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# A Look at Tuberculosis and Multi-Drug Resistant TB in the United States & China

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## Abstract:

There are many things plaguing the world today, one of them is *Mycobacterium tuberculosis* otherwise known as Tuberculosis (TB). Since its origin TB has become more virulent against antibiotics and became multi-drug resistant (MDR-TB). Two countries come to mind for comparison, China and the United States. China is having severe problems with the disease while the United States is managing it a bit better. Each country has unique circumstances and the statistics show that both may be doing better with just TB but MDR-TB is sticking around and gradually becoming more and more of an issue.

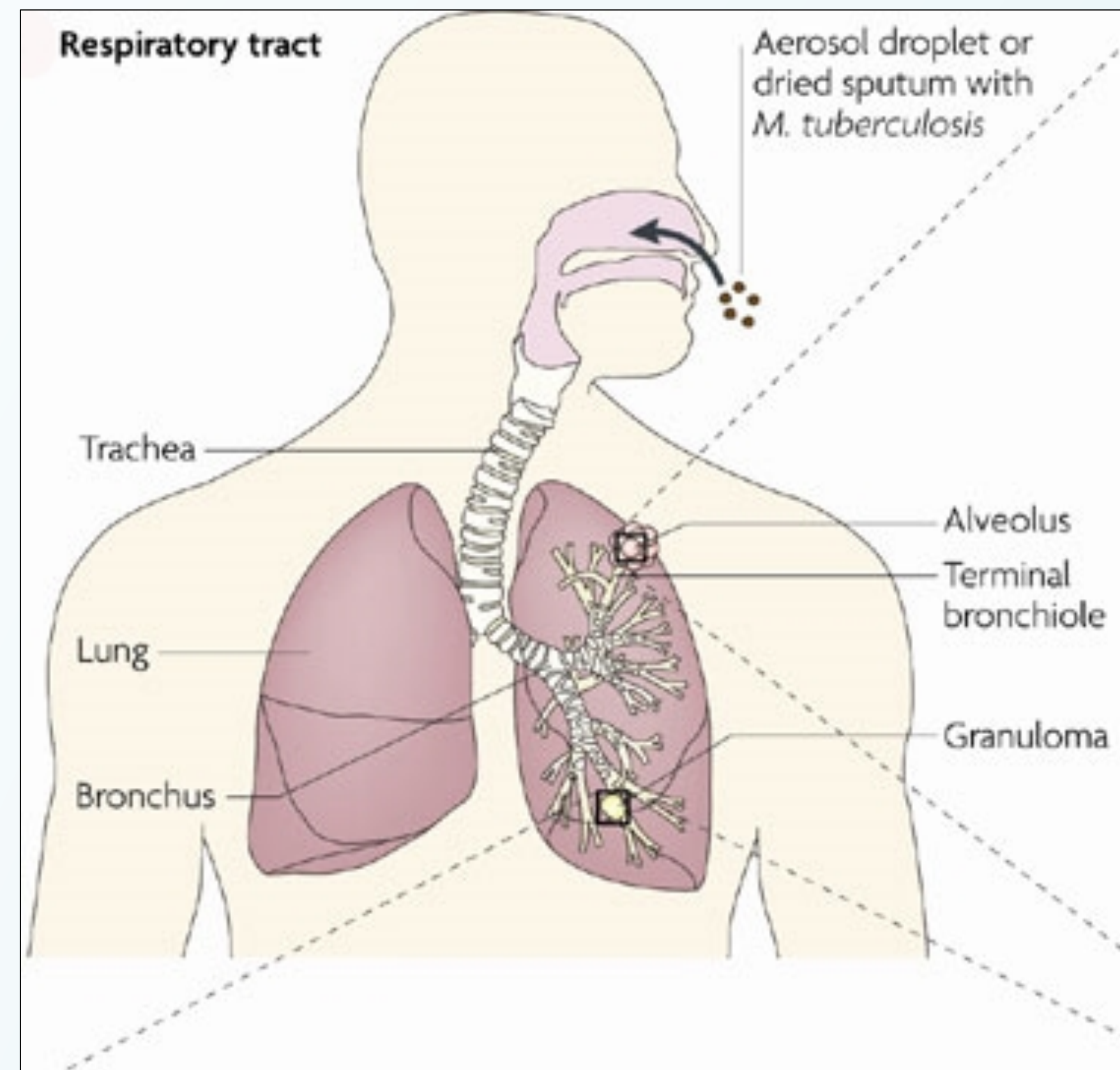


Image 1 (Gareths, et.al)

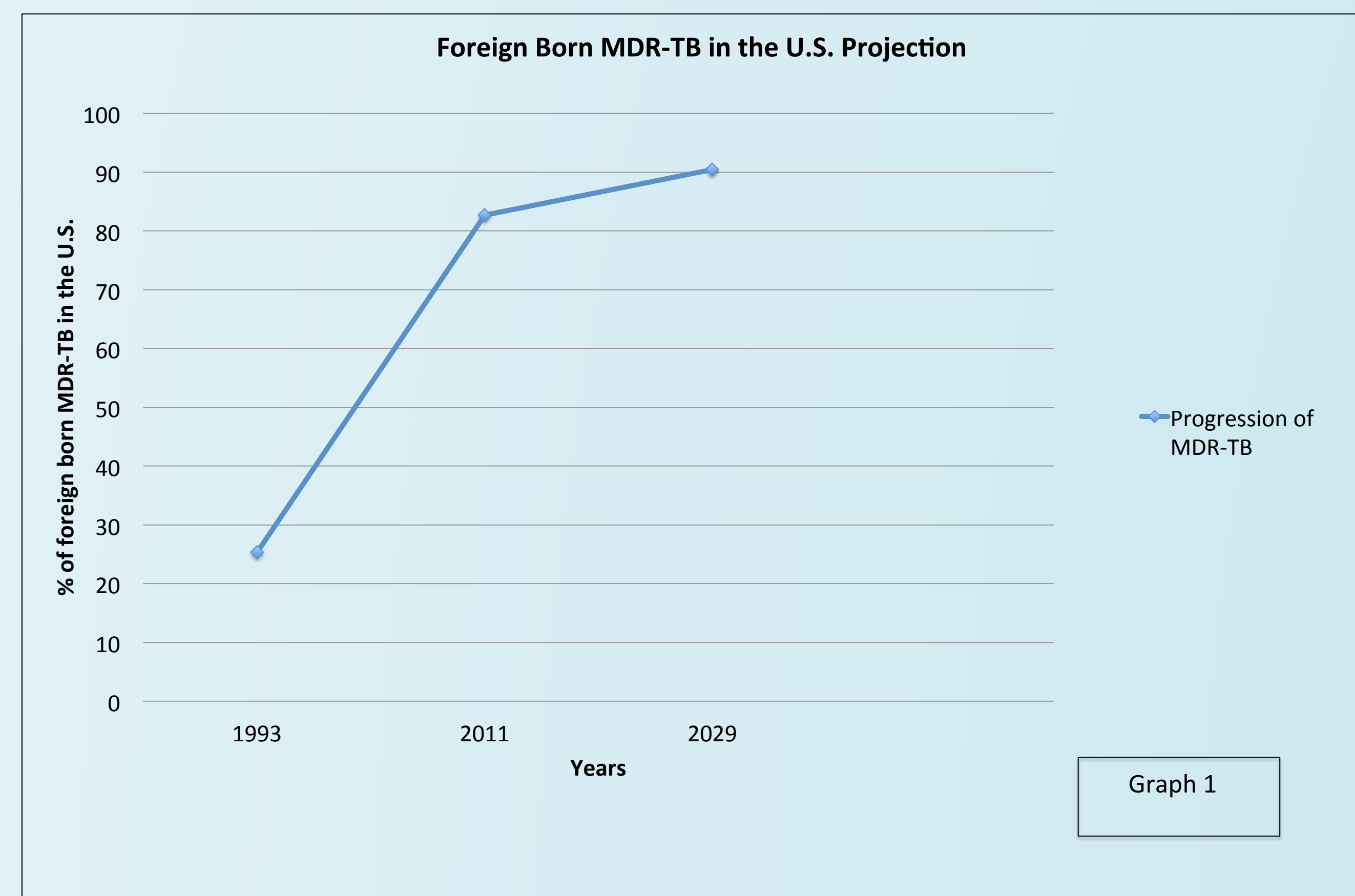
## Introduction:

Every year there are millions of diagnosis' and deaths due to the disease, Tuberculosis (TB) ("Tuberculosis Data and Statistics."). Tuberculosis caused by the bacteria, *Mycobacterium tuberculosis*, is a pulmonary infection that can get into a person's lungs via the air, blood, or lymph. The bacterium instigates the lung to form "fibrous nodules called tubercles" around the bacteria itself (Saladin 888). The main symptoms of TB include, coughing up blood or sputum, chest pain, and coughing that gets worse over three weeks ("Basic TB Facts"). The control of this disease is made more difficult because two of the three main symptoms are also modes of transmission (See Image 1). As of right now there is a way to kill the bacteria in those who are sick with many different lines of antibiotics. What is happening, and has been developing is that the TB bacterium is becoming resistant to antibiotics. What this means is, that TB has become multi-drug resistant (MDR) the first and second lines of antibiotics used to treat TB, rifampin (RIF) and isoniazid (INH) are ineffective to treat the disease (Luo et al.). In most cases of TB these two drugs work as long as the patient follows through with the treatment. What is happening around the world is that MDR-TB is spreading, China being the second highest country, behind India, and the United States further down on the list (Luo et al.). What is the difference between these two countries and how do their problems to solve this epidemic differ?

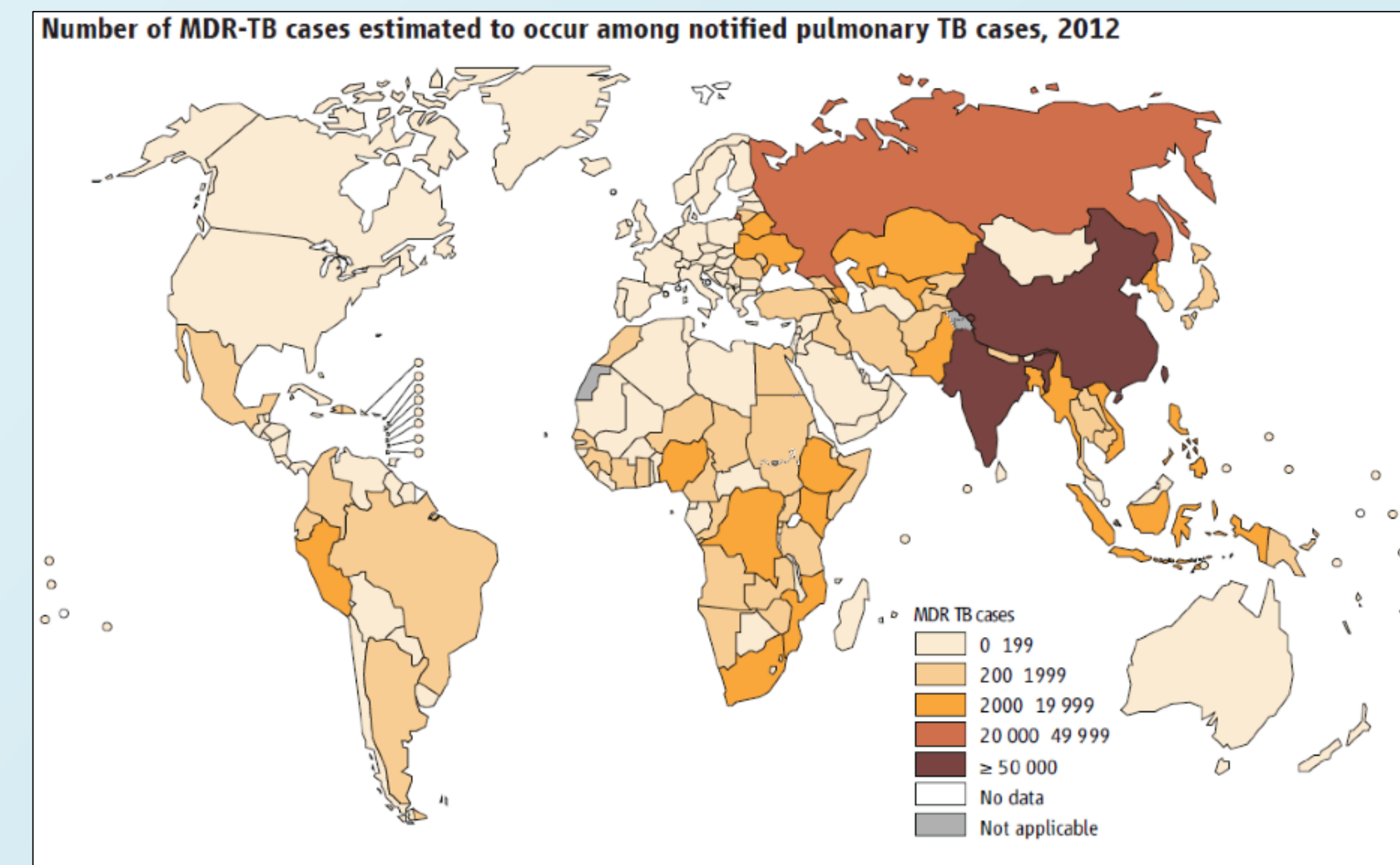
## In the United States:

In the United States in 2011 there has been a decrease in the number of reported TB cases. It has come to about 3.4 cases per 100,000 people. Since 2010 there has been a 5.8% to 6.4% decrease in number of reported cases ("Fact Sheet Trends in Tuberculosis 2011"). This is the lowest recording of cases since national reporting began in 1953 ("Fact Sheet..."). Despite being the 3<sup>rd</sup> most populated country (behind India in 2<sup>nd</sup> and China 1<sup>st</sup>), estimated at 313.8 million people, there is a relatively low level of TB ("The World Fact Book"). Despite this good news in the decrease of TB as a whole there was a slight increase in MDR-TB from 2010 to 2011. When looking at drug susceptibility in cases with no prior treatment, the results increased from 1.2% to 1.3% in 2011 ("Fact sheet...").

This is a small change but in the big picture a significant one. All of the cases tested had never before received treatment so this was not just about people improperly taking their medication or not doing so in a timely fashion. This was the already changed TB bacterium in a new person. These numbers have remained relatively the same but, in foreign-born people the number of MDR-TB cases has increased from 25.3% in 1993, to 82.7% in 2011 ("Fact Sheet..."). This is a huge and steady increase of 30.6% in 18 years. If trends were to continue steadily with no change, in another 18 years there would be 90.4% of foreign-born cases of MDR-TB in the United States (See Graph 1). It seems that in the U.S. the most common way of getting MDR-TB is to come into contact with someone that already has it, and if the number of people who have it continues to increase there will be issues for many – "regular" TB might go away and the new MDR-TB could become the norm. Other drugs are already created for 3<sup>rd</sup> and 4<sup>th</sup> line antibiotic treatments but RIF and INH are the most potent of all of these drugs. Right now there is even an extremely drug resistant strain of TB (XDR-TB) that is resistant to any fluoroquinolone and an injectable 2<sup>nd</sup> line drug and is being deemed by scientists as one of the biggest health threats in the 21<sup>st</sup> century (Luo et al.). This is just looking at the United States, in China things are much worse.



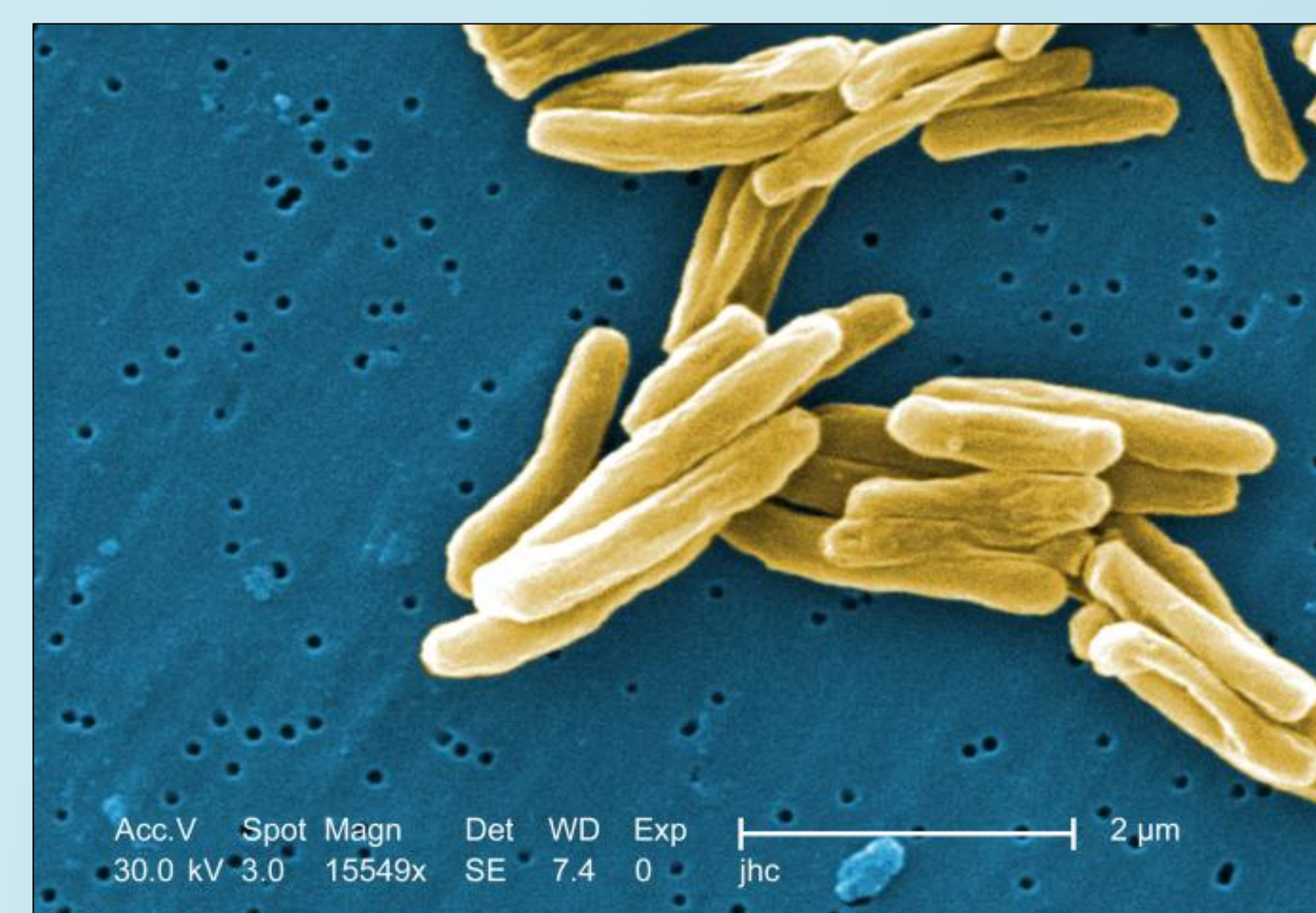
Graph 1



WHO Global Health Report 2013

**According to the Center for Disease Control and prevention (CDC) there are a few reasons that MDR-TB would develop.**

**"When people do not complete the full course of treatment, when health care providers prescribe the wrong treatment, the wrong dose, or wrong length of time for taking the drugs, when the supply of drugs is not always available, or when the drugs are of poor quality." ("Drug Resistant TB")**



*Mycobacterium tuberculosis* colored scanning electron micrograph (SEM) under 15549x magnification. *M. tuberculosis* is an obligate anaerobic bacterium, meaning it can only survive/grow in oxygenated environments (Public Health Image Library).

## In China:

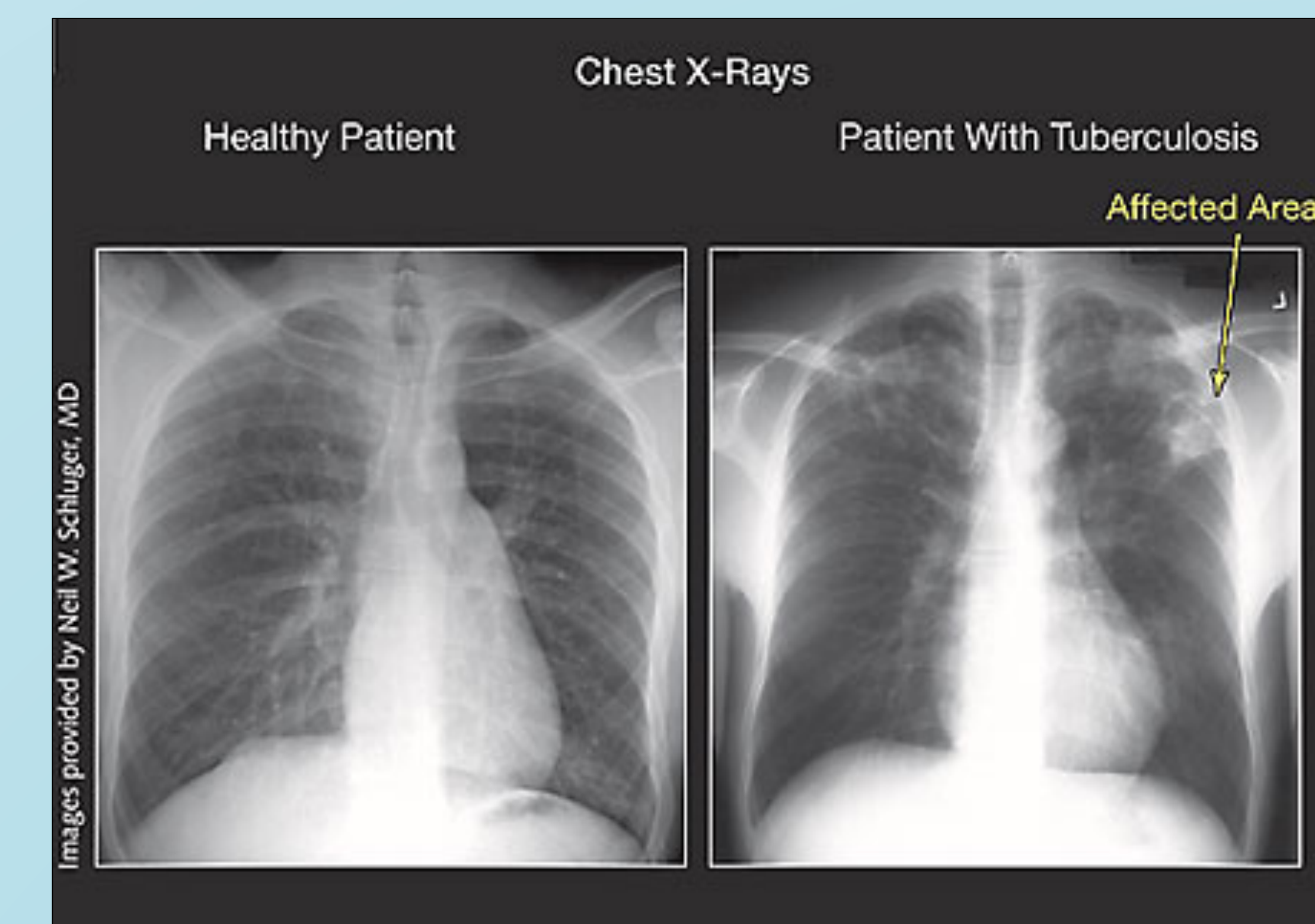
China is ranked as the 2<sup>nd</sup> highest country of reported TB cases. Despite having generous funding from their government and from national organizations there is still a large problem ("China"). In 2011 with a population of 1,348 million people there are about 104 cases of TB per 100,000 people. The total of new and relapse cases of TB in 2011 was 899,699 ("China"). The number of overall prevalence of TB in China has decreased from 1990-2006 but out of the almost 900,000 people with TB only 13,349 were tested for MDR-TB. Out of the confirmed 1,601 patients confirmed to have MDR-TB only 1,155 were started on a treatment ("China"). That means there were 446 people in China that new they had a drug resistant form of TB and either could not get treatment or chose not to. Out of millions of people this number may seem insignificant and according to the Mayo Clinic,

"Although tuberculosis is contagious, it's not easy to catch. You're much more likely to get tuberculosis from someone you live with or work with than from a stranger." (Mayo Clinic Staff)

Although it may not be the easiest to catch that is still 446 people with families, friends, jobs, that most likely can't just stop their life for having this disease. Even those that are getting this disease there were still 26% of MDR-TB patients had to be re-treated. So somewhere in their life they personally were not taking their medication properly, couldn't get access to them or came into contact with someone who also had MDR-TB ("China").

## Findings:

When looking at both of these countries and their problems with TB and MDR-TB there are different issues each needs to handle. In the United States, controlling travel to and from foreign countries as well as incoming immigrants is a serious challenge but the biggest one when dealing with the TB problem. They are having trouble controlling its movement into the country. Whereas in China they have having trouble controlling the epidemic that is already there – and spreading. The impoverished areas of China are more susceptible to disease but that does not mean the cramped major cities of China such as Beijing, which has its own strain of TB, is not going to be affected (Burman et al.). The Beijing strain which has been to more places than just around China's provinces has been known to be drug resistant and is being put through further scrutiny to help identify cases affected by this strain and be able to better treat them (Burman et al.).



## Conclusion:

In conclusion, many countries have terrible problems with TB and MDR-TB. Whether those countries happen to be towards the top like China, or towards the bottom of the list in severity of prevalence like the United States these diseases are still killing millions every year. Plans and strategies are being created and utilized by the World Health Organization (WHO) and individual governments but despite many efforts this bacterium is growing stronger and becoming more resilient.