THOUGHTS ON THE NECESSITY OF DISEASE

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Acknowledgements

This paper is the result of curiosity coupled with an insatiable desire to play the devil’s advocate and explore not-often considered sides of arguments. Taking the “unpopular” approach and examining an alternative view of a highly visible social and political debate, this thesis will argue the need for disease in the world and lives of human beings. The idea took root during the first week of fall semester in 2011. Dr. Kim Finer was lecturing on diseases, and mentioned various diseases and how they affected battles throughout history. As an English major, I am embarrassingly oblivious to world history, but my interest was sparked. I began to wonder what other historical events were altered or affected by disease, and my thesis topic was born.

Predictably, once conceptualized, my thesis topic began to change. I rejoiced when I found a source that would be extremely helpful – until I realized that it was exactly the paper I was planning to write. I shifted my focus, and continued shifting as I continued researching. I wrote the introduction time and time again, scrapping draft after draft. Perfectionism reared its ugly head, and as the months went by, I made less and less tangible progress.

This paper took on a life of its own as I discovered new, fascinating sources I desperately wanted to utilize in my finished product. Alas, not everything I found earned a place in the text that you hold in your hands – this thesis, I have no doubt, will be a project I return to often to update and examine with more intensity. As
exciting as each source was, so was its bibliography… many hours were spent in various libraries, walking in for one book and leaving with ten. Almost as numerous as my sources were my library fines, as a writer’s work is never done – maximum online renewals are the bane of my research existence. In regard to this and so much more, I cannot express my gratitude to the exceptional team at the library at Kent Stark (Maureen Kilcullen, please come to UA Law Library!)

Also more valuable and appreciated than words can begin to describe is Dr. Leslie Heaphy, who must be in more of these thesis acknowledgements than there are seats in a baseball stadium (and for good reason). Thank you for tolerating my procrastination, and never faltering in your encouragement. Seriously, thank you. Dr. Kim Finer, Dr. Horvath and Dr. Norton-Smith all very graciously made themselves available to answer questions, read drafts and take part in my thesis defense: thank you times a million. So many people that I’ve met on campus have made this possible, and I am so grateful.

Finally… whew. For months, I felt like this day - finalizing my thesis - would never come. Then suddenly it came rushing at me with Nascar-like speeds, and I realized that I have reached the point in my life in which I must part ways with my constant companion, procrastination. Farewell, “I’ll do it next week” mentality! You have done me absolutely no good. The countless people who have done wonders for my sanity and success, however, can’t be named in such a short space. Family and friends: I love you like I love coffee (which you know is a lot). Without you all, I’d be lost. Really, really, lost. Thanks for everything!!
Part I: Introduction

Humans are conditioned to view disease and sickness as negative aspects of life. Americans spend millions of dollars a day, hours of time each month, in an effort to eradicate diseases and cancers. This thesis is an effort to comprehend, on a social level, why our extremely complex bodies have not evolved past their current vulnerability to diseases and many physical ailments. The term “disease” is being used loosely, almost being synonymous with “sickness,” “ailment,” “syndrome,” or “illness,” for the purposes of this thesis. The intent is not to scrutinize the differences between these terms in a scientific sense: semantics is not the focus. By “disease,” I will be referring to a negative condition physically affecting the average human, which may or may not result in death. Cancers, conditions such as autism, food allergies and susceptibility to things such as the common cold will be addressed. One goal of this thesis is to analyze the cause and effect disease and humans have on each other. Humans are responsible for some of these diseases, and yet in many ways are reliant on sickness.

An interesting thing to consider is the general human perception of sickness and disease. Why do we view sickness as negative? Do we have any power to control or eradicate sickness and disease? If so, should we use it or not? Disease affects many aspects of our lives. Our society would look much different than it
does now, were disease not to affect us. Would this change necessarily be positive? We create some disease, and we create stigmatizations regarding disease. We promote efforts to cure diseases that are a backbone of our economic world. Are our actions healthy, or are the long-term effects of our actions harmful to our long-term existence? If so, why are humans so counter-productive to our own species? Why do we cower in fear from an aspect of our lives that is not wholly negative?

Disease is not, ultimately, negative. On a personal level, it is devastating for those we love to be diagnosed with cancer, a terminal sickness, or a long-term, chronic medical condition. Socially, we mourn for other countries afflicted with disease. Disease can be painful, terrifying, and terminal. Yet disease exists for a reason. We, as a species, benefit from sickness and disease. A world without sickness is not an ideal world, yet we constantly search for an end to illness.

The intention of this thesis is not to identify specific diseases and their origins. This is not an exhaustive list of all negative health issues, nor is it a biological assessment of disease on a cellular level. The focus of this thesis is to neither lament nor ignore the emotional losses associated with disease and illness; instead, it is a removed, impersonal examination of the effects, positive and negative, that health issues have on the population, as well as an effort to examine our power and influence over this situation.

We must accept that not all microbes – even disease-causing bacteria – are completely antagonistic. In an effort to really understand the relationship between humans and the trillions of microbes living beside us, we must discard the notion that
all microbes, including bacteria and viruses are harmful. “The truth is that we have been evolving in tandem with all of these microscopic organisms – often to our mutual benefit. The way our bodies work today is directly related to our interaction with infectious agents over millions of years.”¹ Disease affects us, and not always in a negative way: there are neutral and even positive effects of disease on the human body. “Everything from our senses to our appearance to our blood chemistry has been shaped by evolutionary response to disease.”² Actually, we owe much of our genetic makeup to viruses. As a more fluid genetic container, they have traded genetic code with humans, both giving and receiving necessary information that has molded us into the figures we are today. Viruses are part of our DNA, so they have an evolutionary interest in our success.³ Their rapidly-mutating abilities have given them access to helpful genetic code far more quickly than we could have ever been exposed to. We borrow from viruses as they borrow from us, and we have borrowed from their extensive genetic library. “Essentially, this partnership with viruses may have helped us evolve into complex organism much faster than we would have on our own.”⁴ In all reality,” persistent infection of other viruses may have put our evolution on “fast forward” by allowing more rapid mutation through exposure to other retroviruses. It’s possible that this capacity helped spur our evolution into humans.”⁵

² Ibid., 97.
³ Ibid., 152.
⁴ Ibid.
⁵ Ibid., 153.
Essentially, we owe our existence on Earth to the successful persistence of microbes. “(Some) microbes release oxygen into the air we breathe, they rid the world of noxious mounds of dead plants and animals, and they free up the parts of those dead things so that we can use them to make our bodies.”⁶ Microbes living in our gut digest our food, create necessary vitamins, and protect us from other unwelcome microbial invaders, keeping them at bay. Not only do they help us: they do not rely on us the way we rely on them. Interestingly, if all other forms of life were to die, it is highly likely that the microbes would go right on enjoying planet Earth without us. Without microbes, however - were they to be somehow annihilated - “plants, animals, and humans would not stand a chance.”⁷ A microbiologist who created the 1941 Census of Bacteria in the United States calculated helpful and harmful bacteria to the best of his ability. His conclusion? “If we summarize all these data in two groups, good bacteria versus bad bacteria, we find more than 10,031,000 quintillion good ones against less than 308 quintillion bad ones.”⁸ This ratio simplifies roughly to 30,000:1. So out of every 30,000 bacteria in the United States, 29,999 are harmless, beneficial, useful or even necessary for our lives compared to the one that is a disease bacterium. This can easily be compared to the human race and its ratio of “good” to “bad.” In 1942, there were 7,569 persons convicted of murder in the United States. This boils down to approximately 1 out of every 17,000. Bear in mind that these are convicted murderers only, not all

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⁷ Ibid.
⁸ Ibid.
criminals. Coupling these two statistics, it is clear to see which record is better.

“Considering that the proportion of harmful bacteria in our estimate is certainly too high, it would only be fair to admit that bacteria are certainly no more dangerous to humanity than man himself.”\(^9\) Since this report was created, “we have found that [bacteria] live in our bodies at many times the density once expected.”\(^10\) They are not simple bystanders, either: they aid our body in its various functions. They help digest our food, but their involvement does not end there. In addition to breaking down our food, they actually also help direct the development of our gut.

“Interactions with these microbes train our immune responses.”\(^11\) So it has been proven that bacteria are essential for the lives we are accustomed to, yet they are still perceived as negative. Our wish to eradicate bacteria largely stems from a general lack of comprehension of the above facts – it is not general knowledge that our bodies rely on bacteria. Society is constantly bombarded with propaganda about bacteria: we are shown images in schools, hospitals, etc about the harms of bacteria. While there are certainly negative bacteria, we are not reminded of the existence of positive, essential bacterium when we only focus on the presence of the bad.

Perhaps some general learning about the spectrum of bacteria would help society recognize that not all bacteria are harmful.

Now that the idea of bacteria being necessary has been introduced, let us consider humans’ knee-jerk reaction to it again: popular opinion likely is not

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\(^9\) Ibid., 5.
\(^10\) Ibid.
\(^11\) Ibid., 5.
different. What are some of our goals regarding disease? As mentioned, a general goal regarding disease and sickness seems to be simple eradication. Many humans appear to believe that our role in disease is in finding “cures,” which sounds much more positive than it is. What would our world look like without disease? Without any disease-related or sickness-related deaths, mortality being determined merely by telomeres\(^\text{12}\), our world would be drastically different. We assume that this difference would be positive, but are we absolutely sure that it would be? We stigmatize disease as evil, and while it is certainly sad, it is not evil, nor is it unnecessary.

Members of the Western civilization tend to exert control in each environment possible – we prefer choice, power and action over being told what to accept, what to do. Throughout history, humans have been trying to control disease, and thanks to advancements in technology, we have gotten better - more adamant and more involved - in our tirade against disease. Is trying to eradicate disease really putting us in control? We use – perhaps over-use – anti-bacterial products, which does not erase bacteria. This practice of relying on and regularly using anti-bacterial lotions and soaps kills 99.9% of bacteria as advertised – but the 0.1% it leaves behind is the strongest. This remaining, most virulent strain reproduces with other strong “survivor” bacteria, and a new, stronger bacterium is created. As we remove bacteria, we remove only the weakest, breeding stronger and stronger organisms,

\(^{12}\) The part of a chromosome that prevents damage: as telomeres shorten and disappear, aging occurs.
microbes and pathogens. We do this more rapidly than we can create more potent antibiotics.¹³

We think that we want a clean, healthy Earth – one with no cancer, no disorders, no illness. While this sounds blissful and serene, how would it really present? A byproduct of this lack of illness would be a great boost in population. This is not simply a hypothesis: we are already experiencing this phenomenon. The mortality rate dropping by massive rates is quickly creating a larger-than-ever population. Would we be able to support this larger population, physically? Could we feed the enormous and ever-expanding global population? Could we financially support a population with life expectancies over one hundred? More importantly, have our efforts so far been successful?

While many previous virus scares, such as smallpox and yellow fever, have been all but eradicated, or can now be vaccinated against, still others are being found – scientists have found that “other plagues are now emerging.”¹⁴ Disease is not a one-time experience: we do not “conquer” disease and move on to different things as if it were a small territory or land with no defense system. Different diseases can be eliminated or controlled, perhaps, but not every single one. It is not feasible to wish for, live in, or create a world without disease. No matter how hard humans try to rid the world of a disease, there will always be a microbe or disease ready to call Earth and its human inhabitants “home.” Hemorrhagic fevers are “evident on all

continents”\textsuperscript{15} and “Ebola, Hanta and Lassa viruses provoke the fear today that yellow fever, poliomyelitis, and smallpox did in previous times.”\textsuperscript{16} Despite medical breakthroughs, inventions and discoveries, humans are still vulnerable to microbes, disease and sickness. We have no way to guarantee safety or invincibility from sickness, which is a terrifying thought for many people. Hollywood plays on these common fears by making movies about contagious agents, depicting a scary world which people fear. Americans react to these fears differently: some prepare, while others deny that a sickness on the scale of Stephen King’s \textit{The Stand} could ever really occur. In all actuality, it already has, and very well could again. Influenza virus, causing a former pandemic, killing over twenty million people in 1918 and 1919, could make a return. Influenza is not the only disease capable of reaching such epic proportions: it is simply one of the first that comes to mind when people consider devastatingly large-scale sicknesses.\textsuperscript{17}

While we are aware of disease, even knowing when people are sick leaves us vulnerable, as there is no cure for influenza or a number of other viruses that plague humans of the current millennia. When Avian flu began to affect people, the only solution was isolation to prevent the spread of sickness – there is not a way to eliminate this disease, or to rid a patient of it. Even during times there is no outbreak of a disease or virus, it is not gone completely: it is simply lying dormant, in a carrier host, until it is transferred to a host it affects in perhaps a more noticeable way.

\textsuperscript{15} \textit{Ibid.}
\textsuperscript{16} \textit{Ibid.}
\textsuperscript{17} \textit{Ibid.}
Another current fear is mad cow disease, which is being linked to human dementia.

Many humans fear aging, whether the process of aging itself, or the fact that aging implies a nearness to death, which is a common fear. Aging is portrayed as painful, unpleasant and undesirable. We accept that it is inevitable, yet billions of dollars are spent each year in the cosmetic industry, both in products purchased and procedures performed in an effort to preserve our youth and vitality. Learning that there is a correlation not only between age and the effects of aging but also between a virus and the effects of aging takes humans even farther from the driver’s seat in this race against time.

Humans feel powerless against viruses, and can incite panic-mode when faced with the reality that disease not only kills, but also decreases quality of life left in non-fatal cases. Humans have tried to manipulate disease and sickness in a multitude of ways, some would say, to no avail.18

“In recent years, a new suite of diseases has begun to plague us. Sickle cell anemia; diabetes; autism; allergies; many anxiety disorders; autoimmune diseases; preeclampsia; tooth, jaw and vision problems; and even heart disease are all becoming more common. More and more, these modern problems seem to be the consequence of changes not in levels of pollution, globalization, or even health care systems, but instead changes in the species we interact with. It is not that we have lost particular species as much as that we have tried to remove whole kinds of life – parasites, bacteria, wild nuts and fruits, and predators, to name a few. The loss of intestinal worms seems to be making many of our bodies ill, just as the circuits in our brains that evolved to deal with predators are now causing us to lose our minds. Our conscious brains have led us to clean out lives of the rest of nature, but the rest of our body, from our guts to our immune system, is having second thoughts.”19

18 Ibid.
19 Dunn, Wild Life xii.
In other words, getting a few viruses under control did not solve our long-term problems: it opened us up to a host of new ones. We did not remove problems: we simply traded them in for new problems, ones that we do not have the answers to. Sometimes, trying to eradicate one disease causes another to emerge.

The world around us is riddled with health issues. We are constantly bombarded with pink kitchen accessories, magnetic ribbons for cars, and fundraisers and events to raise funds towards the awareness and eradication of cancers, disabilities and other illnesses. Is a world devoid of sickness really a better, more progressive, positive world?
Part II: What are the causes and effects of disease? Why does disease exist?

To comprehend the necessity of disease, one must first examine its origins: or, at least, possible reasons disease is present in our world. What brought disease upon us? There are a variety of ways to answer this question, and this thesis cannot possibly begin to address each possible response. In essence, disease is present because humans interact with the world in a way that makes disease inevitable. We have improved our standards of cleanliness and our hygienic practices, as well as the ways we prepare foods (in some parts of the world). Prior to these advancements, and even currently in some places, our primitive actions inevitably make us ill. Eating uncooked or diseased meat, drinking from contaminated water – in some times and places, we were either unable to avoid these conditions due to availability of resources, or simply were unaware that there was a connection between our health ailments and the way we lived and prepared our meals.

Disease exists in certain places because humans have transported numerous diseases through shipping of goods, travel, warfare, and many other methods. Many are familiar with the influenza outbreak of 1918: disease existed in so many countries at the same time because soldiers unknowingly and unwillingly carried it from one place to the next while traveling during the war. Travelers still carry diseases back with them from other countries, especially after being bitten by particular insects. Often times, people are not even aware that they are a carrier for a
Just as the causes of disease are limitless, so are its effects. There are drawbacks to disease, to be sure. Every year, disease kills millions of people. Is this, however, strictly a negative aspect of disease? Some may view this as population control – maintaining a reasonable population prevents many other negative events, such as starvation, overcrowding and increased violence.

The existence of disease has also prompted medical technology and information. Arguably, nearly all medical advancements we have made are resultant from disease. If no one was ill, information or aid would not be needed. A response to this could be, “well, if that were the case, no aid would be needed. If there was no disease, no sickness, we would not rely on pharmaceuticals and habits that we have today.” This may at first sound like a valid response, but upon further thought, one must consider the advancements made in the medicinal field that are not aids in disease control, for example, traumas. “Trauma” is being used to describe physical conditions that are a result of an accident – not an infection (virus, bacteria, etc).

Traumas would include burns, other open wounds, broken bones, sprained ligaments, and a host of other physical disparities. In a non-emergency setting, people are also vulnerable to prolonged cardiac issues, effects of aging, etc. There is still a clear need for medical technology and the field of medicine in general, without disease. This field would be drastically reduced, both in labor and budget, but would still be necessary. Without evolution of disease, however, we would likely be less equipped
to handle these other predicaments. Much of our information was found in reaction to disease – without the catalyst to motivate us to seek knowledge, our medical field would not be as revolutionary and advanced as it is.

In an effort to answer the question of disease’s existence in a philosophical way, this paper will consider the creation and application of a utilitarian approach to the world\textsuperscript{20}. Looking at the world on a broad scope, it is easy to discern that in areas of the world that experience human overpopulation, the quality of life is lower than in other places on the planet. This is not simply correlation, but has been proven as causality: the presence of more people than resources in an area creates a living situation that is dangerous, unhealthy and extremely difficult to improve drastically. It appears evident that our planet is more able to sustain only a particular number of human inhabitants: this number is being called into question with an increasing amount, as we discover that conserved/limited resources are dwindling in amount and availability. Television audiences are constantly inundated with advertisements featuring emaciated children, bone-thin and evidently slowly starving to death. There is not enough food or water, let alone dental or medical help, available for these children. These commercials appeal to viewers’ emotional sides, hoping to elicit donations to aid these children. This begs the question, however: what, exactly, does one’s “thirty cent a day donation” do? Does it help solve the problem, or only address a symptom of the overlaying issue – we are overpopulating parts of the world. The earth may simply not be able to sustain such a large number of

\textsuperscript{20} This is a brief overview of the school of thought as a whole, and is considered by the author as a view independent of other theories in the paper.
people. As one kill simply cannot feed a pride of lions for a month, it is highly probable that the earth simply cannot feed 7, 8, or 9 billion humans.\footnote{According to World Bank, as of 2011, the world had a population of 6.97 billion.} It may not be able to produce the resources needed to run billions of vehicles, subways, etc no matter how we try to enhance it (and especially if we do not). Recently, it has become somewhat trendy to recycle, to utilize re-usable grocery bags while shopping, and “benefit the earth.” Are people following the trends helping on a large scale? How much are these small changes actually helping? Are cloth bags preventing global warming, or ensuring a better world for future generations? The short answer to all these questions is “no.” No, cloth bags alone are not the answer. They are, perhaps, a sentence in the book-long answer. They are a small part of the solution, but at times it feels like the most people are willing to do for their environment is bring their cloth bags to Whole Foods.

Questioning the earth’s ability to provide for a constantly multiplying number of people is not a new process. In the 1700s, Thomas Malthus created a concept now referred to as the “Malthusian Theory.” This inspired Charles Darwin, and greatly influenced his natural selection theory. Malthus believed that population increased at a much more rapid rate than food supply, which would lead to a very problematic existence. His theory outlined effects of the over population: famine, disease, war and an increasingly violent society, among other detriments. According to Malthus, population could be limited in one of two ways – preventatively, or positively. Preventative measures consisted of various methods of lowering birth rates, while
natural effects, such as famine or war, were labeled as positive methods, as they raise the death rate. In the late 1700s and early 1800s, Malthus wrote and published six portions of an essay titled *An Essay on the Principle of Population*. In it, he responded to people’s reactions to his previous editions, as well as updated his opinions and thoughts on the matter. His work was not generally accepted and supported, and many of his positions on social topics were not agreeable to the general public. For example, he supported unpopular taxes and other unfavorable social measures, believing that while they were unpleasant in the present, they would be beneficial in the long run. Malthus was subjected to unrelenting criticism, mostly focused at his personal life by people who know little or nothing about him.

Many people feel that in his predictions, Malthus was incorrect due to his lack of expectation of technological advancements, especially in the field of agriculture. An observation made about Malthus is that while he may have been correct in his hypothesis during his lifetime, the present advantages that we have – mass food production, for example – cancels out the climbing birth rate, rendering his hypothesis incorrect. Others, however, agree with Malthus’s assessment that a world that’s population is surging is growing farther and farther from utopia.

The philosophical existence of disease is very open-ended. It is debatable, and it is abstract. It can be interpreted as selfish, mean or cold to consider that there may be a “need” for disease, and by extension, human death. Acknowledging that there is a place in the world for sickness may come across as small-minded, but in
reality, it is simply being objective about human life and its propensity towards growth – and acknowledging the negative effects of that growth.

As stated, there are a variety of reasons disease is part of our lives. So why do humans work so hard to eradicate disease? Why do we feel that sickness is completely negative?

We are conditioned to desire life – it is the very essence of our being, a desire to live, to procreate, to further our genetic line. This is best accomplished with longevity of life, of the individual. We also tend to favor control, and prefer to be able to prevent unwelcome events and increase the amount of positive experiences in our lives.

However, it does not take long to find connections between current ailments, diseases and disorders and how they increased our survival and durability in past generations, when the high mortality rate could have prevented future generations. “When a disease that is caused at least partially by genetics is significantly more likely to occur in a specific population, it’s time to raise the evolutionary eyebrows and start asking questions – because that almost certainly means that some aspect of the trait that causes the disease today helped the forebears of that population group to survive somewhere back up the evolutionary line. For example, “Diabetes may have helped our European ancestors survive the sudden cold of the Younger Dryas.”\textsuperscript{22} It may have been an adaptation to the colder climates they were experiencing. While diabetes is not an easy thing to endure, considering that without this adaptation, our

\textsuperscript{22} Moalem, 44.
ancestors could have likely died out. There is evidence that helps support this theory: “Children are most often diagnosed with Type 1 diabetes when temperatures start to drop in late fall”, and “fibrogen, the clotting factor that repairs ice-damaged tissue in the wood frog\textsuperscript{23}, also mysteriously peaks in humans during winter months.”\textsuperscript{24} This may imply that cold weather is an important risk factor in stroke.\textsuperscript{25}

Another example of what feels like a completely harmful health condition actually being beneficial in our past is high blood pressure. When Africans were transported to America by slave traders, the conditions were horrible. They were not given sufficient amounts of food or water, which led to a high death rate. It is likely that those with a genetic inclination to retain high amounts of salt had a higher chance of survival, because the extra salt helped them retain extra water, which prevented dehydrating to death. This may explain why African Americans have an increased ability to retain salt, which leads to increased rates of hypertension. So while it is extremely unfortunate that some people are more prone to hypertension, we are in a position where we can educate people and help them improve their health. This condition helped people’s ancestors survive long enough to create future generations – if their bodies had not made this adjustment to retain water, it is likely that many more would have died of dehydration before having children. So while the hypertension would have shortened their life spans on a larger scale, as it still does today, it helped them live long enough to procreate. Biologically, it makes

\textsuperscript{23} The wood frog goes into a type of super-hibernation, essentially freezing its organs on slabs of ice inside its body. This slows the breathing and heart rates to near death. Upon thawing, the frog is immediately as it was prior to freezing.

\textsuperscript{24} Ibid., 45-46.

\textsuperscript{25} Ibid., 27.
sense that the people with the ability to hold water were the ones that stayed alive 
long enough to create offspring – this explains why such a high number of certain 
populations still have the genetic tendency to retain water. Current living conditions 
do not rely on this trait, so it is not beneficial. Instead, as the benefit is negated, 
heart disease is not worth the trade off of shorter lives. So we no longer appreciate 
the short-term benefit hypertension gave our ancestors, as it is not a benefit that is 
currently needed.26

As suggested with the above example, a disease may appear as solely 
negative or harmful on a small scale, but when viewed as part of the big picture, they 
often actually preserve life – and not only the life of the disease in question! Plants 
create diseases/malffects to aid in their survival, which ends up increasing the life 
of the species that feed on said plants. Destroying that which destroys a life form is 
a typical reaction of living organisms: take, for example, Acadia trees and how they 
protect themselves from predators. Giraffes were eating Acadia trees to the point of 
near extinction in an area of Africa, and in an effort to save the species from being 
destroyed, the trees began to omit poisons to deter the giraffes from consuming them. 
“Curious is the pseudo form of communication that acacia trees use. When giraffes 
eat acacia tree leaves, the trees send out a "warning," pheromones that waft 
downwind to other trees. The downwind trees then emit toxic tannins to prevent the 
giraffe from eating the leaves, which may explain why most giraffes move upwind as 
they eat! While this may seem like a detriment to giraffes, in all actuality, it is

26 Ibid., 65.
beneficial for them: the toxins fade as the pheromones do, and they once again become safe to eat. As trees cycle through this process, they have the time to reproduce and re-grow, keeping them in existence, and thus keeping the giraffes fed. If the Acadia trees had not begun to protect themselves in this way, this food source of giraffes could well be nonexistent by now. In this example, it is clear to see how a disease is beneficial in the long run to a species seemingly negatively affected by the disease when only the short-term is considered.\textsuperscript{27}

Yet another example of this is clover. In the 1940s, sheep in West Australia were not reproducing as usual. Sheep would either not get pregnant, or not carry young to full term. The culprit ended up being European clover, which was producing a phytoestrogen which inhibits reproduction in the consumers. The weather was unseasonably dry and warm, and the clover was having a bad year. To avoid being overeaten, it limits the size of the next generation of predators. If sheep ate clover into extinction, it would only be a matter of time before they ran out of food supply and began to starve to death as well. So while, at first glance, it may seem that clovers and Acadia plants making themselves toxic is a bad thing for sheep and giraffes, respectively, without this defense mechanism to help regulate population, it is likely that either or both animals would not have the steady populations that we take for granted. Another example of this defense mechanism in action is the cassava plant, which, during droughts, produces high amounts of

cyanide compound to avoid being eaten by predators, to increase the chances it will make it through the season.\(^{28}\)

With these examples in mind, it feels logical to question if maybe disease is the earth’s reaction to decimation. In an act of self-preservation, the earth is creating environmental factors that damage its inhabitants, who are rapidly destroying the earth and its resources. Humans do not often feel that we have the upper hand against disease, because throughout history, microbes did. During the last century, however, humans found ways to fight back. Through the efforts mentioned, it felt as though humans could conquer and eliminate lethal diseases. This mentality was supported by the United States surgeon General William Stewart’s confirmation that ‘we can now close the book on infectious diseases’ in 1967. Despite this, it was not long before new microbes began making an appearance. These microbes were not new, harmless replacements: some were, but some were as lethal as the ones humans thought were gone forever.\(^ {29}\) “Since then they have hit us at the rate of around one a year, and now the frequency is increasing, a scenario that seems to mirror events of 10,000 years ago when animal domestication prompted a spate of new human infections.”\(^ {30}\) The explanation behind the spread of these new diseases closely resembles the reason for their expansions in the past: our contact with the new microbes is spurned by environmental changes, then the transfer and carrying of

\(^{28}\) Moalem, 68-80. Napier.
\(^{29}\) Examples: Ebola, Hantavirus, MRSA.
these new diseases through travelers and trade bring these new diseases to various locations throughout the world.31

So, as we venture out and discover more natural resources, creatures, etc on earth, we also discover ways to destroy or deplete these new discoveries. With global warming an increasing concern, we are aware that the human race has a huge effect on the earth. Our energy use, pollution and other actions are negatively affecting the planet and many life forms on it. Again, when viewing the short-term, the small picture, these situations all appear to be in desperate need of our help. We hear about clover poisoning sheep, and our knee-jerk reaction is to save the sheep by raising funds to buy them different food. Yet how would that change things in the long run? Once we analyze the reasons for the perplexing natural experiences in the world, and stop trying to control them, instead letting them run their course, we often find that things work themselves out – and not by making the best of a bad situation, but by completing the intended pattern (such as emitting toxins that ensure a future food supply for a reliant species).

By the same token, we often view the short-term effects of illness and disease: we are emotional and saddened by a diagnosis of loved ones. We (narcissistically) believe that what suits us – our loved one not being terminally ill – is also what is best for the species as a whole. In all actuality, what is best for the part is not always best for the whole. This premise holds true for well-being and general health: if we all were to stay healthy, and never fall ill, the fate of humans in

31 Ibid.
general would suffer, and this overall negative affect would trickle down to our individual unhappiness. We can answer the questions asked at the opening of this section by taking a philosophical approach: does the human race benefit from disease in an emotional, social way? Why do we believe that disease exists? There is no definite answer, but people have pondered the emotional effects of coping with loss on a regular basis, and from a young age. Humans accept that they, or someone they know, could grow ill and pass away. There is still an element of the “it will not happen to me” mentality, so with the terminal diagnosis of oneself or of a loved one, an amount of denial is often encountered, but this would be far more severe and more difficult to overcome if the only loss we suffered was old age.

Disease and sickness has also benefited human life by prompting an untold amount of social change, new discoveries and even basic cleanliness habits that we perform regularly. “In response to epidemics of yellow fever, cholera, smallpox, typhoid, and typhus, communities began to recognize the benefits of organized efforts to address health issues.”32 Moral concerns prompted social reform prior to the germ theory of disease, which greatly contributed to public health measures. Organized public health efforts were led by New York state, which created the first state health department in 1866. Members of this department were mandated “to monitor serious health programs and attend to unsanitary living conditions.”33 Shortly thereafter, other states followed suit.34

33 Ibid.
34 Ibid.
Around 1846, John Snow demonstrated that drinking contaminated water from a specific pump was the cause of the 1866 London cholera epidemic.

“Subsequent improvements in water supply and sewage systems reduced both water-borne and food-borne diseases.”35 “By the end of the nineteenth century, proof of the germ theory of disease began to transform medical care and hospital practices.”36 So it is clear that without the catalyst of disease, we would not have all of the cleanliness practices in place that we have today. And again considering the human psyche and emotional tendencies, one must acknowledge that often, one or two deaths are not a huge motivator for large social change. Money and time were spent on isolating the cause of disease and on learning ways to prevent reoccurrence of diseases that killed hundreds and thousands of people. This is unfortunate, but is still a practice in existence today. As more and more women are diagnosed with breast cancer and heart disease, more money is channeled into research and treatment of these diseases. On the other hand, extremely rare diseases37 remain without a cure – not because we are sure none exist, but because it is deemed “unworthy” of research money and manpower because the net gain of a found cure for a rare disease is not as beneficial as the cure for a common sickness, such as diabetes or cancer. Money and time are spent to correct large problems – it almost feels masochistic, then, to state that many must die or suffer so that more may live, but this is a pattern that humans have established in determining which sicknesses and diseases deserve money and

37 Such as tropical neglected diseases.
attention towards cures. So while we can easily show that the solution is elicited by the problem, one could argue that without the problem, the solution would be unnecessary. This may sound like a valid argument at first, but upon simple consideration of other aspects of our lives, one can see the folly in this thinking.

Not every solution holds the answer only to the immediately known problem. Put simply: sometimes what we think may be the answer to one question turns out to answer that question, but other times it answers questions we did not even know to ask. The same can be said for many of the inventions and practices stemming from outbreaks of diseases throughout history. Referencing the questions closing the previous paragraph, one can consider advancements in the medical field. Medical advancements are not all disease related: for example, developing the science of endocrinology (the study of the body’s hormonal system), changed lives with the discovery of insulin by Frederick Banting and Charles Best in 1921. Other drug discoveries led to amazing cures, including Alexander Fleming’s discovery of penicillin in 1928. Prior to this, even a small scrape could result in death. A disease microbe prompted the discovery of penicillin in 1928. Alexander Fleming was growing some pathogenic microbes in Petri dishes when a *Penicillium* spore found its way into a dish. Fleming saw mold growing in a dish, and noticed that the disease-causing microbe was unable to grow in the area next to the mold. He recognized this as having potential to kill microbes in humans, and after several years of development, this mold product was being used as penicillin, which saved the lives of millions. Disease has led to research that benefits those not afflicted by
disease as well as patients of disease. “The first mechanical respirator in wide usage was developed in 1929 by Philip Drinker, an engineer, and Louis Shaw, a physiologist working at the Harvard School of Public Health.”38 This creation led to the design of mechanical positive-pressure respirators, which, over time, replaced the iron lung tanks.39

Despite the breakthroughs we have experienced after being motivated by disease, and the knowledge it has created, disease still holds the power to terrify. One reason humans tend to fear sickness is because many humans fear death, and sickness and disease can be fatal. It is within human thought capacity to accept that individuals are not immortal, yet we practice akrasia by telling ourselves death will not happen to us, we will not be the ones to fall ill, or die in a plane crash. Every year, millions of dollars are spent in learning how to extend life, not by curing disease, but by postponing or prolonging the aging process. This is comforting to many, as the idea of having life eternal is appealing to some. Science, however, simply does not support the idea that we should live forever. Take, for instance, genetic mutations (an aspect of evolution – efforts to help us maintain health to achieve an end goal of procreating and ensuring the next generation). Once we are past the point of reproduction, evolution does not support the idea of long life spans. Even our bodies do not make efforts to increase our life span, as a species. We change to avoid early death, and to avoid passing negative mutations onto our offspring, as this would create a less fit generation. We do not change to extend life

38 Oldstone, 106.
overall. “Mutations offer insights into understanding longevity… There are no known mutations that extend the human life span but many that shorten it. However, if mutations were purely negative, they would disappear.”40 The theory for this is that there must be an advantage to having one copy of a mutation – cystic fibrosis and sickle cell disease are two examples of situations where one copy of a mutation is advantageous, but two copies can be fatal. All things considered, however, the number of people saved from malaria and cholera far outweighs the numbers of people whom suffer the disorders associated with having both copies of these mutations. We also have not ever been evolutionarily inclined to have immortality or long life. Many animals have naturally long lives, largely in part due to higher levels of telomerase than in humans.

If we were intended to live forever, this would be reflected in nature. Immortality would be effortless. American lobster, rockfish, and sturgeon are given this ability – they did not manipulate nature or science to achieve longer life. It is simply the way nature intended. There are a number of reasons that humans were not created with the life span of these creatures, though. “Without aging, the planet could be overcrowded, to the detriment of the young.”41 Aging and death “serve to promote evolutionary progress by accelerating the turnover of species generations.”42 This connection between life span and speed of evolution is demonstrated in various

40 Butler, 149.
41 Ibid., 152.
42 Ibid.
species, a common one being rats. Their short life span enables them to gain immunity to certain poisons in a fewer number of generations.  

Something else that we may not realize is that parasites, despite their bad reputation, protect us. Scientists wondered what happened when the human body came into contact with parasites, and after much research, found the answer: a reaction by the body occurs as it learns to tolerate the parasite, spurning the presence of what are referred to as “peacekeepers.”  

“A team of peacekeeper cells calls off the antiparasite armed forces. The peacekeepers balance the response. They reserve the body’s energy to fight another day against a more beatable or virulent foe.”  

A theory began to form that peacekeepers are only produced “when there is peace to keep.”  

The peacekeepers are then not able to tell our body not to attack everything they come across: when the body begins to attack itself (which is its natural tendency), peacekeeper cells stop them. When peacekeepers are absent, “our immune system battles our bodies without end. It battles our bodies until we are sick and then sicker. Boils erupt on our skin. Our intestines become inflamed. Our lungs wheeze and collapse. It battles our bodies until there are no winners.”  

Peacekeepers are not always present, however; their presence is reactionary to the presence of worms in the human intestine. The peacekeeper is spawned in response to that worm, but the benefit of the peacekeeper is far more than simply keeping the worm in check. A theory is that when the body fights an unimportant but losing

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43 Butler.  
44 Dunn, 42.  
45 Ibid.  
46 Ibid.  
47 Ibid.
battle, it is weakening itself and wasting valuable resources, so the peacekeepers tell the body to accept the parasite, and “admit local defeat” while protecting the immune system from other situations. So while the body benefits from the presence of these “Peacekeepers,” they are not randomly generated. It takes a situation in need of peace to merit a Peacekeeper – this is where the worms come into play. By introducing a foreign entity, peace is threatened, so the Peacekeeper is dispatched. Once this is done, the Peacekeeper aids the body in the ways discussed – not killing the worm, but keeping it check, as the Peacekeeper simultaneously facilitates the peaceful existence its presence ensures. “The peacekeepers keep the peace. The worms, in their way, trigger that peace.”

The Peacekeeper is not the only example of our bodies benefitting from the presence of a worm. “The broad reality is that our immune systems appear to have evolved in such a way as to function “normally” only when worms are present. Scientists have called this phenomenon the hygiene hypothesis, where the idea is that clean living is bad for us because the functioning of our immune systems needs the “dirty” realities of worms and maybe even a particular microbe or two.”

While it is clear that disease affects us during the present, the necessity of disease is not only a recent fact. Not only does disease affect us currently, it has also changed the course of history. “One consequence (of disease) is that battles have been won or lost when a particular virus infected one army but not its adversaries.”

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48 Ibid., 43.
49 Ibid., 43-44.
50 Oldstone, 3.
“Battles and the course of history were determined by the smallpox infection either purposely or inadvertently.”51 We have numerous examples of this occurring, the most well-known being Cortez’s conquest of the Aztecs, or when smallpox was intentionally given to Native Americans.

Disease plays an active role in world history. “Entire countries have been changed geographically, economically, and religiously as a result of sweeping virus infections that were impervious to known cures.”52 Not only did the smallpox Cortes brought with him affect the Aztecs by killing them in mass amounts: it also changed their religious perspective. The Spaniards’ immunity to the illness in the midst of the Aztecs’ universal suffering was interpreted by the Aztecs as the Christian god holding dominance over their native gods. “Therefore, one direct consequence of mass smallpox infection was the subjugation and subsequent exploitation of Native Americans and Mexicans by the Spaniards. A second and more lasting effect was destruction of that native culture; as the Spaniard culture assumed sovereignty, millions of Indians were converted to the Christian faith.”53

Not only did famine occur as people died in such massive numbers that there were few left to farm the land, but approximately one-third of the total population in Mexico was killed at this time by smallpox. The natives deferred to priests and the Spanish authorities, following their commands almost without question, which quickly led to a mass conversion to Christianity and, subsequently, to a Spain-like

51 Ibid., 33.
52 Ibid., 3.
53 Ibid., 4.
country. Still yet another example of smallpox changing history is an occurrence that took place in the war of 1763.\textsuperscript{54}

Disease used as a weapon is a vital part of American history. “In the war of 1763 between France and England to win North America, smallpox was deliberately spread to Indian tribes”\textsuperscript{55} as ordered by Sir Geoffrey Amherst, the British Commander-in-Chief in North America.\textsuperscript{56} “By Amherst’s direction, hostile Indian tribes were provided with blankets contaminated with smallpox.”\textsuperscript{57} Others followed suite, with Colonel Henry Bouquet replying, “I will try to inoculate the Indians with some blankets that may fall in their hands and take care not to get the disease myself.”\textsuperscript{58} This act is monumental in part because it is the first noted use of disease as a weapon. People use the phrase “biological warfare” and it sounds extremely current and new, but in reality, this practice dates all the way back to this example in 1763. The first biological attack that historians are aware of was Amherst’s authorization of “the distribution of smallpox-contaminated blankets to Native Americans who were harassing European settlers around the garrison at Fort Pitt in Pennsylvania.”\textsuperscript{59}

Even when humans were not intentionally exposing opposing troops to disease in an effort to gain the upper hand, disease did its part to cut down soldiers’

\begin{footnotesize}
\begin{enumerate}
\item Ibid., 32-33.
\item Ibid., 33.
\item This was during Pontiac’s Rebellion, and according to some sources, blankets were distributed to peaceful Indians, not hostile.
\item Ibid.
\item Ibid.
\end{enumerate}
\end{footnotesize}
numbers. “In June or 1812, Napoleon Bonaparte assembled his troops to try to occupy Russia via Poland.” Over half a million of Napoleon’s soldiers (nearly five of every six) died trying to control Russia: most of these troops died not from combat, but from disease. The culprit? A spotted fever spread by lice or dysentery. The Russians were not affected. The cause of the discrepancy is credited to hairpieces, which the French wore but the Russians did not. The hairpieces were the perfect habitat for the lice and diseases they became afflicted with. The French defeat led to Haiti gaining its freedom from France, and it dissolved Napoleon’s ambitions in the New World.

This is not the first example in which ectoparasites played a significant role: “By some estimates, World War II was the first war in which more soldiers died in combat than of ectoparasite-transmitted diseases.”

Another such example is yellow fever. Yellow fever affected history in numerous ways, one being the increase in the slave trade when yellow fever ravaged the Caribbean coast. Because African blacks were able to withstand the effects of yellow fever (also known as “yellow jack” or “yellow plague”) and suffered much lower mortality rates than Caucasians, American Indians, or Asians, growing numbers of African slaves were brought to replace those plantation laborers. Most black Africans and their descendants responded to exposure to the plague with mild to moderate symptoms, then recovered after a few days. “This outcome reflects the long relationship between the virus and its indigenous hosts, who through

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60 Dunn, 212.
61 Oldstone, 50-51.
62 Dunn, 212.
generations of exposure to the virus have evolved resistance." Due to its lethal nature, “yellow fever actually disrupted exploration into the Caribbean.” Exploration only picked back up when the disease was linked to mosquitoes, and a successful effort in 1901 was made to destroy mosquito breeding places. In 1937, a vaccine was developed, which furthered the exploration efforts even more.

There were yellow fever outbreaks in both Philadelphia and New York in 1793. In the Philadelphia epidemic, over 4,000 people (10% of the population) died in a time span of four month. “Most likely, the source was mosquitoes in water barrels aboard ships that transported French refugees fleeing the yellow fever scourge of 1792-9 in Santo Domingo, Haiti, and the West Indies.” “During that summer, heavy rains descended on Philadelphia and produced a great increase of mosquitoes, a nuisance to those living in the city.” In 1793, when Philadelphia was the nation’s capital, “George Washington, John Adams, Thomas Jefferson, Alexander Hamilton, and John Knox witnessed the yellow fever plague and watched as it shut down the United States government.” Thomas Jefferson penned a letter to James Madison (in Virginia), telling about the high numbers of people fleeing, and that one in every three affected had died. Government employees were falling

63 Oldstone, 49.
64 Ibid., 45.
65 Ibid., 45-46.
66 Ibid., 46.
67 Ibid., 47.
68 Ibid., 46-47.
victim to the yellow fever, and government papers were locked up when clerks left.

“By September, the American government came to a standstill.”

This was not the last time that illness would change the way that humans existed. “Viruses altered human history again when black slaves revolted in the early years of the nineteenth century.” Napoleon sent almost 50,000 troops to Haiti to prevent an uprising, and there, most of these Frenchman came into contact with yellow fever virus (transmitted by mosquitoes), and died as a result of infection.

“This huge loss influenced the decision not to risk the even larger numbers of troops necessary to protect other French territories in the New World and was one of the major considerations leading Napoleon to negotiate the sale of the Louisiana Territory to the United States.” Soldiers learned to fear not only gunfire and attack from other countries, but to also fear disease. Smallpox was also greatly feared because no one was immune – higher-ranking officers could hide from combat, but not from disease. “Smallpox actually changed the course of history by killing generals and kings or decimating their enemies.” In situations where generals or leaders were killed, surviving members of a battalion were left uncertain of their next order, and disorganization was rampant.

To this point, it may not feel that viruses affected present-day America as much as we may think. However, one marked effect of virus’ presence is the existence of two countries instead of one combined. “Viruses interfered so that

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69 Ibid., 48.
70 Ibid., 5.
71 Ibid.
72 Ibid., 27.
73 Ibid., 5.
Canada and the United States never united into a single country.”’

“In 1776 Benedict Arnold led an army of American colonial troops to attack Quebec with the hope of freeing that Canadian city from British rule and adding it to the territory of the thirteen colonies.”

A little over half of the ten thousand American troops in the attack developed smallpox. “In the same war, the fear of smallpox limited and delayed George Washington’s attack on Boston to free it from British control.”

The medical consequence of America’s attack on Quebec caused Washington to order for the entire Continental Army to be vaccinated in 1777. Countries which followed suit by vaccinating troops (Germany and France, for example), had varying degrees of success based on reliance to vaccination: the Germans, who revaccinated every seven years, lost fewer than 300 out of 8,360 infected during the Franco-Prussian war. France, on the other hand, did not believe in repeated vaccinations, causing them to lose over 23,000 soldiers to smallpox while another 280,000 were infected. “Finally, James Madison, the fourth president of the United States… signed legislation, the first of its kind, to encourage vaccination.”

Not only did disease directly lead to the creation, production and mass use of makeup, it also saves countless lives. As briefly considered while discussing genetic mutation, one must acknowledge that some diseases exist to prevent worse diseases. That is, we evolve to accept the fate of the lesser of two evils. One example of this is the relationship between malaria and sickle cell anemia: “When a child receives a

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74 Ibid.
75 Ibid., 34.
76 Ibid.
77 Ibid., 32-34.
copy of [the gene that causes sickle cell] from just her mother or father, she is immune to malaria and far more likely to live long enough to raise her own children. But when those genes are received from both parents, they produce fatal sickle cell anemia."  

There are many disorders which present in this manner. It has been decided by our bodies that the benefit of this mutation far outweighs the risk of experiencing the possible negative outcome. And is not this how we also actively treat side effects? So many prescription medications have endless lists of side effects, yet we choose to take the medication. Our bodies simply make the same decision for us on a different scale.

And just as inventions were created in response to disease, so was research prompted by disease. James Watson, co-discoverer of the structure of DNA, began his work in genetics after being inspired by the work of Salvador Luria, who was part of a group of researchers who studied viruses that infect bacteria, called bacteriophages. Watson studied under Luria before going to England, where he met Francis Crick, the co-discoverer of DNA structure and nucleic acids, as well as the significance for information transfer in living material.

“With the interest peaking in prion disease and in recognition of its discovery, related scientific work, and identification of human genetic diseases caused by prion, the Nobel Prize in Physiology and medicine was awarded to Stanley Prusiner in December 1997. The aware acknowledged the singular purpose and robust contribution Prusiner made in biomedical research and his discovery of prions – “a new biologic principle of infection.”

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78 Dunn, 212.
80 Oldstone, 206.
As discussed, there are a variety of reasons disease exists, and a great deal of evidence proving that its existence benefits humankind. Disease heightens our rates of survivability as a species. It encourages us to constantly research and discover new medical, biological and social technology.
Part III: What do we want to do about disease? What is the goal that we are trying to accomplish? How do we plan to enact these changes? Is this goal beneficial?

When we begin to accept responsibility for the world around us, and acknowledge that we have the power to change it, we naturally follow that recognition up with a desire to make a change. In many cultures, humans tend to be controlling creatures, wanting to determine situations and their outcomes. Most prefer to consciously choose, premeditate and plan actions, not simply react to situations.

What we want to do about disease is an extremely open-ended, impossible to fully answer question. First, beginning the question is “we” - an ambiguous term. If ten people are asked about disease, all ten are likely to give ten different goals regarding disease. Even if one goal is decided upon, ten people may have ten different methods to achieve the same goal. There are also many types of diseases and sicknesses, some more likely to be eradicated than others. Finally, the scope of the question must be identified – manipulating a disease in a smaller geographical area may be more possible than on a global scale. So while this thesis studies the possible effects of one specific goal, there are countless goals and possible situations that could occur.

Furthermore, the goal itself is not the only question. In setting a goal, or planning a change, a limit must also be defined. If Americans were to determine a
common goal, say, eradication of influenza, the terms of the goal would need to be defined. Currently, different health organizations define “eradication” differently, and “influenza” could even be debatable – would only certain strains be included in this goal? A goal that may feel simple and clear is likely far more complex than perhaps first considered. It may be agreed upon and stated, but setting a goal is only the start of the process. After changes have been made, is there a defined finish line? Goals might have time limits, or certain outcomes which would determine the end of the process. If a goal of eradication is met, does the effort stop? In this case, ceasing effort towards this goal may allow the end result to dissipate without the support that drove it to exist. When will we feel this goal has been achieved? What will we do at that point? Will our goals change? The idea of singling out one goal and one method to achieve it, and collaborating on this goal as a unified group feels as impossible as the task itself.

Many efforts are made to control disease in America, and different people commit to these different goals to varying degrees. Producers and manufacturers produce antibacterial products, organizations and medical professionals educate the public on safe, healthy practices, and healthcare measures are put into place such as giving all American citizens access to preventative health care. Numerous organizations work year-round to raise funds, holding rallies, lectures and other events to aid in the ever-ending quest to cure cancer, Alzheimer’s, or a myriad of other diseases.
Is this goal likely to occur, or even possible? In the eradication of infectious disease, “three indicators were considered to be of primary importance: an effective intervention is available to interrupt transmission of the agent; practical diagnostic tools with sufficient sensitivity and specificity are available to detect the levels of infection that can lead to transmission; and humans are essential for the life-cycle of the agent, which has no other vertebrate reservoir and does not amplify in the environment.”81 As humans are an essential part of disease, a sure way to eliminate disease would be to eliminate their reservoir – the humans. Doing this would completely undermine the reason eradication is desired in the first place, and it also reminds us of a basic fact: diseases need humans to exist. It is common knowledge that diseases that kill their hosts too quickly do not tend to become epidemics – it is the disease that comprehends its reliance on humans, the disease that allows its host to stay mobile, which allows it to reproduce and reach epidemic or pandemic proportion. Could this relationship be symbiotic, that both parties require the other, even without realizing it?

The general consensus appears to be that disease and sickness are bad, and need to be “cured,” needing removed from the earth. We focus on the “here and now,” on our tiny corner of the world, and perhaps lose sight of the big picture. Is a disease-free existence really what we would benefit most from, as a global unit? When we ask for a world devoid of sickness and disease, what else are we really asking for? We are asking for a world that suffers from overpopulation, and other

81 Dowdle.
detriments far worse than the economically-stimulating, population-controlling disease.

One of the many attempts Americans make in the crusade to avoid illness is the massacre of bacteria. Everything we can slather with anti-bacterial products gets slathered, from doorknobs to cell phones to lotion. Yes, it can help limit the spread of germs that pass illnesses such as the common cold, but is it doing more than simply preventing a person from getting the cold that their coworker has? Many anti-bacterial soaps and gels clearly state that they kill 99.9% of all present bacteria. The 0.1 percent of bacteria that it cannot kill, however, are the ones that most humans fear most (or at least, the ones they should fear). These gels do not kill MRSA (methicillin-resistant *Staphylococcus aureus*, an antibiotic resistant strain of *staphylococci* infection), which runs rampant in hospitals, nor does it kill *Clostridium difficile* (often referred to as “C. diff,” also prevalent in medical settings). Topical anti-bacterial gels and lotions kill minor harmful bacteria, but even strains of “minor” bacteria that are not killed only become stronger. By killing the weakest bacteria, we are motivating the strongest to become even stronger, rendering them more and more resistant to over-the-counter anti-bacterial products.

While topically applied anti-bacterial products are likely the first thing to leap to mind when hearing the phrase “anti-bacterial,” they are not the only harmful approach we take towards bacteria, or even any other life form. “Each of the technologies we have used against other species is a kind of anti-biotic (literally, “against life”) - though seldom does a technology actually kill all of the life we are
after. We hunt large predators, making smaller ones stronger. We spray DDT on crops and in homes, and “favored the resistant and insidious.”82 We killed some weeds, leaving the “super-weeds” to grow between cracks in cement. We breed strains of species that “blossom out of hardship and persistence.”83 And this is not something that every single person consciously does: we do not have the power to say, “Okay, we will stop using antibacterial products.” In fact, the consumer is choosing to purchase and utilize anti-bacterial products, but this is not their only interaction with them. We attempt to eradicate bacteria in so many ways – “even if you have not intentionally used them, you have ingested them. They are in our food and drinks. They are used in crops, in cows, pigs and other domestic animals both to treat bacterial diseases and to prevent their occurring in the first place. Antibiotics are nearly everywhere. More than 200,000 tons of antibiotics are consumed annually, with more consumed both per person and overall each year.”84 Of course, this is not evenly dispersed, with some demographical areas consuming and utilizing far more than others.85

Antibiotics are not negative or horrible, but they have been overused and relied on too strongly in the recent past. We started using antibiotics because we needed them: their discovery led to Nobel prizes and helped treat gonorrhea, tuberculosis and syphilis. Antibiotics save lives, and it is not likely that they will ever stop being produced – and if they were, it would hardly be beneficial. They

82 Dunn, 61.
83 Ibid., 62.
84 Ibid.
85 Ibid., 61-62.
should, however, be utilized in a more realistic proportion. Antibiotics are great, “but the use of antibiotics for the treatment of deadly diseases now represents a tiny proportion of all uses – most are for sniffles, earaches, or even preemptive attempts to ward off microbial evil.”86 Many of these uses are more for convenience than necessity – instead of accepting that illness and bacteria are facets of life, American humans tend to prefer to manipulate the existence of bacteria in our world, and eradicate them without any thought to the long-term effects. We have created stronger and stronger strains of bacteria, and this will only continue as our psychological reliance on over the counter antibacterial products continues (or more likely, increases).87

Another tactic of disease control is to amp up healthcare and arm ourselves against disease using medical advancements and technology. Money is being spent, hand over fist, on the treatment and prevention of disease. National healthcare plans are being installed, and healthcare has become more accessible to a larger number of people in American than ever before. This does not, however, come without a price, as healthcare is not cheap. New economic plans are being developed by professionals and experts, yet as the CDC notes, “Formal economic analytical techniques are not ideally suited to eradication programmes. It is not clear, for example, how to handle future benefits and cost, particularly long-term effects. Equally unclear is whether and how to discount future effect.” The journal continues, “The costs and benefits of global eradication programmes can be grouped

86 Ibid., 63.
87 Ibid., 62.
into two categories – direct effects and consequent effects. The direct effects of eradication are that no morbidity or mortality due to that disease will ever again occur. Control programs can cease. The consequent effects are those that impact positively and negatively on the entire health care system.”

Another look at the economic cost of eradication programs is the CDC Workshop that discussed eradication efforts and limitations determined that “Decisions on initiating a global disease eradication campaign should also take into consideration the ideal sequencing of potentially concurrent campaigns. Eradication programmes consume major human and financial resources. Careful consideration must be given whether two or more eradication programmes are to be conducted simultaneously or sequentially, or if the target disease is confined to a limited geographical area.” The CDC is, with these statements, implying that a blind “disease should be eradicated” goal would be foolish and subpar, as well as especially difficult (if not impossible) to achieve. More than that, however, they are showing that the costs and efforts that it would require to eradicate disease may not be worth the end result of possible eradication. To see the Center for Disease Control weighing the costs and advantages of eradication programs and finding that blindly funding eradication efforts would not be supremely advantageous is extremely enlightening.

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89 Ibid.
Regardless of the paths taken, many are intended to lead to the same place: an environment devoid of disease – generally immediately only one or two specific diseases, with the abstract long-term vision of a disease- and cancer-free world in the future. Eradication of malaria, for example, is not an end-goal: it is viewed by many as a stepping stone to the eradication of other diseases. Eradication, as mentioned, is defined and viewed by many different groups and individuals in many different ways.

To define “eradication of disease” as a goal is extremely broad. As stated, not only can different persons make a goal of eradicating various diseases in a range of ways, but they can also define “eradication” in a number of ways, or even classify goals in an assortment of terms, and with extremely diverse end goals. Below is a set of terms and definitions according to “The Principles of Disease Elimination and Eradication,” written by Walter R. Dowdle and published by the CDC. “Although definitions outlined below were developed for infectious diseases, those for control and elimination apply to noninfectious diseases as well.

- **Control**: The reduction of disease incidence, prevalence, morbidity or mortality to a locally accepted level as a result of deliberate efforts; continued intervention measures are required to maintain the reduction. Example: diarrheal diseases.

- **Elimination of disease**: Reduction to zero of the incidence of a specified disease in a defined geographical area as a result of deliberate efforts; continued intervention measures are required. Example: neonatal tetanus.
- *Elimination of infections*: Reduction to zero of the incidence of infection caused by a specific agent in a defined geographical area as a result of deliberate efforts; continued measures to prevent re-establishment of transmission are required. Example: measles, poliomyelitis.

- *Eradication*: Permanent reduction to zero of the worldwide incidence of infection caused by a specific agent as a result of deliberate efforts; intervention measures are no longer needed. Example: smallpox.

- *Extinction*: The specific infectious agent no longer exists in nature or in the laboratory. Example: none."^{90}

These are only one committee’s definitions – this is not a comprehensive, universal way to classify these terms. Each of these categories have been defined in a multitude of ways. Eradication, for example, has been described as complete removal of the disease pathogen; as occurrences of the disease being eliminated; as an absence of preventative measures needed to control the disease; and “as reduction of the worldwide incidence of a disease to zero as a result of deliberate efforts, obviating the necessity for further control measures.”^{91} The WHO defines eradication as “achievement of a status whereby no further cases of a disease occur anywhere, and continued control measures are unnecessary.”^{92} Comparing the two, David Heymann of the WHO writes, “Whereas the proposed definition of

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^{90} *Ibid.*

^{91} *Ibid.*

eradication emphasizes that routine intervention measures are no longer needed once interruption of transmission has been certified worldwide, inherent in the definitions of control and elimination is the need for continued intervention measures to prevent re-emergence and re-establishment of transmission.93

A source of debate and confusion regarding the terms and definition of eradication is continued interaction and care after reaching disease control or elimination. Various departments involved in infectious disease control, such as politicians, health care workers and policy writers in the medical sector debate the role that continued intervention plays in disease eradication. This can lead to relapse of infection, as “at times, misunderstanding has led to neglect or complete cessation of intervention activities, with concurrent decrease in financial resources, and thus to re-emergence of the target disease.”94

One generally agreed-upon aspect of eradication is the lack of need for follow-up care or involvement: once a disease is eradicated, efforts regarding the disease cease. This is what changes a disease from “eliminated” (“the reduction of case transmission to a predetermined very low level; e.g., elimination of tuberculosis as a public health problem was defined by WHO in 1991 as a reduction of prevalence to a level below one case per million population”95) to “eradicated” – its complete removal from the earth, with zero chance of its return. Some definitions of eradication include the requirement that to reach “eradicated” status, there are no

94 Ibid.
95 About WHO.
samples of the disease in question present anywhere, in laboratories or in reservoirs in living creatures. For this reason, smallpox is considered to be eradicated by many, as there have not been any outbreaks in recent history and the disease is well controlled and is not being treated for or acted on, yet there are samples of smallpox vaccines in existence, so to some people, there are currently no truly eradicated diseases.

Smallpox is the only disease that affected humans that is commonly referred to as “eradicated,” but many have been assessed as “eradicable” or “potentially eradicable,” so many have hope that more diseases will join smallpox as eradicated diseases, likely integrating measures used to achieve eradication of smallpox to repeat this success with other diseases. Smallpox has been eradicated due to a programme designed to eliminate the disease from the global population. “In some countries, the simultaneous vaccination with two antigens began soon after the beginning of the programme. In the 20 countries of western and central Africa assisted by CDC, all countries administered smallpox and measles vaccines; in a number of countries of eastern Africa, BCG, TB and smallpox vaccine began to be administered at the same time; and in some countries at special risk, yellow fever vaccine was also added. Few developing countries, however, provided DPT, measles or poliovirus vaccine.”96

Henderson, author of “Eradication: Lessons from the Past,” published by the CDC, reminds readers that the World Health Assembly has only made the

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commitment to attempt to eradicate two diseases. They are Guinea-worm disease and poliomyelitis. In the endeavor to eradicate Guinea-worm disease, under the direction of Don Henderson, the focal point and therefore paramount effort is a combination of surveillance, to community participation, to political commitment, and to research in shaping an evolving agenda. “Despite [all efforts], it lags behind scheduled targets and it is clear that its successful conclusion will require a high degree of commitment and political skill.”  

It is not a definite success, but many are optimistic about the odds of a victorious conclusion. Henderson then leaves us with these parting words: “In looking to the future, however, I believe it is critical that we should not be blinded to a range of new public health programme paradigms by staring too fixedly at the blinding beacon of a few eradication dreams.”  

It has been acknowledged by some researchers that altering health programs to benefit one goal may have adverse reactions in unforeseen ways, but many have decided that the end justifies the means, or that the payoff is worth sacrifice, so new measures are taken and new practices implemented.

Another eradication attempt that lends much information about the processes of disease obliteration and pitfalls is the attempt to destroy all traces of malaria on the island of Mauritius. Mauritius is an island off the southeast coast of Africa in the southwest Indian Ocean that was home to a population of 550,000 in 1955. Efforts were made to get rid of malaria from this island multiple times throughout the 1900s.

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97 Ibid.
98 Ibid.
99 Ibid.
In fact, “Mauritius offers a uniquely informative history, with elimination of local transmission in 1969, re-emergence in 1975, and second elimination in 1998.”\textsuperscript{100} Residents of the island experienced greatly fluctuating population throughout this century, often creating overpopulation which led to malnutrition, starving, and lower wages for workers as a reaction to the surplus of laborers available. Shortly after a malaria eradication effort was disbanded in the early 1900s, “an anti-hookworm campaign was instituted in 1922.”\textsuperscript{101} This endeavor proved successful in that it prevented a number of deaths. As a direct result, the population quickly rebounded from its high mortality rate during the influenza epidemic of 1919, and “by 1929, the annual \textit{Colonial Report} stated that: ‘Undernourishment is becoming a very serious cause of illness and the rising death rate is largely attributable to this cause.’”\textsuperscript{102} This had a negative impact on the laborers (sugar cane and rice growers and harvesters), and “wages were now at a minimum level for the maintenance of life.”\textsuperscript{103} “In this period, fertility declined very sharply, and from 1930 until 1933 deaths exceeded births. Malaria and other diseases took a great toll, and, largely through financial stringency, the anti-hookworm campaign was abandoned as a

\textsuperscript{102} Ibid.
\textsuperscript{103} Ibid.
failure, while anti-malaria works were restricted to the immediate environs of the upland towns."

Malaria eradication efforts were made again, and this effort, coupled with men joining the armed forces, obtaining paid allowances and getting married, led to a crude birth rate peak of 49.7 in 1950, and a second peak in 1952 of 48.1. The population climbed higher and higher, and much of the credit is given to the eradication of malaria. The mortality rate fell and the birth rate remained constant, leading to a steady increase in population. This at first was welcome relief, but as time wore on, people began to realize the consequences of higher numbers of people and overcrowding. Studies were done, and estimates of the future population were calculated. The data can be found on the following chart:

**The Future Population**

The following is a summary of six population projections:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<td>501,400</td>
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<td>513,344</td>
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<tr>
<td>1957</td>
<td>582,890</td>
<td>575,670</td>
<td>566,429</td>
<td>577,284</td>
<td>577,284</td>
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<td>1962</td>
<td>628,860</td>
<td>640,474</td>
<td>622,059</td>
<td>632,812</td>
<td>632,812</td>
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<td>1967</td>
<td>788,320</td>
<td>731,585</td>
<td>684,661</td>
<td>695,352</td>
<td>695,352</td>
<td>695,352</td>
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<tr>
<td>1972</td>
<td>916,760</td>
<td>828,249</td>
<td>755,907</td>
<td>768,014</td>
<td>759,314</td>
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<td>1977</td>
<td>936,577</td>
<td>838,413</td>
<td>853,144</td>
<td>829,129</td>
<td>829,129</td>
<td>829,129</td>
</tr>
<tr>
<td>1982</td>
<td>1,061,525</td>
<td>950,744</td>
<td>947,476</td>
<td>947,476</td>
<td>947,476</td>
<td>947,476</td>
</tr>
</tbody>
</table>

1. C.S.O., Mauritius, 1953
2. C.S.O., Mauritius, 1955
4. 3, revised with 1955 fertility data
5. 3, revised as above, with revised 1952 base
6. Assuming declining fertility and mortality

Image: “The Future Population”
Source: Mauritius: Demographic Upsurge and Projection

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104 Ibid.
105 Ibid.
The following is a chart mapping the actual population of Mauritius from 1960 – 2010:

Image: Mauritius Population
Source: Google and World Bank

The first table shows the inevitable future overpopulation of Mauritius. In fact, it was stated that “The chances of the population failing to reach a million are now remote”\(^{106}\) and as the second table shows, that assessment was indeed correct. In the 1860s, the population had been on a steady incline, but the Mauritius malaria
epidemic of 1867-9 curbed this growth and put the population back at a reasonable size. It was then concluded that “A very sharp increase in mortality indeed would be needed to arrest the growth of population within the next generation.”¹⁰⁷ The problem was not only crowding, but also a “limitation of natural resources” on the island.¹⁰⁸

Eliminating malaria had the negative consequence of overcrowding the island, lowering employment wages and rates, and depleting natural resources. Another negative aspect of this program was its financial cost. “On average, Mauritius spent $4.43 per capita per year (pcpy) during its second elimination campaign from 1982 to 1988.”¹⁰⁹ As evidenced by the re-emergence of malaria, maintaining elimination is difficult, as well as costly. “The Mauritius experience indicates that ongoing intervention, strong leadership, and substantial predictable funding are critical to consistently prevent the reestablishment of malaria.”¹¹⁰ All of these factors coming together is unlikely, and the likelihood of them remaining in place is also slim. A common thought process is that “the squeaky wheel gets the oil,” and once malaria ceased to be a problem, support and funding were pulled, and this reaction is likely to occur each time malaria stops affecting the islanders. Of course, malaria is no longer a problem due to the program and funding, and without both, malaria re-emerges: yet, without the presence of malaria, there appears to be no need for a malaria program, so it is done away with. In fact, “a WHO report noted

¹⁰⁷ Ibid.
¹⁰⁸ Ibid.
¹⁰⁹ Tatarsky.
¹¹⁰ Ibid.
that malaria-free certification in 1973 “was certainly responsible for a relaxation in
case detection activities… And the integration of the malaria services into the
preventative health services further contributed to the weakening of the surveillance
mechanism,” and the head of the Malaria Control Unit at the time agreed with these
sentiments.”

During a time after elimination, “it took nine days for blood smears
taken in the field to be delivered to the malaria laboratory.” In contrast,
newspapers printed on the mainland reached the island within three hours of
publication. So even if we invest the time and money into disease eradication, we
are not likely to continue the efforts and funding to sustain it, so even if costs are not
astronomical, they are still in vain. While Mauritius spent less on prevention of
reintroduction (POR) programs than on elimination programs, their “annual per
capita spending remains at levels that are likely infeasible for countries with lower
overall health spending.”

Mauritius is used as a yardstick with which we measure some other
elimination attempts, and because of this, a number of reports and recommendations
have been made, based on the experiences in Mauritius. It is not the only attempt at
disease eradication, but is possibly the most successful large-scale effort. “The
Rockefeller Foundation began campaigns to eradicate hookworm in 1907 and yellow
fever in 1915. Both these campaign against diseases of humans failed.”

By 1955,

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111 Ibid.
112 Ibid.
113 Ibid.
the WHO committed to eradicate yaws\textsuperscript{115}; this campaign failed for a few reasons. Persons with yaws were not correctly treated, and the condition was not able to be eradicated. Some diseases have been deemed possible to eradicate, and others are not viewed as ready for elimination at the present time. Thirty diseases were assessed, and each was labeled, most as “eradicable,” “potentially eradicable,” “could interrupt transmission,” not now eradicable,” or “not eradicable.”\textsuperscript{116}

Successful eradication efforts are often used as models off of which to base future attempts. Malaria in Mauritius and smallpox have both been used as guides, and many plans to control disease mimic the stages carried out in these situations. “From the beginning of the [smallpox eradication] programme, surveillance for smallpox cases was the basic strategy of the campaign. As expected, it proved to be the ultimate quality control measure, the guide to improved operations, and the yardstick of progress. These principles for conduct of an eradication programme remain valid today and, as applied in guinea-worm eradication and in poliomyelitis eradication in the Americas and western Asia, have proved eminently successful.”\textsuperscript{117}

There are multiple types of diseases, communicable and non-communicable, for example, which will require different tactics for eradication, so it will be interesting to see if one tried-and-true pattern develops that may blindly be applied to each

\textsuperscript{115} Yaws is “a long-term (chronic) infection that mainly affects the skin, bones, and joints… It is closely related to the bacterium that causes syphilis, but this disease is not sexually transmitted. Yaws mainly affects children in rural, warm, tropical areas, such as the Caribbean Islands, Latin America, West Africa, India, and Southeast Asia… Yaws is transmitted by direct contact with the skin sores of infected people.”


\textsuperscript{116} \textit{Ibid.}

\textsuperscript{117} Henderson.
disease in question, and how the validity of that method will change. Some eradication efforts have been made in vain, and goals have been altered (at least for the time being), from eradication to control. “Participation in a successful eradication campaign can also be effective in improving the morale and performance of workers in public health, although this potential benefit can also be derived from a control program.”

It is clear that goals regarding disease are not all made in a unified manner, nor are they carried out this way. Not even everyone agrees that eradication is beneficial or should be obtained – in fact, all were not united in the effort to eradicate malaria, as some viewed it as not appropriate. “Moreover, in 1980, support for any new eradication effort seemed unlikely since the smallpox eradication programme was then being critically maligned by traditional international health planners. To them, the smallpox campaign epitomized the worst of what they characterized as anachronistic, authoritarian, “top-down” programmes which they saw as anathema to the new “health care for all” primary health care initiative.”

Goals of eradication are not indisputably positive, healthy goals. Eradication affects other aspects of life, lowering the quality of life as population soars above rates naturally sustainable by the environment and society.

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118 MMWR
119 Henderson.
Part IV: What are effects of our manipulation of health issues?

At first glance, it may appear that eradicating disease would be strictly beneficial. Working under the assumption that disease is bad, and that all bad things being eliminated would benefit the greater good, it would then follow that disease should be eradicated. However, as has been suggested in this thesis, disease is not always negative – and neither is its existence. Previously discussed was the existence of disease: now a hypothetical look at a future without it is being called into question. Just as disease changes our world, our efforts to rid ourselves of disease and sickness change also.

One way America would change if disease ceased to exist would be the absence of its healthcare system, and with it, millions of jobs. The economic collapse we would suffer would be massive and irreparable. The jobs created by and money spent in healthcare is the backbone of our economic system. Without sickness and disease, the number of healthcare professionals needed and employed would be cut drastically. Pharmaceutical companies and pharmacies would shut down, eliminating revenue and employment for businesses and people.

Inversely, as jobs are eliminated, the population would increase as mortality rates decreased, and the unemployment rate would rise even higher. If people never fell ill, people would no longer die from illness or disease. While this might sound great on a small scale, on a large scale, this massive drop in mortality rate would
wreak havoc on society. Overpopulation would quickly become an issue, and while crowding and homelessness became larger problems, so would issues of food and water shortages. People living longer lives leads to people consuming more food and taking up more space. People would also be reproducing more, further increasing the population at a more rapid rate than at present. With greater crowding and higher poverty rates, violence would also increase. While increased violence would undoubtedly lead to numerous deaths, this number would not even approach a comparable number to the present number of deaths due to illness and disease so these deaths from violence would not offset the overpopulation issues.

Another byproduct of the population aging as opposed to dying from various illnesses is the increased reliance on social security. In recent decades, people have spoken about social security “running out” as the baby boomers approach the age to collect these funds. Increasing both the number of years each person collects social security as well as the number of people collecting would increase the costs associated with social security greatly. As the workforce dwindled from the job losses in the medical field and the public relied more on governmental programs, many people would be caught in the middle, unemployed or simply unaided by programs they either do not qualify for, or that do not have the funds available to help all in need.

Another element of this new world would be the human reception of it: would we be able to fully comprehend a world void of sickness? How would the human race react to this new form of limited invincibility? We would be able to
travel without fear of water or diseases, we would not worry about undercooked meat, and we would not have to worry about infections after experiencing a physical trauma. We now accept death as a fact of life – if the only fear of death aside from old age was physical trauma (such as broken limbs, open wounds, etc), would we feel stronger than we should? Would we understand death, and be able to cope when someone we knew did die at a young age, perhaps from drowning, or a car accident? Or would death be so foreign to us that our emotional reactions to it would become stunted and undisciplined? Not recognizing, fearing or comprehending death would change so much of the human psyche. To remove this element from our lives would be to change the way we think, and the way we perceive our role in the world.

We also know so much about the human body due to research motivated and funded by existing diseases. The fact that humans get sick and die is why so much money is funneled into research and pharmaceuticals. Yes, one could argue that if humans no longer fell ill, they would also no longer need the information and technology they pave the way for, but this argument’s logic would be flawed. It would be valid if the only benefit or result of this research was curing disease; however, these benefits reach much farther than that. Through medical research, we have developed machines and tests to evaluate brain damage from blunt force and traumas, which would still be necessary in a world without sickness. We have discovered so much about human genetics, fertility and reproduction, largely in part due to money from investors hoping to find cures to diseases. Medical advancements would be fewer and simpler if the time and resources we have
available ceased to be. “The pharmaceutical industry has begun to take the genetic differences of populations into account. This study of how genetic variation can affect pharmaceutical treatment is called pharmacogenetics”¹²⁰ and it is impacting and changing the medical field. Pharmacogenetics has produced information and technology that impacts thousands of people. This demonstrates that because disease affects so many people, money is being spent to aid in non-controlled factors, such as genetics. If high blood pressure and other diseases did not exist, we would know far less about issues we cannot control, such as genetics.

Not only is being informed key to being a successful, positive society: also integral to this effort is regulation of population. A common hypothesis is that the world is quickly becoming more populated than it can sustain, and this problem would be amplified without a key population control agent: disease. To attempt to fully recognize the real problem of overpopulation, it must be examined in a little more depth. “By 2050, the world is expected to be occupied by 9.2 billion people. It will be hotter and harder to farm. Diseases caused by pathogens will again be a key problem, not just for developed countries but for the whole world, and all of these issues will coexist with our modern problems that seem to be getting worse rather than better: obesity, immune diseases, social discontent, and the extinction of thousands, maybe millions, of species.”¹²¹ By 2050, with current farming practices, “we will need an area of additional agricultural land the size of South America. It

¹²⁰ Moalem, 67.
¹²¹ Dunn, 238.
just does not exist!"122 A research project conducted by Dickson Despommier and a class he taught found that created rooftop farms and gardens on the vast majority of the buildings in New York would create enough food to feed a mere 2% of the city. This was written considering the world as it presently is – home to a myriad of diseases and sickness, none of which are going anywhere anytime soon. In this scenario, the overpopulation and related food shortage are real, even with the expectation that as many humans will die from disease as presently do. Removing these deaths from the equation, thus adding more humans for more years to it, only amplifies the severity of the situation – and the need for more farmland and food – giving rise to genetically engineered food.123

122 Ibid.
123 Ibid., 242-243.
"Mortality assumptions are similar across all these scenarios"\textsuperscript{124}, so this graph is not representing varied death rates. If we cured all diseases, or they never existed, the mortality rate would be much lower, leading to increased population much more quickly and by a much higher amount. “Beyond 2150, therefore, number

of births makes no direct contribution to population growth, and population change beyond that point—and in earlier periods too in some but not all countries—can be interpreted as due to mortality change or the age structure. Then, since most age structure effects disappear by 2225, population change beyond that point must stem mainly from continuously rising life expectancies.”

This demonstrates that even population control measures that could be created in reaction to overpopulation, such as limiting the number of children per family as some countries currently practice, would not be enough to reverse the trend of increased population. Birth rate alone cannot be manipulated in such a way that it can decrease population: mortality rate is a crucial factor in this.

Not only would the lack of disease-motivated deaths increase world population, so would the increased lifespan of the average American. Let’s look at increasing our longevity in terms of life span: Butler’s book, Aging asks the question, “How much longevity would we gain if we conquered the ten leading causes of death?” Nearly half of all deaths in the US annually are attributed to cardiovascular disease. Estimates suggest that eradicating this cause of death would extend our life span by just over ten years. “The elimination of cancer would add 2.4, perhaps three years.” Do we want the social systems we have in place to continue supporting these populations, both in increased number of participants and in number of years? This will increase cost. Where will the money come from?

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125 Ibid., 11.
126 Butler, 101.
127 Ibid.
To put this into perspective, this information should be coupled with the following graphs, which depict the various leading causes of death among different demographics.

Image: Ten leading causes of deaths in 2008 in high-income countries
Source: World Health Organization
Image: Ten leading causes of deaths in 2008 in low- and middle-income countries
Source: World Health Organization
Source: World Health Organization
As we can see from the chart above, one theory projects that even with current mortality and expected life spans, the world could likely reach a population of 36.4 billion. “By the time rising life expectancy becomes the dominant and
indeed the sole influence on growth—in 2225—it will be at 92.8 years and rising.”128

As made clear by the graph, “the crude death rate does in fact fluctuate. As births fall and populations age, the crude death rate rises, intersecting with the crude birth rate in 2075 and not falling below it again until 2170 (figure 10). Within this period, at least, the rise in the crude death rate is more substantial than the fall in the crude birth rate. Should the crude death rate instead stay at its 2050 level, no population decline would occur. Mortality change therefore does make an important contribution to growth trends.129

David Coleman, the author of an essay included in the United Nation’s report on world population and future population projections remarks that “One of the curious features of the set of scenarios is the asymmetry of assumptions given to fertility and mortality. All the variants are based on different assumptions on fertility levels and trends. None is based on any variation in mortality.130 He mentions this being unexpected, as mortality rates are recently credited as important and greatly influential on population variation. The trend of the mortality rate – whether it is falling to uncharacteristically and unhealthy low levels or not is highly controversial. “This great dimension of scientific uncertainty is ignored in these projections, which adopt a model decidedly on the optimistic side, or at least one leading to optimistic conclusions in the long run.”131 He continues, suggesting that a helpful factor to include in the reports would have been variation in the mortality patterns in addition

128 World Population, 15.
129 Ibid., 16.
130 Ibid., 130.
131 Ibid., 131.
to variation in fertility levels, as opposed to showing changes in only the latter. The inclusion of such information would have acknowledged the importance of mortality rates, and providing this information would have aided experts in making a more precise estimation of the changes in population due to mortality change. He concludes that “without alternative mortality scenarios, the sensitivity of these projections to the mortality assumption, in numbers, age-structure and dependency, cannot be gauged.”

In another essay, one written by Paul Demeny, the concern that the estimates are likely too low is voiced again. “By the criteria of its basic input characteristics, the core trio of the United Nations projections up to 2300 could be justly characterized as optimistic to a fault… the potential curse of populations with extreme senescence is assumed away.” Demeny goes on to state that the gentle flux of fertility and mortality rates given by the UN are unlikely: “If these surprise-free long-term scenarios, especially the one articulated in the medium projection, sound too good to be true in comparison to the demographic dramas and dislocations of the twentieth century, they probably are.” Demeny continues, and ends with the prediction that population will “yield a global total of 36 billion souls in 2300. Welcome to the world of growth, preserving historical continuity. Good-bye to the brave new world of stasis and depopulation.” Multiple expert opinions of the UN’s World Population report agree that their estimation of future population is

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132 Ibid.
133 Ibid., 141.
134 Ibid.
135 Ibid., 144.
unrealistically conservative, expressing concern for the likelihood of a staggering rapid increase in population that most people are not ready for.
### Figure 11. Significant world demographic events between 2000 and 2300

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<th>Year</th>
<th>Demographic event</th>
<th>Population (billions)</th>
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<tr>
<td>2005</td>
<td>Crude death rate starts rise (from 9.0 per 1000)</td>
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<tr>
<td>2025</td>
<td>Fertility falls to replacement (and keeps falling)</td>
<td>7.85</td>
</tr>
<tr>
<td>2075</td>
<td>Crude death and birth rates intersect (at 11.4); population reaches maximum</td>
<td>9.22</td>
</tr>
<tr>
<td>2105</td>
<td>Crude birth rate falls to minimum (at 10.7)</td>
<td>9.00</td>
</tr>
<tr>
<td>2115</td>
<td>Crude death rate reaches maximum (at 12.3); growth rate at minimum (-.15% in 2105-2120)</td>
<td>8.86</td>
</tr>
<tr>
<td>2155</td>
<td>Fertility rises to replacement (and stays there)</td>
<td>8.47</td>
</tr>
<tr>
<td>2175</td>
<td>Crude death and birth rates intersect again (at 11.1)</td>
<td>8.43</td>
</tr>
<tr>
<td>2225</td>
<td>Fertility effects on growth have disappeared</td>
<td>8.62</td>
</tr>
</tbody>
</table>

Image: Significant World Demographic Events between 2000 and 2300

Source: World Population, United Nations
We can see that the death rate rising is crucial for these population estimates to occur as expected. The eradication of population-controlling diseases and viruses would create a major upset, preventing the equalizing of birth- and death rates, instead leading to mass overpopulation in a world where people are living longer than presently, both due to aging and to lack of terminal illness. “By 2300, life expectancies will reach 94.8 and 96.3 years for males and females, respectively, in less developed regions, still short of levels of 99.7 and 102.7 in more developed regions.”

136 Mortality rankings, and actually ranking on many demographic indicators, are substantially affected by the HIV/AIDS epidemic, even though HIV transmission is assumed to begin a sustained decline by 2010.”

137 We know this not to be the case: HIV transmission is increasing, not decreasing. This indicates that the future population projections are likely lower than they would be if recalculated today, as HIV is mentioned frequently as bringing the mortality rate higher and lowering life expectancy greatly in affected countries. This is only one disease, and not one of the top ten leading causes of death world-wide, yet the change in deaths caused by HIV affect future projections greatly. This deduction is made based on the fact that HIV, which was expected to be on the decline, affects mortality rankings – but not by decreasing in cases, but increasing. Following this trend, it is only logical to accept that the ten leading causes of death affect the projections even more strongly than HIV statistics: and if these ten causes of death were to cease to exist,

136 World Population, 21.
137 Ibid., 60.
and each person died of old age (in their nineties or as centurions, as projected), it is simple for one to imagine the gross overpopulation.

Data shows that “2-3 million deaths [are] averted annually by vaccination” (http://www.who.int/research/en/), which is yet another group of people that are alive and drawing from social programs and food supply. Combining this with the growing number of aging persons helps to paint a picture of the increased population. As life expectancy lengthens as described above, population estimates grow, and problems multiply. “The world at large is now gaining an additional one million older persons each month.”138 This is as the world is now, and expecting it to remain as so: that is, this number takes into account the numbers of people dying from illness, cancer, etc. Logically, one can deduce that removing these people from the equation would increase this number. The government will be supporting a large majority of these people, which is already crippling the economy, and will continue to do so. Economist Lester C. Thurow refers to America’s old as a “revolutionary class,” believing that, by seeking advantages for itself, this class presents a danger to society. We are conditioned to feel that it is vital that we care for our aged, but this requires money, and the source of this money needs to be considered. Our societal norms are not economically friendly in this regard: many aged citizens are not financially stable, and require fiscal assistance. Above this, “the aged do not usually live within the family and are largely supported by Governments through

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138 Butler, 21.
The government ends up supporting these members of the population almost completely, which is more of a strain than paying to support children. “The cost of supporting each aged person is greater than that of supporting a child by, according to one calculation, a ratio of five to three.” This is for a variety of reasons: one crucial element of this equation is the cost of health care associated with the elderly as opposed to youth. Health care costs are disproportionately high among the greatly aged, in the stage of life approach and immediately prior to death. “Additionally, many aged persons—most in the West—live in separate accommodation and not with their children. This arrangement is necessarily more expensive, especially when additional services, such as specialized health care, are added.” So while we worry presently that social security will not be there for current generations, this worry only increases with the population.

Another element of our lives that would be affected by decreased mortality rates is employment: “Working age adults 18 to 64 years old accounted for 60 percent of all non-institutionalized persons with chronic conditions. Over 30% of Americans reported chronic conditions in 2000, but they accounted for more than 75 percent of medical cost: $1 trillion of $1.4 trillion. They were also responsible for 96 percent of home care visits, 88 percent of prescription drug use, 76 percent of days spent in hospitals, and 72 percent of doctor visits.” This is money that would not be coming into the economy if disease and negative health issues were eradicated. If

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139 World Population, 117.
140 World Population, 118.
141 Ibid.
142 Butler, 22.
143 Ibid.
we cured every ailment, all these lifelong/chronic illnesses and disorders, a loss of over a trillion dollars per year would result in hundreds of thousands of lost jobs.

In addition to taking away jobs, we would also be adding people to the available workforce, thus driving unemployment rates higher than even fathomable in our current situation, as poor as the present can seem. “Even now in Western and Central Europe the economy cannot provide employment for all persons up to 60 years of age.”¹⁴⁴ This fact is widely recognized by experts. “It is sheer foolishness to imagine that we can extend life or sustain complex modern societies without substantial governmental participation.”¹⁴⁵ This participation would likely need to include some type of social security reform in an effort to minimize costs and increase efficiency in spending and budgeting.

“This research supports hundreds of thousands of skilled jobs at universities, academic medical centers, and companies, large and small, across the nation. In 2004, the pharmaceutical industry employed 293,000 people and generated sales of over $200 billion. In 2003, 1,473 biotechnology firms employed 198,300 people and generated $39 billion in sales. Science is a major economic stimulus to the economy.”¹⁴⁶

These figures reflect data about the United States, but these statistics are similar to that of other established, successful countries. Not only pharmaceutical companies find profit in disease: we also find profit in products relating to cleanliness. “In the United States alone, about seven hundred new anti-bacterial products have been introduced… from antibacterial soap and toothpaste to socks and

¹⁴⁴ World Population, 118.
¹⁴⁵ Butler, 11.
¹⁴⁶ Ibid., 106-107.
steering wheels coated with poisons to kill whatever microbes happen along.”

Many lotion, soap and cosmetic producers have incorporated anti-bacterial items into their inventory, from gels to face powders to air sprays. This is a host of other companies that would suffer profit loss without the market for anti-bacterial products.

Another aspect of our lives that would be altered if disease had never existed (or, separately, ceased to exist) is the quality of healthcare, and general medical knowledge. A hypothesis could be made that without heart disease, not as much money would go into heart research. So when a heart trauma occurred, there would be fewer doctors with less expertise and fewer resources as now. There would be no drug companies, or much poorer pharmaceutical companies, so less (or no) drugs. Even drugs created to correct problems not directly associated with a disease may not exist. This is because drugs to control disease or chronic disorders are a primary source of income for pharmaceutical companies. Without the revenue generated by these money makers, where would pharmaceutical companies find the money to fund research? Why would they even want to, with no major profit? They are not altruistic, they are a business. Without money, these companies have no incentive to make drugs or do research. We would not know as much about how to fix traumas, how to treat burns, etc. Drug companies make money off of chronic “clients,” or patients that take medication daily to combat the effects of illness – not people who are on drugs for a short period of time, such as with a trauma.

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147 Farrell, 16.
As discussed in part two, many medical advancements have been made as a result of sickness and disease. Respirators, the discovery of DNA, and numerous medications can be traced back to being discoveries prompted by sickness. What else would we not have access to or not have the privilege of knowing and utilizing if we had not gone through the situations that created these practices and drugs?

And instead of appreciating the advancements we have as a byproduct of the presence of disease, we attempt to eradicate it. We do not accept responsibility for our hand in the existence of disease and disorders, despite the irrefutable fact that we are the catalyst for many of the diseases we are hoping to evade and eradicate. We do not get sick and think about why we got sick, or what the reason is for a disease’s existence: instead, we immediately try to rid ourselves of it. “If some creature clambers into your orifices or through your skin, there is a pill for it, a spray, or maybe a salve. Got germs? Use an anti-bacterial wipe. Got tapeworms? Take a pill. Most of our long-standing ills can be remedied, at least with enough money. But just as we seem to be getting better at ridding ourselves of the old threats, a set of “new” diseases – including Crohn’s, inflammatory bowel disease, rheumatoid arthritis, lupus, diabetes, multiple sclerosis, schizophrenia, and autism, among others – has become more and more common, and these diseases appear to be, at least in part, what is plaguing us. These diseases, contrary to our standard ideas about progress, have become most common precisely in those countries where we spend
the most in health care and public health. Whether American, Belgian, Japanese, or Chilean, we in the “modern world” are getting sick in new ways.”

For example, Crohn’s is likely a disease we brought on ourselves by eradicating our bodies of parasites. We overcompensate out of fear of getting sick, by getting rid of parasites, which makes us sick. It is cyclical. “When a pronghorn runs fast to outpace a long-gone predator, it wastes energy. When our bodies run fast to escape nonexistent worms, they trip, he believed, or maybe they never learn to run properly in the first place.” This researcher realized a correlation between white collar workers and Crohn’s: “blue collar workers were less likely to get Crohn’s than people who sat all day at desks. They were also more likely to work in the dirt and to get parasitic worms!” In support of this theory are results of an experiment Weinstock and his colleagues conducted. “They found that when you give mice nematode worms, you can prevent them from getting a mouse version of inflammatory bowel disease.” In March of 1999, a further experiment was held using twenty-nine willing human participants. These patients were given Gatorade with whipworm eggs suspended in it. The whipworms were pig nematodes taken from ordinary pigs and given to germ-free pigs, and the hope was that the worms would attach to their new human hosts temporarily – long enough to stabilize the body and negate the symptoms of Crohn’s disease, but not so long that the worms matured and harmed the human host. Over the course of the study, four patients

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148 Dunn, 18.
149 Ibid., 32.
150 Ibid., 23.
151 Ibid., 36.
dropped out, and results were mixed – those patients who felt better may have been feeling better without the treatment. However, as the study progressed, the more encouraging the results became. “By week twenty four, the last week of the study, all but one patient was doing better and twenty-one patients were in remission. These individuals, who had all been sick, were better. Their bodies were healthier now that they had parasites.”\textsuperscript{152} And these patients were not afflicted with mild cases of Crohn’s: their conditions had been untreatable by other methods. The results of this study have inspired numerous other studies attempting to discover a link between worms and autoimmune diseases, allergic diseases, depression and even some cancers. “When treated with worms, people with inflammatory bowel disease get better. Diabetic mice return to normal blood glucose levels. The progression of heart disease is slowed. Even the symptoms of multiple sclerosis improve.”\textsuperscript{153}

We affect and label physical disorders, but our influence is not limited to this aspect of our lives. Validity and cause of many mental disorders and personality disorders are also often debated. Not only do we assess human behavior and deem it “disorderly,” labeling it “autistic” or “hyperactive,” thereby creating disorders in name, we also create them in substance and number. We destroy the planet, create global warming, which increases disease: “[Rob Dunn’s] research has shown that both the number of different diseases in a place and how common they are (the number of cases of a given disease) are influenced strongly by climate. Cold places

\textsuperscript{152} Ibid., 38.
\textsuperscript{153} Ibid., 37-39.
and dry places have fewer diseases.”\textsuperscript{154} Malaria is one example, out of hundreds. Malaria is spread by mosquitoes, relying on a large number of them to move the infectious agent from one body to the next. Simply by moving to a climate devoid of mosquitoes, one can escape malaria.\textsuperscript{155}

We also affect disease with our living habits: we begin by choosing to live in urban areas. “It was the congregation of sufficient numbers of susceptible individuals that promoted measles virus outbreaks in the Civil War. Measles virus was and is primarily a disease of large cities. Urbanization brings in close contact large groups of people which are a requirement for maintaining the measles virus pool.”\textsuperscript{156} “Epidemiologic studies suggest that a population of 200,000 is required to sustain measles virus infections.”\textsuperscript{157} Increasing urbanization also increased the number of child infections, as they were more susceptible than adults.\textsuperscript{158}

As hard as it may be to believe, economic struggle is not the only aspect of our lives that an increased aging population would affect. From an evolutionary standpoint, shorter lives are more advantageous than longer ones. Aging makes room for new, younger models, creating room for change. Shorter life spans mean shorter lengths of time between generations, which is what allows for quick evolution. So the current generation’s manipulation of health factors to benefit themselves is also going to negatively impact the next generations, not only in terms

\textsuperscript{154} Ibid., 220.
\textsuperscript{155} Ibid.
\textsuperscript{156} Oldstone, 81.
\textsuperscript{157} Ibid.
\textsuperscript{158} Ibid.
of comfort and resources, but also in terms of genetic evolution. Also, eradication of the weak or ill prevents them from infecting the next generation.\textsuperscript{159}

Disease is sometimes described as an equalizer: no matter how much we segregate ourselves, dividing ourselves by class, race, gender, age or profession, everyone is vulnerable to illness. Some people are more prone to certain illness than others, but everyone suffers the possibility of getting sick in some shape or form. “Many scholars consider smallpox to have been more significant in its effect on populations and political developments than even the Black Death, because it struck all classes of society.”\textsuperscript{160} Disease creates jobs and a certain amount of stability in the economy, and it prevents the human race from completely overtaking the earth and depleting its resources. Our manipulation of these diseases have effects outside of the immediate population surge, and also because of it.

\textsuperscript{159} Moalem, 190-191.
\textsuperscript{160} Butler, 7.
Part V: Conclusion

As hopefully evident after reading this paper, disease and sickness are more beneficial and necessary than perhaps first interpreted. Disease is not simply a negative part of life which appeared out of nowhere, for no reason: in fact, it has aided human survival and evolution throughout time. Disease is not a flaw, or an element of human life which will naturally disappear from existence. “According to Darwin’s rules, evolution does not overdesign. Natural selection is scrupulous in its editing.” Animals are not built for more than their purpose: they are not built faster, stronger, or taller than necessary. They are built to outperform their competitors, but no more. Nothing is wasted, all material is used as needed, and balance is kept. By this same token, disease evolves only enough to maintain the status quo – it also does not overdesign, as the result of this would be killing off species which it requires to survive.

And we must accept that humans are intertwined with disease for a reason. We are not merely spectators: we are actively involved with microbes, and for good reason. There is an undeniable connectivity between our bodies and disease. “Our diseases have marked us. Long ago they shaped our immune systems…we have evolved to respond to our plagues.” We do not change around disease: we change

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161 Dunn, 26.
162 Ibid.
163 Ibid., 214.
because of it, and generally, those changes make us stronger. “We are who we are because of disease.”

In fact, some scientists consider some positive elements of disease on an emotional level and find that there are emotional benefits to human disease. Together, four scientists found that “the key elements of differences among cultures and individuals were nearly all related to disease.” So our physical ailments impacted our cultures and helped us establish differences from other groups and individuals. “In regions where deadly diseases are more common, people consistently think more about the tribe and less about their own individual fate and decisions. They are also more xenophobic.” While extreme xenophobia can lead to prejudice and bias, this xenophobia likely stemmed from a more rational reason than simple home-pride. Predictably, fear of outsiders has historically been at some of its highest peaks during times of epidemic and extreme illness. Travelers and outsiders were treated with skepticism and outright negativity as locals assumed they were bringing disease with them. Often, there was no way to prove this assumption wrong, as in instances of epidemic the origins of disease were not known.

Disease facilitates evolution, population control, sustains economy, furthers technology and scientific discovery. Oppression is a necessary catalyst for response (think: feminism and gay rights movements, the abolition of slavery, etc) – and by the same token, adversity of disease has prompted us to create great things. Famine

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164 Ibid., 222-223.
165 Ibid., 222.
166 Ibid., 224.
and disease prompt research and population control. We spring into action as a
response, as a reaction, not simply an unprompted action. Where would we be if
earth started perfectly, and we had no changes or improvements to make? People
also bind together in times of crisis. The enemy of my enemy is also my friend
mentality: we are, for the most part, kind in nature. We pull together when things are
at their worst for us as a country. This not only gives us something to do besides
harm each other, but also fosters a feeling of togetherness and peace.

Sickness can create a feeling of community and togetherness among
populations, as they bind together against a common enemy. We saw this after the
terrorist attacks against American in September 2011 when Americans worked
together, comforted each other, and called out for a response as a unified group. In
the early 1900s, a major polio epidemic elicited a similar response in the American
populous: as poliomyelitis affected victim after victim, including the thirty-second
President of the United States, Franklin Delano Roosevelt, Americans contributed
dimes and dollars to alleviate suffering and wipe out the infectious virus that was
responsible for polio. “It was one of the rare times, outside of war, in which the
citizenry of a nation was united. The result was one of medicine’s greatest technical
and humanistic triumphs.”167 This example is indicative of what the human race is
capable of when we combine efforts and work toward a common goal. The
integration of technology, science and the support of the people contributed to the
successful endeavor of limiting the effects of poliomyelitis in America. On April 12,

167 Oldstone, 91.
1955, Americans everywhere, led by the March of Dimes organization, celebrated the Associated Press dispatch of the day that read “The Salk polio vaccine is safe, effective and potent it was officially announced today.”168

Often times, people attempt to measure the success and progress of the human race over time. This is a hard thing to measure, as “progress” is not a tangible, quantitative element which can be tallied or measured in uniform units. One way some people may measure human success, or success of medicinal technology, is in rates and number of diseases, but this is not a fair representation of success or progress, for a number of reasons. A future without disease would not necessarily be a marked victory for the human race, as we would be losing an integral part of our existence, as demonstrated throughout this thesis. Disease has changed the evolution of the human race. “The history of viruses, plagues, and people is the history of our world and the events that shaped it… The splendor of human history is not in wars won, dynasties formed or financial empires built, but in the improvement of the human condition.”169

Experts have weighed in on the eradication debate many times, and will undoubtedly continue to do so. “Those who study microbes look askance at these [eradication] efforts as a waste of money and possibly dangerous.”170 The premise of this idea is that by removing common microbes that we are accustomed to, paves the way for other microbes in their stead – and there is no guarantee that these new

168 Ibid., 90.
169 Ibid., 192.
170 Farrell, 16-17.
microbes will be as tolerable as the ones presently in existence. Another common concern is that our efforts to eradicate only lead to the strengthening of microbes, as we train them to avoid microbe-killing substances. This is a very real possibility, as bacteria have become resistant to antibiotics. “The result can be that when we really need to kill microbes to protect the very sick, our tools will no longer work.”

When people do not fully comprehend a subject or all aspects of an issue, it is predictable that they are unable to make an informed decision regarding the best approach. When this is the case, the general public must accept their lack of knowledge in this area, and trust the opinions of experts in the field. “Students of the microbial world, who look beyond the limits of human vision, suggest that antimicrobial efforts can go too far; we must begin to appreciate that the vast majority of microbes are doing good things for us.”

This being said, despite the enormous amounts of evidence pointing to the fact that disease, microbes (including bacteria) are not out to demolish the human race, the human race still attempts to demolish them. Humans tend to view sickness as negative because it can lead to personal sadness and hardship, and we can be so narcissistic that we forget to consider the larger picture in terms of loss. We want to believe that we control our environment, though it is clear that it is impossible for us to do so. Mortality is inevitable, regardless of personal fortune or advancements in scientific technology.

171 Ibid.
172 Ibid.
In fact, coping with loss is arguably what separates humans from other mammals. The fact that loss often leads to empathy, compassion and bonding with others makes loss and pain very necessary experiences. As individuals and as a community, we grow through trials’ difficult times. As we experience pain and frustration, we learn to understand others’ plights and can often even aid them in coping.

As a world without disease has never existed, there is no empirical evidence to verify whether a utopian world without disease would be better or worse than the real world (with disease). However, there is reason to conclude on utilitarian grounds that the real world with disease would be better. For the utilitarian views the world with less overall suffering to be better than a world with more overall suffering, and the long-term perspective adopted by this thesis is that a world without disease would be a world with more human suffering than a world with disease. It follows that a world with disease is better than a world without disease.

For many people, accepting the above conclusion as fact may be more difficult than proving it. Often times, the human race finds that we sit comfortably in an aura of denial when faced with a situation we are unwilling to accept as reality. Disease is one such aspect of life: it is uncomfortable, sometimes even painful, to consider that death and illness are necessary for the natural cycle of life. We are trained to wish for longevity of life, both for ourselves and for those we love. Even from an evolutionary standpoint, we are built solely to survive and pass on our genetic code. It is no small wonder, then, why we can be so resistant to accept that
fatal disease has a clear niche in our existence. It is counter-productive to want to rid
the world of disease to increase the quality of life, when this would, in the long run,
greatly decrease the quality of life in the number of ways shown throughout this
essay. It is ingrained in us from an early age that disease and sickness is something
to fear: maybe this is an element of parenting and raising our young that should be
altered.

Even if we cannot bring ourselves to enjoy disease, an effort should be made
to at least comprehend and appreciate the roles that disease plays in our lives.
Disease has propelled us to discover medications and technologies that we rely on
every day – not only for diseased patients, but trauma, aging and other patients as
well. Our world would be overrun with people and the standard of living in America
would be drastically lower than it is, if not for human disease. The causes and
effects of disease are more far-reaching than perhaps immediately recognizable, and
after consideration, it is clear that we owe a certain amount of our success in various
aspects of our history over the years to disease.

We have made an endless amount of changes to our daily lives in an effort to
evade contact with microbial agents: we purchase anti-bacterial products, we post
flyers about proper hygienic practice and we form committees and pass laws and
regulations in an effort to corral disease and steer it away from us and our families.
We have staked our claim in the battle against disease, and claim to work tirelessly
to cure and eradicate disease, but not all humans are united in the goal, or in their
level of commitment to the cause.
Nothing about our existence suggests that disease is an unplanned element of our world or our lives. Our bodies are not built to live forever, nor are our social systems able to support the surplus of dependants that eradication of disease would inevitably create. Disease has helped us win battles, and has turned the tides of time. It has evolved alongside the human race, never over performing or underperforming its human hosts.

Many fear disease because of the undeniable power it holds over humans: were a pandemic on the scale of the Black Death or the 1918 Influenza ever to reoccur, we would have a few tricks up our sleeves, but it would not save everyone. In fact, there is not any real security or guarantee that we would fare any better than our ancestors against disease determined to ravage the land. People fear known disease, and some also fear fictional diseases, such a potential future zombie apocalypse. We prefer to think of ourselves as immovable objects, strong and capable of anything, triumphing over all obstacles, but the reality is that we will never have a clear upper hand on disease.

It is possible that an epidemic will occur – not having experienced a severe outbreak since the early 1900s, and with record-breaking and ever-soaring populations, we are arguably overdue. Since the terrorist attacks on America in 2011, many citizens have begun to fear for the state of the country and believe that a future attack on the country may be biological. Biological warfare has been utilized on a small scale (such as anthrax through the postal service in limited select locations), and has been threatened, and some people feel that an attack of this type
and magnitude is imminent. Rumors circulate that certain countries have created viruses intended to infect their enemies, while vaccinating themselves for immunity.

Still others fear that an epidemic may occur if a virus such as smallpox were ever stolen from one of the laboratories in which it is stored. These viruses could escape containment purposefully, or even accidentally, perhaps, for example, if mishandled. As stated in the intro, zero diseases are labeled as “extinct,” which means that the possibility remains that we could suffer revisits of disease at epidemic measures again. These diseases could reenter the human population by chance, or via biomedical warfare, or even through a method not yet considered. Hypotheses regarding disease run the gamut of possibilities, and it is impossible to know what to expect, or how to prepare.

All forms of life have a place in the world, including life on a microbial level. Disease may never be fully understood, but this does not mean it should not be appreciated and respected as the powerful element that it is. Humans must learn to accept that we are a cog – not an entire machine. Each part of a machine may not comprehend other parts’ functions, or even be aware of their existence; all each part needs to do is reliably continue to perform their function. In the same regard, humans must continue living our lives, remembering the delicate balance of various life forms on Earth and the importance of each and every one of them.
Reference List

"100 People: A World Portrait." 100 People: A World Portrait. Web. 09 February 2012.


Crawford, Dorothy H. The Invisible Enemy: A Natural History of Viruses. Oxford:


Fillinger, Ulrike and Steven W. Lindsay. Larval Source Management for Malaria


Napier, Ph.D., Nancy K. "Creativity Without Borders." Ideas From Unexpected


Norton-Smith, Thomas, Ph. D. Kent State University, Stark Campus. Interviews, Discussions. January – August 2012.


"'The Nobel Prize in Physiology or Medicine 1962". Nobelprize.org. 5 May 2012

Census Bureau. Web. 05 March 2012


