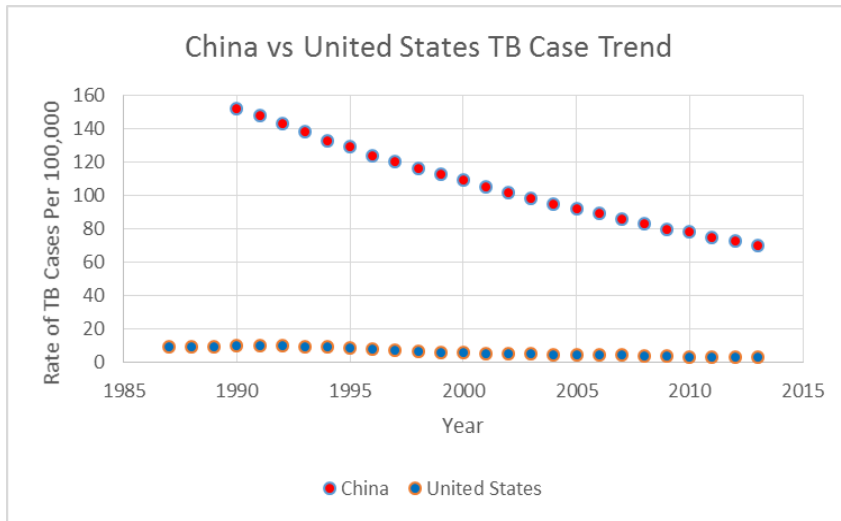


Figure 6. Comparison of China and United States rate of TB cases Cases per 100,000 persons (World Health Organization).

Number of TB Cases per 100,000 Persons		
Year	China	United States
2013	70	3
2012	73	3.2
2011	75	3.4
2010	78	3.6
2009	80	3.8
2008	83	4.2
2007	86	4.4
2006	89	4.6
2005	92	4.8
2004	95	4.9
2003	98	5.1
2002	102	5.2
2001	105	5.6
2000	109	5.8
1999	113	6.3
1998	116	6.6
1997	120	7.2
1996	124	7.9
1995	129	8.5
1994	133	9.2
1993	138	9.7

1992	143	10.4
1991	148	10.4
1990	152	10.3
1989		9.5
1988		9.2
1987		9.3

Table 3. Raw Data comparison of United States and China’s rate of TB Cases per 100,000 person (World Health Organization).

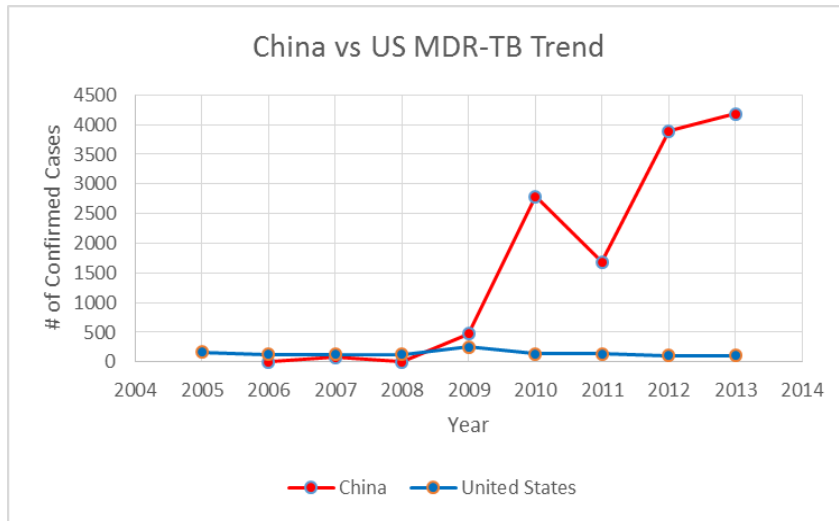


Figure 7. Comparison of China and United States number of confirmed MDR-TB cases (World Health Organization).

Number of Confirmed MDR-TB Cases		
Year	China	United States
2013	4183	107
2012	3891	105
2011	1686	140
2010	2792	138
2009	474	251
2008	0	132
2007	79	124
2006	2	123
2005		168

Table 4. Raw Data comparison of United States and China's number of confirmed MDR-TB cases (World Health Organization).

4.6 Differences in Social Stigmas

Social stigmas seems to be another huge aspect that prevents people in China to go out of their way for treatment. Reasons for people's choice in choosing not to take TB treatments varies in the different age groups. In the elderly age group, many people have reported that because of their age they saw that there was no reason to obtain treatment, and did not want to waste their children, the younger generation's money and time for treatment. While the younger generation, choices related to fears of engagements being broken, marriages ending, and having employers informed of their health conditions and releasing them from their positions. Both age groups feared that their families would face community discrimination as many people fear of being infected themselves and being spread to their children.

While in the United States migrant farm workers, while the difference in respondents were male, Hispanic farmworkers in a case study (Poss), approximately 2/3 of migrant workers that were interviewed in the study stated they would seek out treatment either in the United States or in Mexico and had a general understanding that medication was a vital part of the treatment. The only fear that reasoned why migrant farm workers do not seek out health care is the risk and fear of being deported from the United States.

CHAPTER 5 DISCUSSION/ANALYSIS

When comparing the United States and China, there are similar factors and yet different factors that separates both countries success in TB control. Both countries has made cuts in their funding for TB control, but the main difference is that China's TB rate is so much more than America's rate that it needs the outside sources and funding for its program control. China's situation is larger compared to the United States because also while comparing the rural migrant population's understanding of TB, China has many social stigmas that prevents many people from seeking out medical treatment.

These social stigmas, especially with women and the elderly causes delay in the treatment and the important aspect that needs to be addressed is that TB needs to be diagnosed early. By detecting TB too late, these frequent migrant workers are the biggest factor in spreading TB in not only rural areas, but the urban areas where the populations are larger. Chinese rural migrants seem to be less educated and place their health at a lesser priority compared to American farm workers, as the main factor for Chinese rural migrants' state that they do not want to waste money if they can still work and fear the discrimination that comes with having a positive diagnosis. While in American farm workers, there seems to be a mutual understanding that if they do not get treated, their "lungs finally will just give out." Though there are a few workers that do have a fear of talking about having TB, others reported that they would be happy to talk about it so they can seek out advice in treatment.

CHAPTER 6 LIMITATIONS/FUTURE STUDY

Because my research was conducted through secondary research, obtaining information through case studies and research done by other scientists and researchers, one of the limitations was that I was unable to conduct my own research and obtain information. Another barrier is the language barrier as my Chinese language skills are not fluent enough to read articles in Chinese, there could be more information that highlights China's biggest concerns that we are missing to understand the current situation today.

Other factors that I was unable to include was other health factors that can affect TB status in patients. Health issues, like alcoholism, immune compromising diseases like HIV and AIDs can affect patients. That seemed to be another differing factor between China and America, that America pushed legislations for public health efforts to be made that included TB as a primary health factor. TB was seen as a combining factor for other health issues in America, while in China it was entirely its own issue considering it is still one of the world's largest epidemics now.

One of the differences between China and the United States that was a factor that I was unable to include in my research was how the effect of air quality contributed to rates of TB. Because there are more industries and factories in China compared to the United States, China typically has more air pollution quality that could contribute to how it affect's populations health status and TB rates. Possible future studies could look into how air quality can be a factor in the rate of TB, see if it is a contributing factor in patient's health status.

When obtaining data on China and United States current trends of TB incidence cases and MDR-TB cases, many obstacles were faced. On CDC's databases, there was no documented data sets for China and has not been updated since 2011, while there was for the United States and has been recently updated in 2014. Estimates of China's and further data on MDR-TB trend

for United States, had to be obtained from WHO's databases. Though most recent TB trend data could only be obtained up to 1987 for the United States, while for China it could only be obtained up to 1990.

Other limiting factors that are difficult to measure, but can account for TB trends in both China and the United States are disparities such as language barriers, majority and minority groups in both countries, considering looking at the trends for both countries, China's trends come from rural migrants which often come from rural areas with minority groups, and in America cases are from racial/ethnic groups and foreign-born minorities. Also, factors that can account for the health status of people and communities are: ethnicity, occupation, incarceration status, immigration status, country of birth, homelessness, and resident of long-term facility at time of treatment, HIV status, and receipt of treatment.

A last factor that I was interested in and was unable to include in my research was how the health status of healthcare workers themselves affected the management of TB. Because healthcare workers are constantly surrounded by TB patients, it is possible that healthcare workers can develop latent TB themselves. Could the health status of healthcare workers be also a primary concern for the prevention of decreasing the TB rates? People reported that they would usually seek out treatment if their health status is compromising, but if healthcare workers are not going out of their way to even cure their latent TB, this can be another factor for future researchers could look into in understanding possible reasons for what is preventing not only China, but other's countries goals in decreasing TB rates as well.

CHAPTER 7 CONCLUSION

Although China and the United States both have trends that are decreasing in the number of cases of TB, China still has much more factors to deal with compared to the United States. Factors that China needs to address to be its allocation in government funding and role in public health, reforming TB control programs, and breaking its social stigmas.

Funding should be addressed more towards public health education and providing knowledge to all of China's residents. Education is the primary factor that informs people of the risk factors associated with TB, without the knowledge and understanding of the disease is why the social stigmas are formed. By being able to eliminate the social stigmas, eliminates the fears that prevents people in delaying seeking out healthcare, and therefore addresses TB cases earlier before they can develop further and spread to communities surrounding the infected individual.

Because there are many disparities in the different types of healthcare facilities, TB hospital versus non TB hospitals, leads to healthcare providers unsure of what their obligations are to their patients and the kind of healthcare they can provide. Often patients seek healthcare at these non-TB hospitals that are unequipped to providing the necessary TB treatments they need. The different drug protocol standards can cause people to be because misinformed of the proper treatment plan they need to be on. All healthcare facilities and providers should follow a universal TB protocol considering China's epidemic will be an occurring problem for many years. China needs to address and integrate its healthcare facilities that will form a collaboration between all nationwide hospitals, and TB control centers in order to address China's challenges in controlling TB.

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APPENDIX A

APPENDIX B