

The Rise Of Anti-Resistant Bacteria In China, Sweden, and United States

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On my honor as a University Student, I have neither given nor received  
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## **Introduction:**

Before antibiotics infections such as pneumonia and diarrhea, were the number one cause of death in the world. After penicillin was accidentally discovered, it was mass produced for the general public, which sparked the antibiotic golden era. This led to the discovery of many more antibiotics over the years, and thus revolutionized how countries all over the world treated infectious diseases that were once deemed incurable. However, over time antimicrobial resistance (AMR) has developed and is one of the greatest threats to mankind due to increased usage of antibiotics. According to the CDC, the United States alone currently prescribes over 270.2 million antibiotics per year; around 1/3 of which are either unnecessary or inappropriately prescribed(*Outpatient Antibiotic Prescriptions — United States, 2016 | Community | Antibiotic Use | CDC, 2019*). This overuse of antibiotics can promote the birth of resistant bacteria, thus causing severe infections, longer hospital stays, and increased mortality rates. Currently, resistance has been seen by nearly all antibiotics that have been produced(Ventola, 2015).

I will be focusing on three major countries (United States, China, and Sweden) and will be doing an in-depth comparative analysis between them. This is because each country can have different circumstance regarding the economic, social, and political aspects that can lead to the rise of AMR. For example, all three countries mentioned the struggle with the inherent nature of the patient-doctor relationship. When patients go to the doctor they expect to feel better, and thus demand antibiotics despite it may not helping. This expectation from the patient results in the doctor feeling pressured to prescribe antibiotics inappropriately, as they don't want to risk losing the patient. There are also many economical aspects that further complicate the problem of AMR. Currently, there is no viable antibiotic market as developing them is a complex and risky process, especially in the U.S. This leads to insufficient funding in the later stages of

development which is coined the “Valley of Death”. In addition, the profit made from antibiotics is not enough to cover the cost of development, and has caused multiple pharmaceutical companies located in the U.S to file for bankruptcy(Gupta & Nayak, 2014). As a result of this profit driven mentality of pharmaceutical companies, only two new classes of antibiotics have been created in the past three decades. In some low-income areas in China, antibiotics can be obtained easily by purchasing them over the counter(Morgan et al., 2011). One reason may be that low income countries lack the necessary funds to coordinate an effort to establish rules and regulations regarding the usage of antibiotics. Political aspects also help contribute to the problem of AMR. In the United States and China, there are numerous private corporations/hospitals that provide healthcare to the common public(Angell, 2008). This allows the private hospitals to have their own rules and regulations regarding the usage and management of antibiotics due to there being no centralized government establishing order. However, Sweden is a current example of a government centralized system. Most of the hospitals in Sweden are public and are mainly government funded, thus making it easy to regulate and establish rules. As a result of this centralization and coordination, Sweden is one of the countries with the lowest antibiotic use and has worked to decrease the usage of antibiotics since the mid 1990’s. Overall the problem of AMR is extremely complex due to involving many different aspects and moving parts. If the misuse of antibiotics continues, then in the foreseeable future there may emerge an untreatable bacterial infection that will be incurable and devastating to the general public.

**Research Question:**

For my STS prospectus, I will be conducting an in-depth comparative analysis of the rise of AMR in the three different countries mentioned in the previous paragraph (China, United States, and Sweden). AMR is a global problem, but the reason contributing to it depends and can

vary depending on the circumstances. I am proposing three research questions that will be applied to each country. The first is how does the patient-doctor relationship contribute to the problem of antibiotics prescription and AMR? The second research is how the current government involvement/policies of antibiotic regulation impacts the growth of AMR. The last research question is how the profit driven mentality of pharmaceutical companies, their business, and innovation strategies lead to the overdose and over prescription of antibiotics?

### **Literature Review:**

Before antibiotics, infections such as pneumonia and diarrhea were the number one cause of death in the world. This revolutionized how countries all over the world treated infectious diseases that were once deemed incurable. However, over the years the increased usage of antibiotics all over the world has led to the rise of resistant bacteria. If precautionary measures are not taken, then in the not so distant future there may be an infectious disease that is incurable due to being resistant to current antibiotics. The following literature review discusses factors that help contribute to the rise of antimicrobial resistance (AMR) and certain solutions that are being implemented to help combat it.

Sanchez and Demain discuss the rise of antibiotic-resistant bacteria(Sánchez & Demain, 2015). They found that bacterial infections even with the use of current antibiotics are still causing thousands of deaths and billions of dollars in healthcare costs. They also found that 70% of infections within the United States are now resistant to at least one type of antibiotic that is currently used in hospitals. The lack of new and innovative drugs is also mentioned. In 1996 the FDA approved over 120 drugs, which dropped greatly to 20 in 2005. The number of new and approved antibiotics is even less; in 2004 only 1.6% of the compounds in clinical development were antibiotics. Sanchez and Demain explained that this was due to primarily a couple of

reasons. The first is the merger of many pharmaceutical companies, such as Wyeth and Pfizer, which decreases the number of companies searching for new antibiotics. The second reason is that discovering new natural products with antibiotic activity is difficult as most of it has already been discovered. The third is the increased cost and time of getting a new antibiotic in the market, which is around 1 billion dollars and 10 years respectively. Cooper discusses the need for government change to make the innovation for new antibiotics viable (Cooper & Shlaes, 2011). Cooper mentions that the cost of antibiotic phase III trials alone cost an alarming 70 million dollars and that current government grants and other venture capitals cannot fund this. Solutions have been debated over the past, but no concrete action has occurred. Also, because the FDA has demanded more costly studies to prove the superiority of a new antibiotic over a preexisting one, many companies have taken their work overseas. Doripenem is a current antibiotic that is used all over the world except for the United States. Cooper mentions that leadership and government intervention is required to change not only the strict rules of the FDA, but to also provide incentives to the pharmaceutical companies creating new antibiotics.

Harrison discusses how AMR is one of the greatest threats to humanity, but the magnitude and impact are still deeply unknown (Harrison et al., 1998). Harrison mentions how no country, including the United States, has a reliable antimicrobial resistance surveillance program to monitor trends in antimicrobial usage. Multiple surveillance groups around the world are attempting to create systems to do this, but are uncoordinated and unstandardized. To identify the problem and magnitude of antimicrobial resistance, coordination on a global level needs to occur to ensure that humanity can adequately prepare for the inevitable problem of antimicrobial resistance.

Gröndal also discusses the management of antibiotics in medical practices and how it

contributes to the problem of antimicrobial resistance(Gröndal & Holmberg, 2020). Gröndal mentions how clinicians and doctors want to be the gatekeepers and to have the authority regarding prescribing drugs without pressure from outside sources such as the government. As a result, he discusses several studies that suggest physicians sometimes prescribe drugs for non-medical reasons to maintain authority. In addition, patients also see antibiotics as a miracle drug that cures everything and often ask for it when ill. As a result, Gröndal found that some general practitioners prescribe antibiotics to simply keep the patient happy and to maintain loyalty. Gröndal's findings were replicated by Butler who conducted a qualitative study with structured interviews to better understand why general physicians were prescribing antibiotics for sore throats despite knowing that they will not help(Butler et al., 1998). Butler found that almost all physicians acknowledged that antibiotics were prescribed too often for upper respiratory tract infections. Most doctors however felt that the possible patient benefit outweighed the community risk of antimicrobial resistance, as their main priority was the well-being of the patient. In addition, Butler found that most doctors did not want to jeopardize their relationship with the patient and cited that if they didn't prescribe antibiotics, the patients would find another doctor who would. The doctors also feared medicolegal problems if the patient did get sick and being perceived as someone who did nothing for their patient. Overall, the studies by Butler and Gröndal show that social aspects between the doctor and the patient greatly influence whether an antibiotic is prescribed.

There are also the social and economic factors investigated that influence acquisition of antibiotics without prescription in India(Saradamma et al., 2000). Saradamma found that several conditions in India help facilitate the inappropriate use of antibiotics. The first is the government encouraging the expansion of pharmaceutical companies, thus resulting in more licensed

pharmaceutical manufacturing units than primary health centers (20,000 vs 17,000). In addition, because of economic restraints and the perception that antibiotics were seen as a “miracle drug”, it led to many people of low-income status to not consult a private practitioner, and instead to self-medicate. Saradamma discussed how many of these antibiotics were easily bought over the counter and often taken in inadequately. Only around 11% of people were taking the correct dosage and for the correct amount of time. Through the usage of logistic regression analysis, Saradamma found that the people least likely to follow this practice were educated and from higher-income families, suggesting that education can be a possible solution to reduce the inappropriate usage of antibiotics

As mentioned in the previous paragraphs, there have been increasing numbers of bacterial infections that have become difficult, and sometimes impossible to treat with current antibiotics. The United States federal government in response to this global threat has created a 5-year plan that was created in 2015. In this study, the GAO was tasked to examine the efforts and efficacy of this plan(CDC, 2020a). In this report, the GAO found that there were challenges regarding the surveillance of antibiotic resistance bacteria by the CDC, appropriate antibiotic use, and the development of new and innovative antibiotics in pharmaceutical companies. The GAO concluded their study by recommending multiple things that could be done to reduce the impact of antimicrobial resistance. This included things such as suggesting higher market incentives from the government to pharmaceutical companies producing new antibiotics and proposing that all healthcare facilities are required to implement stewardship programs. This would ensure that patients are receiving the right antibiotic at the right time, in the right dose, and for the correct duration.

Despite the problem of resistant bacteria rising in countries such as China and the United

States, Sweden has the lowest levels of antibiotic use and resistance among the European Union. Mölstedt discusses the strategies that Sweden is incorporating to successfully handle the rise of antimicrobial resistance (CDC, 2020b). Due to an outbreak of penicillin-resistant pneumococci among children in the 1990's government authorities and professional organizations, such as STRAMA, have been working together to address the problem of AMR. Not only has Sweden passed legislation banning the use of antibiotics in agriculture, but they also are committed on both a national and local level to educate and monitor antibiotic prescribing. Moreover, Mölstedt mentions how the government is responsible for the overall policy of healthcare, thus allowing for stricter regulations on the usage of antibiotics. In addition, the general public of Sweden seems to be well educated about the dangers of the overuse of antibiotics thanks to organizations such as STRAMA. André examined the level of knowledge regarding antibiotic treatment and awareness of antibiotic resistance in Sweden (André et al., 2010). Through cross-sectional interview studies based on a structured questionnaire, André found that 80.7% of people in the study agreed that bacteria could potentially become resistant to antibiotics and that most people trusted the doctor to make the correct decision for them.

Although the problem of AMR is inevitable some things can be done to slow down the usage of antibiotics. Ka examined the impact of an antibiotics stewardship program (ASP) in a hospital in Hong Kong (Ka et al., 2007). Ka found that before the implementation of the ASP, broad-spectrum antibiotics were prescribed inappropriately 28.9% of the time. However, after post-intervention, this decreased greatly, along with the overall consumption of antibiotics in general. In addition, Ka found that even though the ASP placed more regulations on the usage of antibiotics the quality of medical care was not jeopardized. Moreover, an economic analysis was done which showed that the implementation of the ASP would cost \$71294 per year, but would



save the hospital in Hong Kong \$380899 per year. However, just because this may be a solution in Hong Kong, it necessarily doesn't mean it will work in other countries. For example, in the United States ASP programs are in place, but not many doctors take it seriously and often forget that it even exists.

In conclusion, the problem of AMR is inevitable and highly complex due to there being many social, economic, and political aspects contributing to it. However, each country has their own circumstances and problems that need to be fixed. In the United States and China for example they mostly use private healthcare, thus making it harder to establish regulations. Although Sweden has taken many successful steps to combat AMR, they much like the rest of the world, struggle with the fact that antibiotics are finite. Fewer and fewer companies are attempting to innovate new antibiotics due to the whole process being so costly. Although the problem of AMR will exist for as long as humanity lives, this literature review shows how different countries struggle with different problems in regards to AMR, and the varying solutions that can be implemented to slow down the rise of AMR.

### **Research Method:**

Two STS frameworks were mainly used to conduct my research. To start, I adopted Winner's perspective to determine whether or not there was politics underneath the design, production, and distribution of antibiotics. Through this, I was able to identify how the lack of government involvement regarding regulations, the social relationships between the patient and the doctor, and the profit driven mentality of pharmaceutical companies all help contribute towards the problem of AMR. I also applied LTS analysis to each of the three countries previously mentioned. This helped me better understand who exactly the system builders are in each country and how the system was built in the first place. Through this analysis, I was able to

understand how the government, the doctors/patients, and the pharmaceutical companies are the major contributors. I also used LTS analysis to determine if there were any forms of technology that are going through a similar process of development. Overall, both of these frameworks helped me answer the research questions proposed earlier in the paper, by giving me insight into the political/social factors behind the production, distribution, and usage of antibiotics.

The research methods I used for this literature review were composed of books, studies, and research papers found from Google Scholar and from the UVA Virgo database. I also interviewed Dr. Nguyen, an anesthesiologist at the Virginia Mason Hospital, and asked him some questions regarding the usage of antibiotics. For the material that discussed the social aspects that lead to the rise of antibiotics, the authors mostly interviewed clinicians/general practitioners. This allowed them to better understand the relationship between the doctor and the patient. The papers discussing the political aspects mostly used data from other cited research papers to back their claim and studies to show how current government intervention can be improved. For the articles discussing the economics regarding AMR, they not only conducted studies to determine the efficacy of things such as the stewardship program, but also used data from other research papers to come up with legitimate claims and conclusions. An example of this was when Mölstad used data gathered from the Swedish government and other research articles to discuss how Sweden is one of the countries with lowest rate of resistant infections and how the rest of the world can learn from them.

### **Data Analysis:**

As mentioned before, AMR is an increasingly serious global threat that needs to be taken seriously all around the world. Sanchez and Demain, scientists in the field of molecular biology,

found that the rise of AMR is costing countries all around the world billions of dollars, and more importantly, killing thousands (Sánchez & Demain, 2015). They also mentioned that every single type of infection known to man has seen at least some type of resistance to modern-day antibiotics. Harrison, an author who works with the Institute of Medicine, also mentioned that “No country in the world has a good surveillance AMR system” and that many countries have to set up a system but it ended up being too costly(Harrison et al., 1998). These findings from these two research papers indicate that the rise of AMR is imminent and if necessary measures are not taken, millions of people could die in the future. However, fixing the problem of AMR is complex as each country all around the world has their circumstances that contribute to the problem of AMR. In the following paragraphs, I will be conducting an in-depth comparative analysis regarding social, political, and economical factors between the United States, China, and Sweden. I will also be determining the main system builders responsible for the rise of AMR in each country.

### **United States:**

There are many sub systems that contribute to the rise of AMR in the United States. The first is the social relationship between the physicians and the patients themselves. According to the CDC, the United States alone currently prescribes over 270.2 million antibiotics per year; around 1/3 of which are either unnecessary or inappropriately prescribed(*Outpatient Antibiotic Prescriptions — United States, 2016 | Community | Antibiotic Use | CDC*, 2019). Guillermo V. Sanchez, a scientist who works at the Centers for Disease Control and Prevention (CDC) did a research study where he conducted 36 in-depth interviews with physicians, with each interview lasting around 45 minutes. Through the interviews he found that many of the physicians prescribed antibiotics to their patients due to “pressure”(Sanchez et al., 2014). Many of the

physicians stated that patients come to them to get better and that they prescribed antibiotics to simply keep them happy, even when they knew there was a chance that the antibiotic wouldn't work anyway. Modifying the prescribing behavior between the doctor and the patient is a complex and multifaceted problem, as the solution would require many mechanisms to inhibit it. For example, patient-based interventions (delayed prescribing practices), interactive group meetings, outreach visits to individual physicians, and better education regarding the dangers of antibiotic misuse have shown the most promise in attempting to change the prescribing culture between physicians and patients (Sanchez et al., 2014).

To better understand how antibiotics are given to patients, I interviewed Dr. Nguyen, an anesthesiologist at the Virginia Mason Hospital in Seattle. I asked him a series of questions regarding how often he prescribes antibiotics, and whether there are established rules and regulations regarding the usage of antibiotics. He mentioned that he could "essentially prescribe the general antibiotics whenever he wanted" and that there was minimal oversight. I also asked him if there were stewardship programs implemented in his hospital to prevent the misuse of antibiotics and he said that they exist. However, he mentioned that even though he has heard of it, no one follows the rules laid out by the program. Because the bulk of healthcare in the United States is private, each hospital and private practice control the way how they manage and use antibiotics. This interview shows that government is another main system builder that helps contribute to the rise of AMR. Government intervention is needed to establish centralized rules and regulations that all hospitals and primary care providers need to follow.

Pharmaceutical companies and the strict rules from the FDA are other system builders in the United States that help contribute to the rise of AMR. Despite there being a severe need for new and innovative antibiotics, pharmaceutical/biotech companies aren't incentivized to create

new drugs, as there is little profit to be made. Creating a new antibiotic is time-consuming and costly (can take 10 years and can cost millions of dollars) (Sánchez & Demain, 2015). Cooper, the former vice president of Wyeth Pharmaceuticals, and author of *Antibiotics: The Perfect Storm*, argued that the pipeline for creating new antibiotics was “broken”. In his research paper, he found that phase III trials for a single antibiotic alone cost an alarming 70 million dollars and that government grants and venture capitals weren’t enough to keep biotech companies from going bankrupt (Cooper & Shlaes, 2011). Cooper also mentioned one of the reasons why creating a new antibiotic is so expensive is due to the FDA demanding more costly studies to prove the superiority of a new antibiotic over a preexisting one. This also has forced many companies to take their work overseas. For example, doripenem is a current antibiotic that is used to treat nosocomial pneumonia all over the world except for the United States. This data suggests that there are many economic reasons why the occurrence of AMR is increasing. As a result of this broken pipeline, only four new classes of antibiotics have been discovered in the past four years (Cooper & Shlaes, 2011). Overall, this data shows that leadership and government intervention are required to not only fix the strict rules of the FDA, but to also provide market incentives to the pharmaceutical and biotech companies.

### **China:**

China has the world’s most rapid growth rate of antimicrobial resistance (22% growth from a study from 1994 to 2000) (*The Lancet | The Best Science for Better Lives*, n.d.). Much like the United States, there is little government reinforcement or established rules regarding the usage of antibiotics. Gong, a scientist from the Department of Social Medicine and Health management whose goal is to strengthen enforcement of regulations, improve public education on antibiotics, found that many online and community pharmacies sold antibiotics illegally (Gong

et al., 2020). Specifically, out of the 220 online and 675 community pharmacies that they studied, 174 (79.1%) and 586 (86.8%) sold antibiotics without a valid prescription, respectively. In addition, 0% of community pharmacies and only 1.1% of online pharmacies explained “the possible adverse reactions to the antibiotic and correct duration of how to use it”. He also found that by the end of 2017, there were 453,738 community pharmacies but only 408,431 licensed pharmacists in China. Overall this data shows that the unregulated pharmacies are one of the main system builders that lead to the misuse of antibiotics in China. Based on how many antibiotics are sold illegally (without a prescription), government intervention is required to strengthen enforcement of regulations and improve public education on antibiotics.

Other studies have shown that there are financial drives that contribute to the rise of AMR. During the 1980s, China changed their socialistic economic health system into a market system. As a result, The state's revenue declined greatly and the government reduced subsidies to public hospitals and clinics from more than 50% to about 10%(Yip et al., 2010). However, the government still set medical prices below normal and to assure that basic health services remained affordable even for the poor. As a result of these changes, hospitals are forced to rely on drug sales as their major source of income. Specifically, drug sales account for over 50 of all hospital revenues and antibiotics account for 47% of all drug sales(Yip et al., 2010). Because the majority of a hospital’s money comes from drug sales, physicians have a strong financial incentive to prescribe antibiotics, even when unnecessary. This incentive system has also seriously eroded professional ethics and practice norms in China. For example, 75% of patients with a common cold are prescribed antibiotics, and so are 79% of patients in the hospital—ie, over twice the international average of 30%. Overall, this data shows that one of the main

reasons for the rise of AMR is due to financial incentives, which was ultimately set by the government of China.

There are also many social problems regarding the usage of antibiotics in China. Ye, who works at the Department of Pharmacy Administration and Clinical Pharmacy, and other scientists conducted a cross sectional study to identify the knowledge, attitudes, and practice of the general public towards antibiotic use in China. He found that out of the 1255 people that took the survey, just over half (n = 659; 54.8%) of participants incorrectly agreed that “antibiotics are effective against viral infections” and only one-third (n = 413; 34.3%) of participants knew that antibiotics and anti-inflammatories are not the same drugs. He also found that fewer than half of respondents knew that antibiotics should only be purchased with a prescription (n = 585; 48.6%)(Ye et al., 2017). This data shows that there is insufficient general knowledge surrounding the role of antibiotics and that it is common for people to misuse antibiotics. Better education about the dangers of antibiotics and the rise of AMR needs to be implemented so people that people are aware of the misconceptions.

### **Sweden:**

Much like the United States, the social interactions between the patient and the doctor are one of the main system builders that help contribute to the rise of AMR. Hedvig Gröndal in her research paper mentioned that physician sometimes prescribes drugs for non-medical reasons to maintain authority and patient loyalty(Gröndal & Holmberg, 2020). Another study was conducted by Butler, whose goal was to better understand reasons for antibiotics being prescribed for sore throats despite well-known evidence that they are generally of little help. He found that all of the 21 general practitioners that were interviewed acknowledged that antibiotics were prescribed too often for upper respiratory tract infections. However, they all mentioned

how they didn't want to "jeopardize" their relationship with the patient. Most felt that the possible patient benefit outweighed the community risk of antimicrobial resistance, as their main priority was the well-being of the patient. In addition, Butler found that when patients expect antibiotics, they are more likely to be prescribed and when physicians perceive that patients expect antibiotics they are 10 times more likely to be prescribed(Butler et al., 1998). Overall the data from these interviews show that the overprescribing of antibiotics is a complex behavior that can be seen in other countries, such as the United States.

However, Sweden has one of the lowest rates of AMR in the world(Mölstad et al., 2017). Unlike China and the United States, Sweden is committed on both a national and local level to educate and monitor antibiotic prescribing. Mölstad, a scientist from the department of clinical sciences in Sweden, mentions in his research paper how the government is responsible for the overall policy of healthcare, thus allowing for stricter regulations on a national and local level regarding the usage of antibiotics(Mölstad et al., 2017). In addition, the general public of Sweden seems to be well educated about the dangers of the overuse of antibiotics thanks to organizations such as STRAMA. Andre, a scientist at the Centre for Clinical Research in Sweden, conducted a study and surveyed 1000 random people through cross-sectional interview studies based on a structured questionnaire to determine the general's public knowledge on antibiotics. Andre found that 80.7% of people in the study agreed that bacteria could potentially become resistant to antibiotics and that most people trusted the doctor to make the correct decision for them(André et al., 2010). Overall, this data shows Sweden has done a much better job than other countries such as China and the United States due to their government establishing centralized rules/regulations. In addition, by educating the general public about the dangers of antibiotics people are more likely to trust their doctors and are less likely to misuse antibiotics.



## **Discussion:**

What may seem like a biological problem at first, AMR is a wicked problem with many interweaving political, economic, and social factors that contribute to it. As seen by the data, each country has the similar set of sub-systems that help contribute to the rise of AMR. However, each country has their own circumstances and system builders that create each sub-system. For example, in the United States, a capitalistic economy, you have doctors who are afraid to lose their patients, and thus are incentivized to keep their patients happy. However, doctors in Sweden, another country that struggles with the complexity of the patient-doctor relationship, are more worried about the well-being of the patient as opposed to for financial reasons. Most felt that the possible patient benefit outweighed the community risk of antimicrobial resistance and thus prescribed antibiotics to their patients even when it may not help. China also has problems with doctors prescribing patients antibiotics far too often, but for different reasons. Because the government changed their socialistic economic health system into a market system, the majority of a hospital's money comes from drug sales and thus incentivizes physicians to prescribe antibiotics, even when unnecessary and immoral.

The level of government interventions and who they interact also differs between each country. For example, In the United States, much of healthcare is private and thus each hospital has their own rules and regulations on the usage of antibiotics. In addition, due to the strict laws set up by the FDA and the United States government, creating new antibiotics becomes timely and costly. In China, one of the main problems is the complete lack government regulations with pharmacies. Many pharmacies distribute antibiotics to patients illegally and many don't even mention how to successfully use it. However, Sweden is unique from the other two. Because the Sweden government is responsible for the overall policy of healthcare, they can place stricter

rules and regulations regarding the usage of antibiotics on a national and local level. The government has also placed an effort to education their citizens about the dangers of AMR through organizations such as STRAMA, and thus 80.7% of people in the study agreed that bacteria could potentially become resistant to antibiotics. This is unlike China, where many people were uneducated about general knowledge regarding antibiotics.

### **Conclusion:**

The main goal and expected outcome of this STS prospectus was to gain a better understanding of the rise of AMR and to identify the system builders that were directly contributing to it in varying countries. Through my research, I discovered that there are many underlying social/cultural, political, and economical aspects that heavily influence the distribution, production, and usage of antibiotics. I also learned that different countries have different contributors as to why the problem of AMR is rising. Overall, AMR is one of the greatest public health challenges and requires effort on a global scale to slow down this inevitable threat. It is my hope that the main contribution of this STS prospectus is to reveal some of the main reasons behind the rise of AMR, so that in the future these problems can be properly addressed, thus potentially saving millions of lives.

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