The Green Staff of Asclepius: Envisioning Sustainable Medicine

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DEDICATION

To Amanda, who has been a constant well of support.

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ABSTRACT

To make society sustainable our institutions must also become sustainable. As an institution, health care contributes to environmental degradation. While unsurprising, contributions to environmental degradation increase risk factors for disease and illness, effectively frustrating the goals of medicine. To find ways to make health care sustainable I begin by reviewing the literature on sustainability from within environmental ethics and two previous attempts at envisioning sustainable health care in order to learn what to include in a vision of sustainable health care. Then I examine problems specific to making medicine sustainable by investigating how sustainability might affect the principles of medicine. Next I develop ways to address the concerns of upholding the principles of medicine under a system of sustainable health care, centering on inequality and its negative impact on the sustainability of society and health care. Finally I envision ways to make health care sustainable by applying a schematic definition of sustainability adopted from the work of John Nolt that is consistent with the key strategy of reducing inequality.

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CHAPTER I

1.1 HEALTH CARE AND ENVIRONMENTAL HARM

Health care is at a crossroads. For the past several decades, bioethicists have noted that health care is economically unsustainable. The rising cost of health care, they argue, has been outstripping our ability to pay for it for quite some time. Similarly, environmentalists have warned us for decades that human activity, anthropogenic activity, was causing ecological degradation and leading to climate change. The bioethicists and the environmentalists were right, and still are. Yet health care remains largely untouched amidst the warnings, especially here in the United States.

The practice of modern medicine is in tension with commonly cited goals of medicine—healing the sick, improving health, and avoidance of a premature death. On one hand, there seems to be overwhelming concern for individual welfare. Presented with the sick and dying, doctors and nurses attempt to heal our various illnesses. In the field of medical ethics, the concerns rarely ever reach outside of the medical setting and very often focus on individual issues. When larger contexts are considered, issues are expanded to the organizational or institutional level, and even concerns of social justice. But there is little consideration of the environment present in the literature of the field, or in the actions of medical professionals within the clinical setting. On the other hand, medicine can no longer afford to remain divorced from broader environmental concerns.

N. Ole Nielsen notes that "most of our society defines health in terms of freedom from disease" (1999, 65). There are, however, other aspects to health that are not as well

recognized by society at large. Well-being is recognized by many organizations as another aspect of health that includes social and mental wellness. Nielsen writes, "This distinction between coping with disease on the one hand and promoting well-being and productivity on the other is not a new issue. It was recognized by the Greeks who had deities for both healing (Panacea) and health or well-being (Hygeia)" (1999, 65). Doctors are currently more likely to fall into the category of panacea, as they intervene during an individual's illness and attempt to make them better. Patients want to be healed, and demand healing from their doctors. Public health is the realm of hygeia, where health or well-being is maintained through such practices as water filtration and sanitation.

Our desire is often for another panacea. To be healed from infirmities, though beneficial in the short-term, is not necessarily beneficial over the long-term, and is possibly even harmful to the health of the population in general. In our quest for healing, we have often forgotten to take care of our own well-being, both collectively and individually. Modern life in the developed world is potentially unhealthy unless a special effort is made to exercise and eat correctly—the artificial environment we surround ourselves with is unhealthy, while human activities such as consumption harm the environment. We don't have to be as active as we have in the past in order to survive because so many services are available so long as we can afford them. The professionals trained within the dominant medical establishment treat the patient they see, but seldom look for environmental factors—outside of individual lifestyle--that may have led to or contributed to the illness. Such work is for the work of public health specialists such as

epidemiologists and pathologists, many of whom are proponents of expanding our view of health to include the world around us as well.

How this might occur may still seem a mystery. Let's start with the current conception of health. The current dominant conception of health is expressed by the definition given by the World Health Organization: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO 1948). One merit of the definition is that it does recognize the necessity of social interaction for health. Note that this definition focuses on the individual, specifically the human individual, and does not mention nonhuman health or the environment. In some ways this makes sense: doctors are healing patients, not their surroundings. However, there is no consideration for the ways in which medicine might affect the environment surrounding the individual in negative ways that contribute to the presence of disease and infirmity, save until disease and infirmity are already present in the individual. The WHO definition is exemplary of how our medical system operates because, definitionally, the focus is on the individual patient, without wider regard for how important environmental factors are for health. The WHO definition also nicely highlights how one might not have a disease, but still not be in a state of well-being. Health is not merely physical, but also mental and social. Medicine tends to focus on the physical aspect of the definition, and less on the mental, social and environmental aspects. This focus is to the benefit of services aimed at treating the individual, but it is to the detriment of public health.

Unfortunately, with the dominant concept of health reinforcing a narrow focus on individual treatment, the dominant definition of health also serves to reinforce the notion

that we are separate from the environment. Practicing physicians learn this definition, as well as researchers, nurses, and other health care professionals. But our health cannot be understood properly in isolation. That is, to understand our health without consideration of the environments we inhabit yields an incomplete picture of what affects our health and may hinder the ability of doctors to heal infirmities and illness. Alternatively, though doctors may still be able to heal the individual, the opportunity to prevent similar illnesses of environmental origin is sometimes lost because the definition of health employed focuses on the individual, but does not often look to environmental factors. Once the individual is healed, the job of a doctor is largely complete, and other factors like environmental impact remain secondary. Even if considered by a doctor, there are few mechanisms in place to change environmental problems identified as leading to disease and infirmity.

The editor of the *British Medical Journal* notes the recent backlash against the WHO definition, stating that a state of complete well-being is absolute, and therefore unattainable by most of the population. By itself, this may not be a problem because the WHO definition of health could be considered an ideal to strive for. However, insofar as the goal is unattainable, it contributes to the medicalization of society as more human characteristics are recruited as risk factors for disease (Godlee 2011). Because we continue to strive for the ideal of health like that found in the WHO definition, we find more problems to diagnose in individuals, but spend far less time looking at the environmental factors that affect the health of all individuals. We consume more drugs and perform more procedures in an effort to attain an ideal of health that seems impossible. Our focus on the individual is reductionist insofar as the causes of disease

are not so easily separated from the environment, even though we may find instances of disease in individuals.

If health is viewed reductionistically in health care practice—if when people are sick, we'll try to make you well and leave it at that—we'll focus less on how one became sick before pathology was present in the body, or why there are trends in pathologies and epidemics. Such a simplistic view limits the effectiveness of medical treatment because of its scientific incompleteness. Self-evidently, we are obligated to operate health care nonreductionistically because doing so will lead to better health outcomes.

Already, approximately 24% of the disease burden is environmental in origin, and 23% of deaths worldwide are attributable to environmental factors (WHO 2006). This number will only continue to rise as long as current measures to stem the tide of environmental degradation remain inadequate. Medicine, as part of health care, contributes to this ecological degradation. Pharmaceuticals leech into our water supplies and scarce resources are mined for the production of medical equipment, all while medical waste contributes to pollution, the cost of healthcare rises, and we use more resources than ever before—all in the name of saving life. As more people get sick, we use more treatments. Health care as it is currently practiced is not only economically unsustainable, but socially and environmentally unsustainable as well.

We have largely failed to practice health care in ways that demonstrate concern for the environment. Part of the problem is scale: according to the Environmental Protection Agency (EPA), health care accounts for 16% of the economy (EPA 2014). World Bank figures calculating health care expenditures in the United States from 2009-2013 report that the United States spent 17.9% of its gross domestic product on health

care compared to the global average of 10.2% (World Bank 2014). As such a large part of the economy, health care is also a large contributor to various kinds of environmental degradation, but difficult to deal with because of its size. Reporting only on hospitals, the EPA reports that hospitals significantly impact the environment by:

- Generating approximately 7,000 tons per day of waste, including infectious waste, hazardous waste, and solid waste.
- Using mercury in medical devices, equipment, light bulbs, etc.
- Using materials that may have toxic effects: PVC, DEHP, cleaning materials, heavy metals in electronics, pesticides, batteries.
- Consuming large amounts of energy in buildings and car fleets, and generating significant greenhouse gas emissions.
- Consuming large amounts of water for domestic use and heating/cooling as well as landscaping (EPA 2014).

But the environmental impacts of health care don't just end with hospitals and the materials listed. The effects are not limited to the EPA's list, and the effects of health care should arguably be expanded to include activities that require the use of services whose origins are in health care and health care research.

We can expect the percentage of human health problems caused by the environment to increase. The effects of ecological degradation due to climate change on our health are already perceivable, but will become worse with further ecological degradation. Widespread negative effects on health are possible, partially due to how "the very young and the elderly, those with preexisting cardiovascular and respiratory disorders are at particular risk for heat exhaustion and heat stroke" as global temperatures

rise and become more apt to extremes (Patz and Wolfe 2002, 168-169). The World Health Organization reported in 2005 that "abnormally high temperatures in Europe in the summer of 2003 were associated with at least 27,000 more deaths than the equivalent period in previous years" (WHO 2005). The fatality rate among crop workers has risen from 15 deaths per every 100,000 workers per year from 1992-1996 to 35 per every 100,000 in the period from 2002-2006 (CDC 2008). One may strongly infer from such data that despite heightened awareness of the dangers of working in the heat, climate change has already contributed to an increased amount of heat related death.

Increasing solar radiation together with the emission of nitrogen oxides from the continued burning of fossil fuels will also result in higher concentrations of ozone in the lower atmosphere. For allergy sufferers, this will increase "the sensitivity of asthmatics to allergens and impair lung function, particularly in children and the elderly… in addition, the combination of high temperatures, sulfur dioxide, and particulate pollution may result in higher mortality than that caused by pollutants alone" (Patz and Wolfe 2002, 169).

The most destructive sort of ecological degradation is arguably the reduction in biodiversity because such reductions in biodiversity are largely irreversible. Scientific breakthroughs in medicine are often a result of discoveries in nature. The loss in biodiversity is then two-fold, as a reduction in biodiversity causes damage to ecosystems but also limits our ability to find cures and treatments for disease (Chivian and Sullivan 2002, 182-183). We may be better able to synthesize new compounds in the laboratory, causing one to consider that the loss in biodiversity may not be as acute a loss for medicine as once thought. However, very often it is the observation of the effect a

compound has in its native environment that inspires us to investigate the use of the compound for medicine. In many cases, the compound is found in nature and only later produced in the lab. The widely prescribed cancer drug Taxol followed this path of development (Guerra-Bubb et. al., 2012). In a study authored by David Newmann and Gordon Cragg, seventy percent of all new drugs produced in the United States in the last twenty five years come from nature (Newman and Cragg 1, 2007). In an even more telling statement, they surmise that "although combinatorial chemistry in one or more of its manifestations has now been used as a discovery source for approximately 70% of the time covered by this review, to date, we can find only one *de novo* new chemical entity reported in the public domain as resulting from this method of chemical discovery and approved for drug use anywhere" (Newmann and Cragg 1, 2007). Observing nature and mimicking its processes is still essential for the discovery of useful medical compounds, even if we might replicate it in the lab later.

A loss of curative medicine from decreased biodiversity is not the only direct and immediate danger from ecological degradation, however. We know that healthy ecosystems have greater biodiversity. As the effects of ecological degradation worsen, biodiversity—and the ability of the ecosystem to resist and bounce back from perturbance—decreases. Joshua P. Rosenthal and Trent Preszler write that there are four broad areas where biodiversity significantly contributes to biomedical science:

1. Biological models for biomedical research have been provided by thousands of diverse species.

2. Naturally occurring compounds found in plants, animals, and microorganisms form the basis for almost half our pharmacopoeia historically.

3. Diverse organisms play a significant role in the ecology of infectious diseases, primarily as vectors and reservoirs, and as control agents for these organisms.

4. Bacteria, algae, plants, and terrestrial and marine vertebrates, among others, play an increasingly important role as indicators of environmental quality for human health (Rosenthal and Preszler 2002, 328).

This list points to the ways in which medicine comes into tension with its own principles by contributing to ecological degradation. Human health is dependent upon ecological health insofar as we need a healthy environment in order to be healthy or flourish.

A loss in the functionality of ecosystems is a much greater problem than usually appreciated because when the functionality of an ecosystem is compromised, so too are the services that an ecosystem provides. Ecosystems provide a long list of services, including but not limited to: the regulation of such things as oxygen concentration, carbon dioxide, atmospheric water vapor, water filtration, temperature and precipitation regulation, soil formation and fertilization, pollination, and act as provider of food and fuel (188). Rectification of ecological degradation via restoration, policy, and societal change is often the only viable option if the functionality of a degraded ecosystem and the services it provides is to be restored.

C.L. Soskolne and R. Bertollini point out that there are three basic points with respect to the relationship between ecological integrity and human health:

1. Human population and individual health ultimately depend on the integrity of ecosystems and the ecosphere.

2. Healthy populations can exist in local environments that have lost their ecological integrity—such as most urban regions—only if healthy ecosystems

exist elsewhere to support them. This component may be termed interregional dependency.

3. It is unlikely that increasing "footprints" are sustainable in the long run.

All of these concepts and measures are related to public health by virtue of the link between the sustainability of human health as a function of the sustained health of ecological life support systems (Soskolne and Bertollini 373, 2002). Note that the second point, interregional dependency, does not seem to account for dependencies that exist between regions even when the relevant ecosystems are not healthy. For example, urban areas depend upon agricultural areas, but neither is largely considered to be healthy. The third point concerning unsustainable footprints is true; however, the point is leading. While there is a possibility that sustainability measures may decrease footprints despite a burgeoning population, the possibility is remote. Nonetheless, the three points are worthy of consideration because they pinpoint ways in which declining ecosystem health is related to human health.

Moreover, Soskolne and Bertollini ask what adaptations are feasible in the face of progressive declines in ecosystem health. Is it necessary to be concerned about environmental health, or are there ways to skirt the effects of a deteriorating environment? There are three primary approaches. Other approaches are derivations of the three insofar as the primary approaches are broad ideas from which we may draw more specific solutions. The list is not exhaustive and is only indicative of the items that Soskolne and Bertollini choose to identify.

1. We hope that humans will be able to adapt to coming environmental changes.

2. We could implement remedies through approaches to currently perceived problems.

3. We could proactively promote substantive policy reforms designed to restore, maintain, and protect the ecosystems upon which human and other life forms depend (Soskolne and Bertollini 374, 2002).

Adaptations to changes that occur due to ecological degradation and affect long term environmental health are certainly possible, but such adaptations are unlikely due to the scale of the changes involved with mechanisms like global climate change. We cannot expect evolutionary adaptions on such a short time scale, as evolutionary adaptations happen over many thousands of years. The current rate of extinction is tribute to the inability of many previously successful species to adapt to the current changes in our environment. Adaptations that are feasible must be cultural or technological in nature. Technological and cultural changes, however, tend to be reactive rather than proactive. Reactive change is good for addressing current environmental crises, but the prevention of environmental crises in the future requires a more proactive approach.

Soskolne and Bertollini note that "presently, adaptation to ecological disintegrity has meant high levels of disease and unemployment among most of the world's poor" (374, 2002). Superficial remedies have worked with some success, but treat the symptoms of ecological degradation rather than the causes. This falls short of what is necessary to make our lives sustainable. Carbon emissions from automobiles may be curbed by building hybrid and electric cars, while coal plants may be replaced in some areas by massive solar arrays. However, further measures are necessary because sustainability arguably requires real lifestyle and societal changes necessary for human

life to be sustainable on Earth. Our current rates of consumption, combined with an ever growing global population, require us to deeply consider whether treating the symptoms of ecological degradation is enough. We must also consider the causes.

Health and human flourishing require a healthy ecosystem. One strategy for theoretically approaching environmental problems in health care is to combine the often separate fields of environmental and biomedical ethics. This view of bioethics hearkens back to the early days of bioethics when Van Rensselaer Potter first coined the term in 1971. He intended a deeper, more holistic view of bioethics instead of the estranged marriage now seen between the specialized fields of environmental and biomedical ethics. At its inception, Potter intended bioethics to include animals and their communities as well. His vision was for an ethic that could inform a postmodern industrial future that will have problems on a scale not seen before in human history (Potter, 1971). Sustainable medicine is a return to these roots. In bridging the gap between environmental ethics and biomedical ethics, sustainable medicine is an attempt at addressing problems in medicine from a holistic standpoint.

If long term environmental health is dependent upon a network of healthy ecosystems, and human health is dependent upon environmental and ecosystem health, then medicine should cease contributing to environmental decline and is, at the very least, obligated to mitigate and limit its contributions. We have seen that long term environmental health is dependent upon a network of healthy ecosystems and that humans are dependent upon those ecosystems. If medicine contributes to environmental decline, then medicine is harming human health. If medicine is to avoid harming human health via contributions to environmental degradation, then medicine must change by

incorporating a truly holistic conception of health that includes nonhuman life. By including nonhuman life, moral considerations properly encompass the relevant considerations that play into human health more completely.

This is not to say that medicine must entirely drop current treatments just because the approach to health needs to change. But methods and ideology will need to be revisited. The place to start is at the foundation, with our concept of health. Practical fixes, while a step in the right direction, will do little to curb our expectations for medicine. We need an approach that encourages not only practical fixes, but also a re-envisioning of the concept of health to one that is inclusive, rather than exclusive, of the environment. So long as we view ourselves as entities independent from the environment, we will be likely to undervalue the ecosystems we depend on.

Just where might we begin to change the concept of health to something that more accurately reflects what we know about human health? To best figure out how to proceed, we must understand how the current conception of health may put us at odds with the natural environment. First, we fight natural processes such as aging and death that are necessary parts of ecological cycles of renewal and death. Without the cycle of renewal and death, i.e. a process of constant renewal, ecosystem resources fueling the renewal will not be replenished.

The side effect of fighting these natural processes is increased health care cost and resource consumption. The average person in the U.S. spends more on health care during the last two years of life than at any other point (Social Security Advisory Board September 2009, 5). So, while end of life care continues to cost more, it costs more because of how we approach care at the end of life. Following the dominant definition of

health, each individual is entitled to as much care as possible because each individual is considered independently from the environment and the population in general. We proceed as though all resources are available to each patient. The result is that, although for each individual patient there is little wrong with pouring resources into their care, when the same approach is used for everyone, the trend created is unsustainable. If medicine is to become sustainable, we must learn to consider the individual patient within the context of the social, environmental, and economic resources available to all. We must also find a definition of health that is better equipped to address the tension between our obligations to individuals and our obligations to current and future generations, as well as the environment.

Second, we maintain individual health without regard for the wider societal and environmental effects, even aside from care at the end of life. For example, technological solutions often disregard environmental impact or have unintended negative consequences for the environment. Ours is a time of unsustainable expectations: age is a disease to be cured and treated. Health care degrades the environment disproportionately compared to other institutions. We are all too willing to accept this side effect of care because medicine can serve to excuse us from irresponsible habits, as an enabler to an alcoholic. In reconceiving our conception of health, we need to change it in such a way as to alter our expectations for medicine, and some of that starts with our own habits. If we maintain our own health better, we may come to expect less from health care at the end of life, and we will arguably use less health care per year lived. By viewing our health and environmental health as part of a nonreductionistic whole, we may more clearly see the obligation to care for ourselves as one that we owe not only to ourselves

and loved ones, but to the population and the environment in general as well. A more efficient use of health care resources will lessen environmental impact, but there is little motivation to do so when our health is considered independently from the health of our environment.

Chapter two discusses different theories of sustainability, beginning with a brief synopsis of the history of sustainability before leading into a critical discussion of particular sustainability theories. The chapter is divided into two main sections; in the first section, particular theories of sustainability from the literature of environmental ethics are discussed, including theories from J. Baird Callicott, Bryan Norton, and John Nolt. The second section is dedicated to a review of the two main theories of sustainable medicine already in existence, with the first originally authored by Andrew Jameton and Jessica Pierce, and the second by Daniel Callahan.

The focus of chapter three shifts to a discussion of the principles of medicine. The aim is to explore the relationship between the principles of medicine and sustainable health care. In particular, questions arise as to whether the principles of medicine are consistent with the ideas of sustainability and whether or not the special problems that arise in making a valued institution sustainable may be resolved. Particular attention is paid to the principles of autonomy and justice, as each plays a central role in both medicine and sustainability with respect to individual goods versus the good of the many, and with regard to justice between current and future generations within a theory of sustainable medicine. Concerns over autonomy focus on the tension between the implementation of sustainable medicine as a public health measure and reduced autonomy. To address this tension, I examine literature on inequality and outline the

relationship between sustainability, inequality, health, and the environment. I then argue that a reduction of inequality would make medicine more sustainable and help to offset the diminishment of autonomy that would likely result from the implementation of sustainable medical practices.

Chapter four develops a positive vision for a theory of sustainable medicine based upon John Nolt's schematic definition of sustainability. I delineate adequate health care from luxury care and develop criteria for determining whether any particular health care good or service is sustainable. Moreover, I outline why there is a baseline of care that adequate health care cannot fall below. This baseline of care is based on the equality of opportunity account of health care developed by Norman Daniels. Finally, I suggest options for dealing with desired levels of care and the tension between those desired levels and limited resources coupled with burgeoning populations.

CHAPTER II

2.1 LITERATURE REVIEW

In order to assist in the formulation of a theory of sustainable medicine, it is prudent to learn what one can from previous theories of sustainability, particularly the existing theories on sustainable medicine. In the process of envisioning a theory of sustainable medicine, I will examine various theories on sustainability and sustainable medicine with the intent to critique said theories, take the positive contributions from many different ideas of sustainability, and examine how each may help to inform my theory of sustainable medicine. First, I will offer a brief history of the concept of sustainability, followed by an examination of some prominent theories of sustainability.

2.2 Literature on Sustainability from Environmental Ethics

Today, sustainability is a trendy buzzword, but our trendy buzzword has hundreds of years of history behind it. There are traces of sustainability found at least as early as the eighteenth century, though the concept of sustainability as we currently use it does not mature until approximately the early mid-twentieth century. The idea of sustainability arguably begins in 1713. Hans Carl von Carlowitz, a Saxon tax accountant, was worried about the disappearing forests (Mcelroy and van Engelen 2012). Timber was used to support a burgeoning ore industry in Europe, but the forests could not support the usage; Carlowitz proposed that the forestry industry should only log trees at

the rate at which they grow. Carlowitz's single usage of the term occurs in the following passage:

> Therefore the highest level of art, science, industry and institutions in this country will have to make every effort to achieve conservation and cultivation of wood for continuous and sustained utilization [*nachhaltende nutzung*], because it is an indispensable matter, without which a country cannot continue in its *esse* (Von Carlowitz 1732 69).

Later in the eighteenth century are the better known writings of Thomas Malthus. His *Essay on the Principle of Population* famously argued that human population growth would soon exceed the upper limits of food production. Again we find recognition of the limits of our planet: the idea that, in a finite world, we must be wiser if we want to maintain well-being. The idea that there is a limit to how many people may live on the planet later becomes the idea of carrying capacity.

The end of the earliest phase of sustainability literature may be marked by the writing of John Stuart Mill, who in 1848 wrote about the stationary state. In book IV chapter VI of the "Principles of Political Economy," Mill argued that unlimited growth would not only result in environmental degradation, but also a reduced quality of life. He writes:

> I cannot, therefore, regard the stationary state of capital and wealth with the unaffected aversion so generally manifested towards it by political economists of the old school. If the earth must lose that great portion of its pleasantness which it owes to things that the unlimited increase of wealth and population would extirpate from it, for the mere purpose of enabling it to support a larger, but not a

> better or a happier population, I sincerely hope, for the sake of posterity, that they will be content to be stationary, long before necessity compel them to it (Mill 1848, IV.6.8).

Mill keenly observed the danger of growth for the sake of growth at the sacrifice of quality of life in his role as a prominent social reformer of the industrial revolution. His worry over growth has only become more relevant with the passage of time.

In the twentieth century, we find a maturation of the idea of sustainability that continues to the present day form. In the early part of the twentieth century, economists began discussing the beginnings of what we would come to talk about as natural capital. That is, the notion of capital began to be more broadly defined to include nonmonetary forms of equity. In 1906, Irving Fisher defined *capital* as "a stock of wealth existing at an instant in time" and *income* as "a flow of services through a period of time" (Fisher 1906, 52). In this way, capital began to be defined in ways that were at least potentially inclusive of other forms of wealth, like natural or social wealth, even though Fisher does not reference such wealth directly. He does, however, discuss the railroads as a source of capital for the country, and the services provided by the railroad as the income they yield (Fisher 1906, 53). This definition is not quite the same thing as we mean by natural capital in contemporary terms, where the term natural capital refers to the stock of natural resources a specific region, such as a country or state contains. Definitions of natural capital do not come for well over fifty more years. Some contemporary definitions of natural capital include as capital ecosystem services as well, and discussions of natural capital often coincide with discussions of ecosystem services (cf. Costanza et. al, 1997).

To find something more focused on natural resources, we might turn to the writings of Gifford Pinchot, who advocated a conservation ethic as a means to gain wanted production from the land. Natural resources could be managed, he argued, in such a way as to maximize production. Once taken to market, those resources would yield a higher profit year after year than the same natural resources would yield under an unmanaged approach. Pinchot's version of conservation meant "the greatest good to the greatest number for the longest time" (Pinchot 48). According to Pinchot, the forest should be useful to humans, but also sustainably used.

The recognition that different forms of capital are producers of income insofar as they contribute to human well-being is the basis for much of modern sustainability. These ideas of sustainability and the way the previous thinkers relate the human position to the environment are anthropocentric, or human centered. Anthropocentric approaches couch doing right or wrong to the environment in solely human centered terms. By contrast, nonanthropocentric approaches to environmental ethics use an approach centered on nonhumans, though exactly what that means is a matter of intense scrutiny due to the variety of nonanthropocentric ethics developed today. A nonanthropocentric ethic has different practical implications than an anthropocentric ethic, largely due to how each ethic shapes our attitudes toward nature. An anthropocentric ethic may undermine many of the attitudes toward nature that we wish to encourage, including love, respect, and awe (McShane 2007). Nonanthropocentric ethics may be preferable to anthropocentric ethics because they tend to foster an attitude toward nature that is more likely to reflect respect, awe, and love for the natural world.

The most well-known modern definition of sustainability is from the Bruntland Report. This definition differs from the definitions of sustainability discussed so far because it concerns sustainable development. Sustainable development is defined in the Bruntland Report as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations 1987, 16). There are several virtues to this definition of sustainable development.

First, the Bruntland definition focuses on needs. The goal is not to meet the *wants or desires* of the present, but to meet the *needs* of the present. These are real needs like the need for shelter, food, or water, as opposed to what people sometimes think they need, especially in areas with luxury income, i.e. enough income to fulfill the very basic needs and spend more money/resources to consume goods fulfilling wants or desires. This is perhaps the most important virtue of the Bruntland definition because it allows us to draw sharp contrast between luxury development that might be justifiable, e.g. luxury development that does not compromise the ability of future generations to meet their needs, and luxury development that is not justifiable, e.g. development that clearly does compromise the ability of future generations to meet their needs.

However, even the Bruntland Report's definition of sustainable development is not without criticism. For our purposes, it is notable in the history of sustainability, but it pertains only to development and isn't meant to be a complete theory of sustainability. The following reviews are about current theories of sustainability, beginning with the theory of sustainability developed by J. Baird Callicott.

2.2.2 J. Baird Callicott

Callicott labels his theory of sustainability as nonanthropocentric. The label is true, insofar as Callicott's theory is oriented toward ecological conservation. However, there are many principles of ecological conservation that anthropocentrists would have little or no disagreement with. In the end, it may be more accurate to label Callicott's conception of sustainability as ecological rather than strictly nonanthropocentric. Callicott's theory is also monistic, in that all things morally considerable may be considered under one theory instead of a plurality of theories. In particular, Callicott's theory is based on a monistic metaethic and view of moral psychology borrowed from Hume, arguing that morality is based on social sentiment (Callicott 1985, 1986, 1987, 1990). Callicott's use of Hume is highly debated, because Hume's theory of sentiment is largely relational (between people) and not directed toward nature. Although similar to Hume's theory of sentiment, Callicott's use of that theory is considered divergent from the original. For Callicott, we are part of a single community—the land. The advantage of monism, according to Callicott, is that one avoids different and sometimes conflicting duties and obligations that are a result of membership in a plurality of moral communities (Callicott 1994).

Sustainability, as Callicott views it, should be a guiding principle for conservation (Callicott and Mumford 1997, 33). Callicott's version of sustainability includes both ecological and economic factors. In particular, Callicott situates human activity within ecological parameters in an attempt to show how human activity is confined within the

finite boundaries of natural limitations, though confining human activities within ecological boundaries is common among contemporary theories of sustainability.

Callicott defines sustainability as a "property of an activity or complex system of activities capable of going on and on indefinitely, if not forever" (2010, 59). In an earlier work, Callicott defines sustainability as "meeting human needs without compromising the health of ecosystems" (Callicott and Mumford 1997, 32). The earlier definition is still operative in Callicott's more recent account of sustainability insofar as human usage of the environment is constrained by natural limitations.

Callicott's definition looks potentially valuable as a definition of sustainability for envisioning a sustainable medicine because, if we want to minimize the environmental impact of medical practice, then we must necessarily recognize the limitations of the natural world. We must further recognize when those limitations are exceeded and what the effects are on human and nonhuman health whenever those limitations are exceeded.

A large part of achieving the sustainability of certain human activities lies in making certain that human activities are not disruptive of ecological processes and functions (Callicott 2010, 62). Callicott sees the human economy as a "subset of the economy of nature" (2010, 60). This is an attempt to recognize that the overriding factor of economic stability is nature and that nature has an economy made of natural capital exchanged between ecological systems. Ecosystem services are the foundation for all life. We depend upon these services for food and the raw materials for many different products. If we lack the necessary resources, or if the ecological systems that we depend upon collapse, then the human economy collapses. Clearly, if the human economy is dependent upon the natural economy, then the human economy is subsumed within the

economy of nature. If we recognize that the human economy is but a component of the natural economy, then wholesale changes in the way we live are called for due to the limited amounts and rapid use of natural capital.

The human economy must depend upon the natural economy, but the dependence must be sustainable. That is, resources from the natural economy cannot be used for the human economy at such a pace that the natural economy is compromised. In order to change the harmful nature of our relation to the natural economy, Callicott believes that we need to re-envision the good life "from consumerist values to those of association, environmental aesthetics, education, and vegetarianism" in order that we may "increase standards of living without inevitable adverse impact on the natural environment" (2010, 59). Examples of such actions are found in the "reduce, reuse and recycle campaign," the simple living movement, and various environmental activist groups around the globe.

One promising idea from Callicott for a theory of sustainable medicine involves this re-envisioning of the good life as well as a propagation of the re-envisioned good life to others. Any change that is to become permanent must in some way become the "new normal," both legally and culturally. A propagation of sustainable principles of any sort must be passed on to the remainder of the current generation and future generations. Otherwise, such change will face even more resistance than it already does or become merely temporary. A re-envisioning of the good life will be necessary if a vision of sustainability is to gain widespread adoption, either generally or with particular regard to sustainable medicine. For example, if people continue to expect expensive technological solutions to disease, then those expectations will undermine efforts to realize some form of sustainable medicine that might focus on cost effective public health projects.

Although Callicott includes future generations as part of his theory to the extent that they play a role in the propagation of the good life, he does not find future generations morally considerable. Many environmental philosophers, including myself, will find this point highly contestable. Callicott rejects making future persons the object of moral considerability because of the non-identity problem. The non-identity problem concerns future directed acts. If I perform some act harmful to future people, then it seems I commit a moral wrong. But could I harm that person if my actions cause that future person who would otherwise be harmed to not exist? Normally, our actions are only considered harmful to those who exist or will exist. Callicott applies the non-identity problem to question whether future generations can be the object of moral considerability for sustainability ethics. He writes,

> If business goes on as usual, my grandson and other members of his generation will meet, mate, and have one set of children. But if radical changes in the human economy are effected, with attendant lifestyle changes, my grandson and other members of his generation will meet, mate, and have a set of children different from the set of children they would have had had business gone on as usual (Callicott 2010, 68-69).

According to Callicott, future generations are indeterminate, and so cannot be the object of moral considerability for sustainability ethics. When Callicott refers to future generations as indeterminate, he makes the metaphysical claim that it is not now determined who will exist in the future. The thing that we can most accurately say will continue on into the future, and that future generations will also engage in, is human activities necessary for the survival of human civilization—including art, literature,

science, poetry, philosophy, and music—despite the indeterminacy of exactly who will be part of the composition of future generations (Callicott 2010, 69).

I find it problematic that Callicott argues that future generations cannot be the object of moral considerability for sustainability ethics. The possibility that future generations are indeterminate does not necessarily entail that future generations are not morally considerable. It is also unclear that the indeterminacy of an object means that it cannot be the basis for sustainability ethics. First, let's examine the more general claim concerning the moral considerability of future generations. The idea that the indeterminacy of future generations makes it impossible for them to be objects of moral considerability is contestable. The inability to harm future generations, it is thought, rests upon the idea that one cannot harm distant future people. Usually the argument goes something like this. If we change our ways and stop harming the environment, then the people in the distant future who we would be harming with environmentally destructive behavior will not be born. Different people will be born into a world with less environmental damage. The people who would be harmed if we do not change our ways then have no reason to complain, for if we change our ways they will have no life at all.

I find it unclear whether the two options mentioned are the only options. It is clear that we could change our ways, or not. Another alternative is that we could also partially change our ways, and we could change them within the scope of a myriad of possibilities. We could still grant the premise of the argument anyway and question a more integral part, however. The argument's flaw rests upon the idea that people are harmed by an action only if it makes them worse off than they would have been without that action (Nolt 2014, 200). Suppose that we do not change our ways, and so the people

who would be born in the distant future are actually born. Our actions might still harm them: weather events resulting from climate change could kill or cripple many of them. Increased environmental risk factors for health could harm them. People may be harmed by many of our actions, even though our actions may not make them worse off than they would have been without our actions. That is, the non-identity problem is the product of unsound reasoning (Nolt 2014, 200).

Nonetheless, Callicott sees human activities important to human civilization as the object of sustainability. This raises a natural question—how long might these activities endure, and how does the longevity of human activity affect his vision of sustainability? The temporal scale of sustainability, as Callicott argues, is tied to how long human activities might continue. It is not infinity because human activities will not continue forever. We simply cannot be sure how long human activity will continue, in the same way that we cannot foresee how long any particular human activity will continue. The most we can say, according to Callicott, is that human activity will continue on indefinitely, and so there is no known temporal limit for sustainability (Callicott 2010, 69).

Callicott argues that the proper focus or scope of sustainability is a global scope "because of the indistinct ontology of the Earth's many ecosystems in comparison with the robust ontology of the Earth itself considered as a systemic unit" (Callicott 2010, 68). Here Callicott is pointing to the interdependencies between ecosystems, how difficult it is to know just what those ecosystems are, and how they affect one another. As I understand Callicott, the spatial unit of sustainability must be global first because it cannot be any one ecosystem or group of ecosystems. Not only is it difficult to tell where

the boundaries of any particular ecosystem lies, but similar difficulties occur when we attempt to determine which ecosystems might be the most relevant for human existence.

Much can be gleaned from this analysis of Callicott's vision of sustainability. Callicott proposes that sustainability should be global in scope, focusing on an indefinite period of time. Human activity is a possible object of moral considerability for sustainability, but, contrary to Callicott's position, there is little reason to believe that future generations are not a good candidate for moral considerabilty as well. Regardless of one's theory of sustainability, I think Callicott is correct to point out that sustainability requires, in some way, a re-envisioning of the good life and a propagation of that re-envisioned good life; otherwise, efforts focused on sustainability will encounter increased opposition from those who disagree with that particular vision of the good life. Finally, because human activity is dependent upon various ecosystems and ecosystem services, human activity must operate without compromising the natural economy that supports the human economy.

Next, I'll consider the influential theory of sustainability developed by Bryan Norton. Norton has long been influential on the topic, but his theory of sustainability is particularly notable for its applicability as a decision making resource for communities trying to envision a sustainable future.

2.2.3 Bryan Norton

Whereas Callicott advocates a more globally focused idea of sustainability, Norton advocates an idea of sustainability focused on individual communities. Callicott

argues that sustainability has an implicit spatial and temporal scale within it due to the openness and interdependence of the world's ecosystems. Norton's focus for the spatial scale of sustainability is the local community, and is sometimes characterized (as by Callicott) as an implicit bioregionalism (Callicott 2010, 62). Bioregionalism, roughly defined, is the notion that naturally defined areas or bioregions should determine economic and political boundaries. Norton's idea is arguably close to bioregionalism, but instead of focusing solely on naturally defined areas as a determinant of political boundaries, Norton focuses on individual communities, broadly construed, as the appropriate spatial scale for sustainability. There is no one particular solution for achieving sustainability under Norton's approach—communities and the values they decide to instill shape what Norton's theory of adaptive ecosystem management looks like as a theory of sustainability enacted by a community. Based on Norton's theory, our policies should take the form of adaptive strategies based upon the values of individual communities. This high level of autonomy may allow communities to shape health care policy to best suit their needs while attaining some implementation of sustainable medicine. An evaluation of Norton's philosophy of adaptive ecosystem management and its definition of sustainability is necessary to determine whether his philosophy may prove useful for the management of not only the relationship of humanity to the environment, but also of humanity's institutions, including medicine. Given the complex considerations necessary, a system of adaptive management may be well suited for evaluating and ensuring the long term sustainability of various institutions.

Norton's theory is schematic because a schematic approach allows him to account for a complex array of variables. This is accomplished by dividing ecosystem

management into tiers representing various considerations that go into ecosystem management. The two tiers (or phases) of Norton's strategy for adaptive management include an action tier and a reflection tier.[1] In the action tier, criteria such as cost benefit analysis, safe minimum standard of conservation[2], or even a maximum sustainable yield criterion (and more) are applied to environmental problems. The reflection tier involves judging the impact of certain policies and examines or re-examines courses of action. Both tiers alternate depending on whether reflection or action is needed to manage an ecosystem at a given time. Norton observes that theories which include only economic concerns and theories which include only ecological concerns are not only too exclusive, but faulty. By focusing on merely one aspect, such theories reduce the complex interplays present in considerations of sustainability too far to be practically useful. Such an approach cannot sufficiently appreciate concerns which may more appropriately be approached from another, or additional, vantage points. Norton approaches the problem of sustainability in this way in an attempt to address both ecological concerns and economic concerns without reducing both to a common metric in order that both types of concern receive the appropriate consideration.

Just how an ecosystem is managed using Norton's strategy depends on the values and preferences of the community managing the ecosystem. Norton writes that all value "is explained by reference to satisfaction of some felt preference of a human individual or

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[1] Note that in some places Norton refers to these tiers as phases. On page 167 of *Searching for Sustainability* he writes that he has come to prefer the word "phases" over "tiers."

[2] Norton defines a safe minimum standard of conservation as "a presumption of species protection, provided that the cost of protection is bearable; species will normally be saved, but interest groups have a right to challenge this presumption if important interests are at stake" (2003, 124).

by reference to its bearing upon the ideals which exist as elements of a world view essential to determinations of considered preferences" (Norton 1984, 134). Properly understood, what emerges is a nuanced view of preferences and values. A preference is a prioritization of one thing or idea over another. Values are "considered preferences." When considering values, we give some values preference, i.e. prioritize some values over other values. We might value health and prosperity. When these values are considered, we may conclude that prosperity without health is worthless, and so health is preferred over prosperity.

Not all communities will show the same preferences, nor will all communities have the same values. Norton's theory for how we come to value the environment is weakly anthropocentric in the sense that our interactions with the environment, and how we formulate sustainability, are still expressions of community values and emerge from the process of community deliberation. For example, with regard to medicine, a community may hold a meeting to determine what kinds of care to fully fund; what they choose will depend upon their values and how those values are prioritized. They may so value infants that they wish to do everything in their power to save each newborn no matter how premature, pouring resources into each life. Obviously, such resource use may lead to a lack of resources in other areas because so many resources are required to save severely premature infants. Resource intensive projects come at the expense of our ability to use those resources elsewhere, including but not limited to time, money, and facilities, along with the environmental impact of such activity. How we enact sustainability is a matter of considered human preference, and requires making decisions on resource use and management.

By making his version of sustainability community based, Norton hopes to allow each community to specify its own sustainability goals. This is a good way to ensure that the particular contextual nuances of each community are accounted for. This is a significant break from earlier sustainability theory, where one prescription or principle is meant to be applied to every situation and every community, as in Callicott's monistic theory.

We can begin to see the framework around which Norton builds his definition of sustainability and what he hopes to accomplish. So far, Norton

1. Reduces value to considered human preference (1984, 134).
2. Holds that every community must create its own sustainability ethic, i.e. each community must identify its own sustainability goals (2010, 174-176).

There is one other important aspect of Norton's framework that we have yet to explore. Norton also

3. Recognizes that there are scientific constraints regarding our use of natural resources, and that these constraints limit the scope of our considered preferences (2005, 353).

Norton's community approach is based on Edmund Burke's understanding of a society as "'a partnership not only between those who are living, but between those who are living, those who are dead and those who are to be born'" provided that the continued existence of humanity is good or worthwhile (Burke qtd. in Norton 2003, 174). This partnership is concerned with the use of resources as relates to the obligations the present has to "perpetuate the conditions necessary for the continuation of the human species and its culture" (Norton 2003, 174). Exactly what actions are permissible must be determined

scientifically: easily reversible actions are more permissible, but actions causing wide swaths of destruction require great caution and may be impermissible. For example, differing levels of resource use may be permissible depending upon how that resource use affects the relevant ecosystems. However, resource use may need to be reduced or may become impermissible if the impact of resource use on the relevant ecosystems threatens the integrity of those ecosystems.

Within this framework, Norton gives a schematic definition of sustainability, where sustainability is "a relationship between generations such that earlier generations fulfill their individual wants and needs so as not to destroy, or close off, important and valued options for future generations" (2005, 363). That is to say, if one generation lives in such a way as to remove options and choices from that generation or generations that follow, then that generation is living unsustainably. If the present generation were to gather a specific plant to the point of extinction, then the possible choice of future generations to avail themselves of the use of that plant is removed. Note that the definition is still schematic because the valued options and values to be sustained are not specified, but are to be determined at the community level.

We can understand unsustainable living by a community or group of communities in the following way. Norton's model of sustainability is a contextualist model of sustainability, i.e. it interprets the systems impacted by human activities in ecological terms (2003, 176). Within a contextual model of sustainability, individual actions are inconsequential unless part of an overall trend, but where trends occur there is a potential for intergenerational impact.

Unsustainable living by a community or group of communities can be identified by trends that limit or destroy important options for future generations. Norton gives the following example:

> Assume… that models showing rapid and accelerating warming of the atmosphere in response to a build-up of greenhouse gases were strongly verified, and that these models showed increases, 50—100 years in the future, too rapid for civilizations to survive. I believe that most people would say, once more scientific uncertainty was removed, that such a scenario would trigger non-negotiable constraints limiting current behavior (2003, 174-175).

Non-negotiable constraints on our behavior may come from scientific fact that we learn through inquiry. In the above example, because of the fact that the earth is warming at a rate that would make the survival of civilization and the human species unlikely, there are non-negotiable constraints on our behavior. Still, how we operate within those factual constraints is a matter of considered preferences pertaining to what values are to be sustained, and what options are chosen for sustaining those values. The obligations come from our values, which are considered preferences that are constrained by real contextual features, e.g. levels of resource availability.

One might argue that, while the preservation of value is useful, if we're really worried about leaving future generations better off, then we should focus on leaving future generations greater economic wealth. Greater wealth would increase the options available to future generations even in the face of environmental degradation. For example, an economist might point out that while destroying a natural resource like a forest eliminates some options, it also increases wealth, which in turn creates new

options. In reply, Norton points out that people in the future may be worse off than we are now even if they are wealthier and have *more* options, if the values specified as important to be preserved for future generations are hindered or lost (2005, 364). Values that are most important are likely to be values that are important to preserve independently of one's preferences. Developing strategies to sustain certain values, however, is impossible without first determining what values are to be sustained. Such decisions, though they comprise the heart of Norton's theory, are up to individual communities.

The benefits of Norton's definition of sustainability are obvious. I endeavor to discuss only a few of the many virtues Norton's definition possesses. First, it avoids one pitfall of a general principle of sustainability by allowing communities to decide what values are to be preserved instead of dictating those values to the plethora of diverse communities with differing concerns. Communities are arguably best suited for knowing how to act sustainably in ways compatible with their local culture. A community in a desert region will face different challenges for sustainability than a community in a temperate climate even if both communities are within the same nation and of comparable socio-economic demographics.

Second, in combining ecological and economic considerations at the community level, concerns over what values are to be sustained become appropriately complex. An economic solution may lead to negative ecological consequences, while an ecologically sound solution may be economically unfeasible. This cautious approach is often necessary to avoid unintended negative consequences when dealing with issues within medicine. Physicians put the patient first, and rightly so. Nevertheless, putting the

patient first may be short-sighted, especially when rationing resources. All too often medical technology is developed and offered with the benefit of the individual patient as the sole concern of medicine, while concerns over how the population is affected are secondary concerns at most.

Unfortunately, there are more considerations. Any technology implemented sustainably will have to be evaluated in terms of ecological and economic considerations. Whether the community level is the appropriate level for these decisions to occur remains a complex issue. Furthermore, if medicine is to be sustainable, it must also be socially sustainable. Concerns for social sustainability are "concerns over the processes that generate social health and well-being now and in the future, and those social institutions that facilitate environmental and economic sustainability now and for the future." (Dillard, Dujon, and King 4). A medicine that is economically and ecologically sustainable may still fail if it is not socially sustainable. One could imagine ecologically and economically sound measures taking a toll on the community such that the community would no longer be able to sustain their efforts due to exhaustion, lack of will, etc.

If we apply Norton's model to building a theory of sustainable medicine, we can immediately see that, at the very least, communities will have to agree that health is a value that must be sustained for posterity. Otherwise, community A may choose values that may undermine the ability of community B to choose health as a value. For example, one community might choose economic growth as a value to be sustained, and so medical technology may develop and be implemented very rapidly. The unfettered use of medical technology may actually have ill effects on the economy and the

environment like we have experienced today, including rising health care costs and contributions to environmental degradation, both of which may harm human health. The question of what kind of health any particular value includes, and whether the health a community chooses as a value includes a consideration of environmental or ecological health, is debatable. For example, a community may choose to value health, but only insofar as everyone gets "fair innings," or lives a reasonably long life, after which emergency care is not given. Alternatively, another community might choose to value health as vitalists and include complete consideration for the elderly, including all life-saving treatments and prolonging life whenever possible. Valuing health in this way is likely antithetical to environmental or ecological health because of the resources and intervention used to treat every illness that comes along.

We might also wonder whether health takes priority over other values, and what those values might be. Further, communities will have to decide just how to sustain health, dependent upon the relevant contextual factors. Certain practices or procedures might hold more value for one community than another, especially if there are any common health problems within a particular community, e.g., high cholesterol levels due to genetic factors. Naturally, these factors will be the ones the community prefers to sustain over other factors.

Despite the advantages of the community-based focus for the formulation of sustainability goals within Norton's model of sustainability, there is a source of great tension when Norton's model is used to inform a theory of sustainable medicine. What medical services a community places value on will vary and may even undermine sustainability efforts elsewhere. Where scarce medical resources are used to the

advantage of patients in one community, other patients will want to avail themselves of those same resources, even from other communities. Because of a new influx of patients, the use of scarce medical resources may no longer be sustainable.

Still, one consideration that might fruitfully be taken from Norton's account of sustainability lies in his balancing of economic and ecological concerns. Balancing economic and ecological concerns is certainly an advantage, if it can be done. Adaptive ecosystem management allows for varying metrics to be applied to ecosystems in order to manage those ecosystems and balance ecosystemic concerns with economic concerns. However, varying metrics may be incomparable to one another. Incomparability is problematic because, if two metrics are incomparable, then there are significant problems trying to discuss how the metrics relate to one another and what input each should have for the management of an ecosystem.

Despite similar difficulties, sustainable medicine also requires the successful navigation of economic and environmental concerns. Ecological and economic considerations affect the current and future practice of medicine by changing what procedures and practices are available and which are not. For example, there may be a plentiful supply of rare earth metals today, but in the future there may be a shortage, altering the availability, cost, and frequency of products and services that involve rare earth metals. Such a shortage would impact the ability to produce most modern electronics, including durable magnets used in magnetic resonance imaging machines or MRI's.

There are several lessons to carry forward toward envisioning a sustainable medicine. The lessons are listed, followed by a brief discussion of the justification for each:

1. Public discussion and prioritization of values as relates to sustainable medicine is necessary for the success of implementing sustainability initiatives.
2. There are non-negotiable constraints regarding our use of natural resources.

Questions surrounding the discussion of which values should besustained as well as how to implement and enforce non-negotiable constraints may fruitfully be considered by examining the successes and failures of past public health measures, and finding the appropriate strategies. Within a democracy, it is of the utmost importance to gain popular support for laws before, after, or during implementation. There is no guarantee what values will result from a public discussion of value. Many public health measures began as unpopular, but later appreciated wide acclaim. A common thread for the success of such measures is facilitating individual voluntary assent to the public health measure—the gaining of which is a topic of deeper discussion in chapter three.

2.2.4 John Nolt

Nolt's definition of sustainability is based upon the Brundtland definition, but is schematic like Norton's definition of sustainability. Nolt's definition of sustainability is also similar to Norton's definition in that there is choice concerning what value is sustained. Nolt notes that there are many points of agreement between himself and

Norton, writing, "He sees, as I do, important advantages in formulating the definition of sustainability schematically; and, like me, he holds that these include logical clarification, potential agreement on fundamentals despite disagreement on the identity of *V*, and openness to a plurality of quantities to be sustained," where *V* is a value to be sustained (Nolt 2010, 151). Norton takes values to be considered preferences decided upon by a community, and there is no guarantee of what sorts of values the community will choose. Nolt notes that what value is to be sustained is often contested, and that values should be contested because there is more than one value that ought to be sustained. The problem of how to come to a consensus on what is to be sustained and how to do it is outside the scope of his project, as the purpose of his project is to schematize the Bruntland definition in such a way as to adapt it to more than just sustainable development, and to allow for various instances of particular values to be sustained.

There are several critical points that Nolt raises in reference to Norton's schematic definition of sustainability. According to Nolt, Norton's definition

1. "implies that sustainability can be achieved without any substantive value being sustained,
2. if some value distinct from adaptive management itself is sustained, the definition does not require that it meet any ethical standards,
3. the definition's mention of human wants, in addition to needs, reinforces the second worry,
4. the definition rules out direct consideration of non-anthropogenic values, and
5. it is community-based and hence insufficiently global" (Nolt 2010, 152).

I'll explain these criticisms, in the order listed above, after some commentary related to the first point. First, it seems that the set of environmental debates in which it is possible to have the dialogue necessary to determine the values to be sustained is quite small. Nolt quotes an important passage from Norton illuminating the issue. Norton writes:

> All of the models, the analyses, the applications of concepts and methods from the various fields of study explored in the book apply only to that subset of environmental "solutions" where a community-based, inclusive, deliberative process is possible because participants and opponents in a disagreement are committed to addressing the situation cooperatively (by seeking consensuses on which to act) and deliberatively (by openly seeking and employing environmental science in an adaptive search for cooperative actions and win-win solutions) (Norton 2007, 402).

Several key points are worthy of note. Community-based initiatives are often easily corrupted because the numbers of participants are small and the stakes are sometimes high concerning what values are to be sustained. However, even if we grant that corruption will not occur, the set of environmental debates like the one Norton describes is quite small, even in liberal democratic states. In the US, recent political debate is fragmented by lobbyists and wedge campaigning, often obfuscating environmental problems under the guise of political ideology. The deliberative process is undermined. The mechanism of deliberation that makes democracy possible is also the mechanism which slows democracy when political self-interest trumps public minded service. The

point is this: democratic processes and deliberation do not guarantee problem resolution, and sometimes worsen problems instead of making them better.

For example, there is no guarantee that a consensus ever emerges even if we find an ideal situation in which to deliberate what values to sustain. Democratic deliberation and public discourse of various issues like abortion, how to stimulate the growth of a troubled economy, and what a just system of health care may look like are all questions that have been extensively debated in the public sphere without consensus. All three of these issues are a matter of disagreement because of disagreement over the values that inform our views on these issues. Because of conflicting values, consensus on these issues has never emerged. A consensus may be defined simply as an agreement that most of the relevant parties are comfortable with. Furthermore, there is no guarantee how long a consensus might last. It may change from year to year or from generation to generation. Here we have come to the first criticism listed above. Through constant adaptive management, the only value sure to be sustained is adaptive management (Nolt 2010, 152-153).

Second, there are no ethical standards that adaptive management must meet. Nolt argues that the deliberative democratic process by which communities will choose what values to sustain does not automatically yield ethical results. This seems uncontroversially true. Democracies may enact legislation which sustains some values, but those values are not necessarily ethically sound values, e.g. slavery, misogyny, etc. If the people practicing adaptive management are not ethical, then there is no guarantee that the results of their deliberation will be ethical (Nolt 2010, 153).

Third, Nolt argues that Norton's definition and inclusion of human wants reinforces the worry that Norton provides no ethical standards that adaptive management must meet. Wants, for Norton, are preferences. Specifically, the preferences Norton includes are considered preferences, to be differentiated from mere preferences. His intent is to avoid the inclusion of just any preference while including preferences of great import. To ensure only important preferences are included as values for adaptive ecosystem management, Norton theorizes that the inclusion of preferences must come only after democratic deliberation (Norton 2005, 360). But even our considered preferences, Nolt argues, may not be ethical (Nolt 2010, 155).

Fourth, there is reason for concern that Norton excludes non-anthropogenic values. Non-anthropogenic values are values that originate not from human interests, but from the interests of nonhumans. If nonanthropogenic values are excluded, then the value of all things is judged according to human standards of valuation. Though Norton realizes that some humans do recognize nonanthropogenic values, those values may only be considered through the humans that recognize them. There is no way to directly recognize nonanthropogenic values. Such preference for human values may be speciesist, discriminating against other species solely on the basis that they are other species. Nolt's schematic definition allows for nonanthropogenic instantiations of value *V*, and so has the possibility of being more inclusive than Norton's definition (Nolt 2010, 156-157).

Finally, Nolt argues that Norton's community-based system is insufficiently global. According to Nolt, sustainability cannot be defined adequately apart from global considerations. Nolt uses an apt example from *Healing Appalachia: Sustainable Living*

through Appropriate Technology by Paul Gallimore and Al Fritsch, whose authors argue that ecotourism should be included in the sustainable economy of Appalachia. Nolt points out some troubling problems with ecotourism, criticizing the idea on the basis that, while ecotourism may arguably be good for the economy of the area, it may have a negative impact on areas. He writes:

> There must be a sustainable supply of tourists, who can have or can be sustainably stimulated to have, a desire to visit Appalachia. These tourists must have wealth and leisure, provided by a larger, and ultimately global, sustainable economy. This economy must provide a sustainable transport system that can move them to, from and around Appalachia, and sustainable sources of energy, food, water, waste management, and so on, to provide for them *en route* and during their stay. The community cannot simply decide on its own to make ecotourism a sustainable value (Nolt 2010, 157).

Though a community may decide to sustain some value like ecotourism, in a modern economy these values have far reaching effects. These far reaching effects must be taken into consideration and will often conflict between communities, undermining the efforts at sustainability.

Now that we have seen how Nolt's schematic definition of sustainability differs in important ways, a deeper exposition will be useful. Nolt's definition is based upon the famous Bruntland definition for sustainable development. Sustainable development is defined in the Brundtland definition as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations 1987, 16). This is a good basic starting point for sustainability, but Nolt's

definition of sustainability has wider applicability. With regard to sustainable medicine, Nolt's definition seems initially promising because it seems that it counts medicine as sustainable only if it is adequate according to a reasonable definition of adequacy. Both Nolt's schematic definition and a possible definition adapted to sustainable health care follow.

According to Nolt,

> A global generation *G* achieves the sustainability of value *V* if and only if
>
> (1) *V* is already adequate or *G* raises it to adequacy, and
>
> (2) *G* does not impair the ability of its posterity to maintain the adequacy of *V* (Nolt 2010, 150).

Adapted to health care, we might propose the following:

The present global generation achieves sustainable health care if and only if:

1. Health care needs are already adequately satisfied or the global generation brings their satisfaction to adequacy, and
2. The global generation does not impair the ability of its posterity to adequately meet health care needs.

Nolt notes that his definition is similar to the Brundtland definition in three ways. These are listed below, followed by a brief explanation.

1. It makes the criterion of sustainability *adequate*, not non-declining *V*, thus avoiding both the mentality of 'always at least as much as before' and the need for a linear ordering of levels of *V*.
2. It distinguishes sustainability from sustainedness, i.e., it does not tie a generation's achievement of sustainability to what future generations do, and

3. It makes the spatiotemporal unit of sustainability the global generation (2010, 150).

There are distinct benefits to avoiding a mindset of 'always at least as much as before.' There are times when sustaining some value at a level of 'always at least as much as before' is unsustainable, or, even if that value is sustainable, it may not be right to have always at least as much as before. Consider this mindset applied to health. Health is a value which we always strive to attain a level of at least as much as before. Maintaining at least as much health as before is unsustainable given current population levels, technology levels, and resource consumption in the institutions responsible for maintaining high levels of health. Sustainability, if it is to be successful, must be responsive to changes in resource availability and resource use. Always at least as much as before may lead to unsustainable resource use when adhered to for too long. As long as the adequacy of *V* is maintained, then that value *V* is maintained, even if *V* declines.

Second, Nolt's definition distinguishes sustainability from sustainedness. When value *V* is extended beyond the current generation, we risk some people confusing sustainability with sustainedness. Sustainability requires that *V* be sustainable now, but does not guarantee that *V* will be sustained far into the future. Sustainedness, by contrast, implies that *V* will be sustained indefinitely. Sustainability may be achieved by the current generation even if *V* drops below adequacy in the future. (Nolt 2010, 147). The responsibility for sustainability, then, is properly placed upon the current generation, yet the current generation is not responsible for future sustainability. To hold them responsible for future sustainability would be to confuse sustainability with sustainedness.

Third, Nolt's definition makes the smallest spatiotemporal unit of sustainability the global generation. The spatial dimensions of sustainability are often contested. Some theories talk of communities achieving sustainability; others speak of individuals. Nolt makes the global generation the smallest spatiotemporal unit of sustainability because sustainability attained by a group or an individual cannot be considered in isolation—that is, even if a community is performing some action sustainably, what they are doing cannot be considered sustainable outside of a global context. Their actions must be considered within a global context in order to be sustainable at all. As the global population increases, the ecological footprint that each individual or group may sustainably maintain decreases. The smallest temporal unit of sustainability is a human lifetime or a human generation, because sustainability depends on our actions during our lifetime (Nolt 2005, 149). That is, we may achieve sustainability today. This does not, however, guarantee that *V* will be sustained in the future. Whether we achieve sustainability depends upon what we accomplish during our morally responsible lives, making the smallest temporal unit, in the global sense, a human lifetime or generation. Nolt concludes that the spatial dimension of sustainability is the global generation because sustainability is "relative to, and cannot be understood apart from, global population" because the effects of living unsustainably are global effects (2005, 148).

Though Nolt presents a schematized version of the Brundtland definition, the schematization is superior because it allows for various values to be sustained, it clarifies the logical structure of the definition, and it allows for a discussion of what value should be sustained in a way that is abstracted from political considerations, at least at the outset (Nolt 2005, 151). We could, for example, easily apply Nolt's definition to many values

that we wish to make sustainable. Some of these values may be the values of human institutions. Manufacturing, health care, and agriculture are all examples of human institutions with values that are good candidates for sustainability.

As pertains to health care, the advantages listed by Nolt are mirrored when applying his schematic definition to health care. We can immediately see that, according to Nolt's definition, health care must be adequate, but it need not be non-declining. That is, health care under this model of sustainability is properly dynamic, meaning that the kind and level of care provided will depend on the relevant contextual considerations (while remaining adequate) rather than on sustaining a set level of care. This is advantageous because the levels of care provided, in order to be sustainable, must always take into account the economic, social, and natural capital available. The exception to this is, of course, when even minimal standards are beyond our ability to meet. This might occur because resources become too scarce; in such a scenario, the value cannot be sustained and sustainability is lost. On the other hand, we might sustainably raise the standard of adequacy due to a wealth of resources, technology, or innovation. Furthermore, the responsibility for making health care sustainable lies with the current generation. The current generation cannot be held responsible for whether health care remains sustainable indefinitely: they are responsible only for what they can control, e.g. events that occur which affect whether medicine is sustainable in the present without impairing the ability of future generations to maintain health care as well.

Fleshing out Nolt's definition for a more detailed analysis requires a look at some background thought. Already, we noted that, for Nolt, the proper spatial dimension of sustainability is the global generation. This is in direct contrast with Norton's local,

community based approach. The difference becomes important when we consider the ramifications of sustainability actions at the local level and universalize the act across the global generation. The global generation is constantly increasing in size (globally, though some regions are decreasing) at the time of this writing. An increase in population requires that the ecological footprint for some will have to shrink in order to maintain current demands on the environment. If we are only concerned with local sustainability, then we might lose sight of how our local sustainability practice affects others globally. A community may be sustainable, but the sustainability efforts in one community may undermine the sustainability efforts going on elsewhere.

It is expected that sustainability will not look the same everywhere, even though global sustainability is the goal. In different environments, various practices may be sustainable that are not sustainable elsewhere, though the definition of sustainability must be inclusive insofar as it must be sustainable for the global generation and the consumer culture that dominates. In making medicine sustainable, we must likewise be concerned with the global generation because sustainability is an inherently global concept (recall ecotourism in Appalachia).

One problem requiring close examination when applying Nolt's schematic definition of sustainability to medicine is why people should be content with adequate care when adequate care may not be the best care possible.[3] If we apply Nolt's schematic definition to health care, we immediately wonder why anyone would want just adequate health care. Indeed, there are few things people value more than their health. It follows

[3] Special thanks are due to John Hardwig for many discussions surrounding this issue.

that a great many other values are secondary in comparison to the import that health care carries with it. If so, it seems that what people really want is *exceptional* health care—but exceptional health care is not possible to achieve if it must be achieved sustainably for the global generation. Under an ecological conception of sustainability, exceptional health care that is not limited in any way by consideration for the environment is impermissible.

The problem with Nolt's definition as pertains to sustainable medicine is largely practical. Some notion of adequacy must be determined. With regard to medicine, whatever notion of adequacy is used will likely be a hotly debated topic given the history of debate within medicine concerning the rationing of care (a related, though not identical, topic). Health care levels will change over time due to resource use, innovations toward renewable resources, and the discovery of new resources. At some times, what was once sustainable may become excessive; at this juncture, hard choices will have to be made when the topic of sustainability is health care. Any notion of adequacy would be dynamic, not static, due to the various factors that affect what resources may be put to use for health care and how those resources may be used, so long as adequacy is some minimum standard or higher. Policy based on this theory must reflect this uncertainty, though this concern is perhaps not special to Nolt's theory, as adaptive management techniques like Norton's face similar policy challenges concerning the elasticity of policy with respect to what is sustainable at any given time.

2.3 Lessons from Sustainability Literature

By examining the literature on sustainability, we can see the important ways in which the study of sustainability has evolved in philosophical conversations. Each theory of sustainability reviewed offers its own promise as the basis for a theory of sustainable medicine, yet each has its flaws. Looking at the history of sustainability, we found that early visions of sustainability were anthropocentric and concerned with resource consumption as it relates to humans and the ability of humanity to survive or thrive. Ecosystems, nonhuman life, and the environment are all considered through the lens of their value to humanity. There is little recognition of invaluable goods, i.e. goods that have no monetary valuation, in the earlier versions of sustainability.

We may also question whether an anthropocentric or nonanthropocentric strategy would be beneficial, or if some other way of envisioning a theory of sustainable medicine would be maximally useful. The idea that there is a sharp distinction between anthropocentrism or human centered ethics and nonanthropocentrism or non-human centered ethics is overblown, insofar as anthropocentrism is often equated with only valuing the environment instrumentally. If the differences between human centered and non-human centered approaches are overblown, then a useful strategy for formulating a theory of sustainable medicine may be to provide a theory of sustainable medicine that is simply ecological, i.e. a theory of sustainable medicine focusing not only on human health and medicine but also on ecosystems and their relation to human health. Such a conception of sustainability could technically be anthropocentric, as ecosystems need not

be valued independently of human valuation in order to be morally considerable in important theory and policy shaping ways.

In addition, we find that the object of sustainability differs widely between each theory. If a theory of sustainable medicine is to be complete, then it must argue in favor of some object of sustainability, or it will lack a cohesive, unifying factor. Callicott's object of sustainability is human activity, while Norton's object of sustainability varies based on the values of each community. Nolt's notion of sustainability focuses on value *V,* while *V* must be adequate for the global generation: whatever value we use for *V* is the object of sustainability. Note that even Norton's community-based approach is global to some degree, though insufficiently, insofar as each community everywhere around the globe has an obligation to act sustainably. The choice that each community must make is what values will be sustained. These values need not be global, and communities need not directly consider nonanthropogenic values. Callicott's vision of sustainability is also global; human activity, as he understands it, is largely the kind of activity that is required for living and going about daily business, regardless of culture.

In Norton's defense, it may be that some values are so common to human experience that they will obviously be valued in some way by all communities. Health care may be one such value because it is unlikely that future generations will be so free of disease and infirmity that they do not need health care. But perhaps the majority of values, and many important values, are not of this enduring type. Should unenduring values be the ones that a community decides to sustain, they may miss the point of sustainability altogether—to sustain at some level those things necessary for a decent human existence now and into the future.

The key pragmatic difference between the theories is, of course, applicability. Callicott's theory remains a viable alternative as a theory of sustainability even though his reasons for choosing human activities as the object of sustainability are flawed. Despite his flaw in reasoning concerning the non-identity problem, we might still consider human activities (essentially those activities that comprise human culture) as the object of moral considerability for a theory of sustainability. However, the emphasis on human activity as the object of sustainability is worrisome because it is unclear that the activities are what we really want to achieve sustainability for—it is the product of those activities. For example, we may wish to sustain the activity of practicing health care far into the future by making it sustainable now and maintaining sustainability, but the activity is not really the important object of sustainability. Rather, the important object is of sustainability in such a scenario is health. If for some reason we cured disease and remained healthy until the moment of death, we would be satisfied even though the activity of sustaining health was no longer necessary, e.g. practicing health care.

Norton's vision of sustainability appears quite strong, but may not be a good candidate to model sustainable medicine due to differing community values. There is no guarantee that each community chooses to become sustainable. Nolt's theory seems to be workable, but finding the level of health care sustainable (as adequate) and figuring out how to do that properly places sustainability and what is sustainable out of the abstract and into the concrete. I find the transition into the concrete helpful, yet dangerous, because dealing with concrete issues leaves much room for debate. I now turn attention to the main theories of sustainable medicine available at the time of this writing.

2.4 Theories of Sustainable Medicine

It will be useful to evaluate the existing theories of sustainable medicine in addition to the literature on sustainability already reviewed. There are two major works on theories of sustainable medicine. The first I will address is entitled *The Ethics of Environmentally Responsible Health Care* by Andrew Jameton and Jessica Pierce. The second is Daniel Callahan's book, *False Hopes: Overcoming the Obstacles to a Sustainable, Affordable Medicine*, with additional information included from many of his other important works. Each section includes a synopsis of the work, followed by a critique of each. In particular, the short review given to each will give clues as to how the issues and problems highlighted in the previous sustainability literature may be mitigated or solved by an existing theory of sustainable medicine. In turn, we'll look at the remaining issues that might be worked out in a new theory of sustainable medicine.

2.4.2 Andrew Jameton and Jessica Pierce

Jameton and Pierce, in describing their own theory of sustainable medicine, identify three key ethical tensions that must be addressed in any model of sustainable medicine: the individual versus the whole, sustainability versus social justice, and sustainability versus health (Jameton and Pierce 2001, 367). Any attempt at sustainable medicine needs to address these tensions to satisfy both environmental concerns and a worthy commitment to patient care. Their approach may be described as ecological,

insofar as they are concerned with the health of ecosystems and environmental restoration.

The first tension, the individual versus the whole, references the problem that current medical practice focuses on the well-being of the individual to the detriment of other people in need of medical services. For example, the ethics of health care is deeply influenced by the Hippocratic principle of "do no harm." This is in part a problem of resource allocation. If medicine is to operate within the boundaries of sustainability, then considerations like finite resources and the distribution of those resources become paramount. Doctors are sworn to do what is in the best interest of their patient; yet when focusing on the individual, the whole is often sacrificed, either because resources have been exhausted on individuals or because of other unintended consequences of treating individuals such as environmental degradation. As global environmental concerns become a part of health care, then the principle of "do no harm" must be applied not only to the patient but also to society in general (as society may be seen as composed of future patients) and the environment.

The second tension, sustainability versus social justice, concerns whether we can accomplish both sustainability and justice; if not, then an account of sustainable health care will have to demonstrate ways to navigate this tension. Much of the time, the relationship between sustainability and justice centers on questions of distributive justice, such as resource allocation. For example, given limited resources, what might a just distribution of those resources look like, and how would we accomplish such a distribution? In addition to distributive justice, there are also concerns pertaining to retributive justice, e.g. the just enforcement and implementation of a theory of sustainable

medicine. For example, legislation aimed at making medicine sustainable has to be sensitive to differing resource levels. It would be unjust to outlaw the use of DDT in developing nations without some alternative to protect the population from malaria. Even if sustainable medicine is implemented justly, there are still concerns relating to how to enforce violations of policies stemming from a theory of sustainable medicine and what those policies should look like.

The third tension is sustainability versus health. This tension concerns the problem of balancing environmental concerns with competing concerns about human health. Sustainable health care is often incompatible with the aggressive gains necessary to continue the rate of improvement in human health and welfare. Improvements in human welfare often rely on increased standards of living through economic improvement, while human health improvement is currently driven by technological advancement. If the industrialized world becomes widely sustainable and health care also becomes sustainable, then it is unclear that the current methods employed in the improvement of human health and welfare can be continued. For example, if human welfare is improved in the developing world using fossil fuels for developing industry and infrastructure, environmental degradation is highly likely to result.

One alternative for the improvement of human health is given to us by examining past public health measures. Significant gains in health and welfare are recognized as sanitation, safer foods, and vaccinations, to name only a few (CDC 2001). Further gains, such as the gains attempted in much of current medicine, often require an intense use of resources and wealth, which often result in solutions that are unsustainable. Jameton and Pierce address the key ethical tensions mentioned above by envisioning a theoretically

environmentally responsible medicine. In envisioning an environmentally responsible medicine, they avoid trying to form a model of sustainability and focus on sustainable solutions to particular problems within the field of medicine. Their solutions culminate in a vision of an ideal health care practice: The Green Health Center (GHC). The preamble to the guidelines for the GHC will give us an idea of the theoretical underpinnings of the GHC, while the guiding principles will demonstrate how these theoretical underpinnings might be realized.

In the preamble to "Ethical Principles and Purpose of a Green Health Center," included in *The Ethics of Environmentally Responsible Health Care* by Jameton and Pierce, there are several statements that articulate their vision of sustainable medicine.

1. Human well-being is dependent on the intact functioning of earth's ecological systems.
2. The well-being of individuals and families is dependent on access to health care and public health, together with other basic social goods.
3. The provision of health care for present generations must not undermine the ability of ecosystems to support future generations.
4. Health care practice must reinforce the restoration and maintenance of global ecosystems.
5. The clinical and environmental activities of health care must be conducted with fairness and without exploitation (Jameton and Pierce 2004, 63).

These five statements combined give us an idea of the framework within which Jameton and Pierce argue that medicine should operate. In the preamble, we find statements similar to some of those gleaned from a review of the literature on sustainability, namely

that human health is dependent upon the health of various ecosystems. Concerns for justice in health care acquisition and distribution are addressed, and there is an attempt to balance those concerns over justice in health care with environmental concerns. By seeing how they frame the boundaries within which sustainable medicine should operate, we can infer what the basic ideas behind their idea of sustainable medicine are, or what a hospital operating under these statements might look like in operation. Fortunately, we don't have to wonder, because Jameton and Pierce have developed a detailed conception of just such an institution.

The following principles are meant to guide the operation of the GHC within the boundaries of the preamble. These are:

1. The GHC provides health care in ways that minimize harm to human and ecosystem health.
2. The architecture, organizational design, strategic planning, management, and budget of the GHC embody principles of responsibility to nature and future generations.
3. The GHC provides ecologically sustainable therapies and products.
4. The GHC provides services to patients with any health condition but may limit the range of therapies offered in order to reduce ecological impacts and increase efficiency.
5. The GHC engages in a continuous process of assessment and evaluation of its services, in light of both patient satisfaction and research into environmentally preferable technologies.

6. The GHC employs ecologically sound conceptions of health, recovery, and rehabilitation.
7. The GHC encourages staff and patients to live in environmentally sound ways that express a modest level of consumption.
8. The GHC acts as a community educator, advocating principles of sustainability in every aspect of life.
9. The GHC encourages institutions with which it has business and academic relations to operate in environmentally responsible ways.
10. The GHC pays its share of the environmental and social costs of providing health care.
11. The GHC monitors, minimizes, and equalizes environmental risks to GHC employees.
12. The GHC provides high-quality services at a level inexpensive enough that they can be made equally available to all (Jameton and Pierce 2004, 63-75).

There is much to be said for this approach. Insofar as the GHC operates within the parameters set forth in the preamble, it shows in sharp detail what is required of health care if it is to become sustainable. The GHC is designed in theory to at least be entirely sustainable, from brick to lab coat, student to resident, scalpel to sick bed. Jameton and Pierce also recognize that "a sustainable health perspective recognizes that the overall public health gains realizable from health care are limited. Allocating resources to meet the health care needs of individuals should be framed in the context of maintaining sustainable public health for all people and ecosystems" (Jameton and Pierce 2004, 3).

The GHC is only part of what Jameton and Pierce have to offer. Any complete analysis of Jameton and Pierce's model of sustainable medicine will need to focus on and evaluate not only the GHC, but also the prescriptions drawn from its guidelines. Such an analysis is outside the scope of our purposes in this chapter and this work as a whole, but the GHC remains an excellent example of what kind of health care institution their theory might yield if their theory were implemented. Though merely theoretical, the GHC gives ideals to strive for, and, in striving for those ideals, practical considerations arise that must be dealt with. For example, the GHC buys locally whenever possible to reduce environmental impact. But in many areas of the globe, the materials necessary to run the GHC are not available locally, and must be shipped; for example, surgical tools may have to be imported to developing countries that lack the capacity to manufacture their own. Such difficulties illustrate how institutions must be careful of unintended consequences pertaining to medical supplies in addition to those pertaining to patient care. Furthermore, buying locally will not always be in the best interest of the environment in cases where the pollution from local production and energy sources are greater than if the products were produced and shipped from elsewhere.

In summary, Jameton and Pierce advocate environmentally responsible medicine. They recognize that major changes to social structures, cultures, and economies are necessary in order to make medicine sustainable. They have a strong grasp of the environmental issues at hand and suggest a detail oriented approach to those problems in an effort to make health care environmentally sustainable. For example, they suggest that materials and procedures must each be studied to calculate the full cost of the material or procedure, including environmental, economic, and social costs. They also recognize

that these studies will have to be done in various regions in order to account for the resources, cultures, and needs of those regions. They recognize that this could result in "fewer, more carefully chosen treatments and technologies may be offered, with an eye toward serving the key health needs as many as possible, within global environmental constraints" (Jameton and Pierce 2004, 3). One aspect of Jameton and Pierce's approach that differentiates their approach from Callahan's is precisely the detail oriented approach to various problems and an advocacy of placing sustainability principles at the core of bioethics.

Their work is yet unfinished, however. The sustainability principles at the core of their discussions concerning medical ethics suggest the need for a complete theory of sustainable medicine. Through maintaining a detail oriented stance on the issues, Jameton and Pierce offer much to the expert, but less for those uninitiated in philosophy and medicine. They advocate a limitation of autonomy and indicate that coercion may be necessary to attain sustainability, but offer no analysis of the implications of such a suggestion. Furthermore, without an explicit account of human health and ecosystem/environmental health, their detail oriented approach to the relationship between environmental problems and human health seems inadequately justified.

Still, there are more virtues of their theory than I could list. Some aspects of their theory that seem particularly worthy of carrying forward for inclusion into a vision of sustainable medicine are those listed in the preamble to "Ethical Principles of a Green Health Center" relisted below for convenience:

1. Human well-being is dependent on the intact functioning of earth's ecological systems relevant to human well-being.

2. The well-being of individuals and families is dependent on access to health care and public health, together with other basic social goods.
3. The provision of health care for present generations must not undermine the ability of ecosystems to support future generations.
4. Health care practice must reinforce the restoration and maintenance of global ecosystems.

Jameton and Pierce note the importance of a well-functioning ecosystem to human well-being, but do not make the further distinction that some ecosystems may not be important for human well-being at all. From an anthropocentric standpoint, with regard to sustainable medicine, the only ecosystems we need to worry about are those that directly affect human health, though we may worry about other ecosystems or parts of the environment for aesthetic, scientific, or recreational reasons. If we view ecosystems nonanthropocentrically, then even ecosystems that do not have a direct effect on human health are morally considerable and must be factored into how health care is provided. Depending on how far toward a nonanthropocentric view the reader is willing to go, a sustainable medicine may look very different—including what ecosystems figure into a vision of sustainable medicine. Though ecosystems may affect one another, and are certainly interconnected, it is not true that human well-being depends upon the intact functioning of all ecosystems. Think of the following example. Some ecosystems are more important for human well-being than others. The Amazon is extremely important for human well-being because of its ability to produce oxygen and absorb carbon, but the Sahara is less so because the Sahara provides few of the resources and ecosystem services on which human well-being depends. If true, then regardless of what value or kind of

value an ecosystem has, some will be more valuable for human well-being than others. It is only on a nonanthropocentric view that all ecosystems matter independent of human valuations.

On the individual level, access to health care is a major issue for sustainable health care. Without access to health care, it is more difficult for individuals to remain well over long periods of time (though exceptions do exist). Public health projects arguably create the largest gains in standard of living while being more cost effective than individual treatments. This kind of access to health care is not available everywhere, which is a major reason why the health of some societies or cultures ranks much lower than that of other places. Aside from public health, social goods, including social interaction and access to goods and services, are necessary for individuals to stay healthy. Again, we see that many areas lack these basic necessities of life. A theory of sustainable medicine must include in its considerations the accessibility of these basic necessities in order to be a successful model of medicine.

With respect to the provision of health care, health care for the current generation must not undermine the ability of ecosystems to support future generations. It is easy enough to see how this might occur. A health care practice that may be sustained for the current generation might exhaust resources to the point that future generations cannot use health care in the same way, making the practice unsustainable. There is a large debate concerning this discussion in sustainability. Depending on your definition of sustainability, an action may be sustainable only if future generations have the same resources available; alternatively, another approach is that future generations have to be left no worse off. There are many others. The point to carry forward from Jameton and

Pierce is more specific. Ecosystems must be able to function well so that future generations might avail themselves of the resources and ecosystem services from well-functioning ecosystems to provide for the relevant ecosystem dependent parts of their health and health care. This is a slightly different point than the older debate within sustainability concerning resources: though ecosystems may provide resources, the chief benefit for human well-being that ecosystems offer are ecosystem services like soil creation, hydrological cycles, food production, and many more. Properly understood, Jameton and Pierce rightly advocate that health care should not undermine the ability of an ecosystem to provide those same services to future generations.

Lastly, health care must reinforce the restoration and maintenance of global ecosystems. Health care *must* because health care *should not* contribute to ecological degradation. Contributing to ecological degradation is antithetical to the ends of medicine because, as ecological degradation occurs, the likelihood that individuals living in and dependent upon that ecosystem will suffer ill effects from the ecological degradation increases as environmentally dependent risk factors for illness increase. If medicine contributes to environmental degradation in ways that affect human health, then medicine has an obligation to stop contributing to that degradation simply because of its stated ends. What those contributions may be, and to what extent they affect human health, is a topic for later discussion.

2.4.3 Daniel Callahan

Another extensive attempt to describe a sustainable medicine is Daniel Callahan's book, *False Hopes: Overcoming the Obstacles to a Sustainable, Affordable Medicine* (1999). First, I'll introduce Callahan by way of a brief summary. Second, I'll follow that summary with a look at some of Callahan's key points.

Callahan does not give a neat definition of sustainability. Rather, Callahan's notion of sustainability is defined by certain goals and characteristics. Callahan is trying to accomplish two goals in his theory of sustainable medicine: a steady-state medicine and the advancement of a view of human life (1999, 23). A steady-state medicine is a medicine "in which a socially agreed upon proportion of the GNP is devoted to health care, with a set limit; in which technological changes are slow to come and are rigorously screened for efficacy and affordability; in which the public for the most part expects only slightly incremental improvement in the level and quality of health care; and in which further scientific gains are not deployed until earlier ones are fully utilized (Callahan 1999, 38). Usually, steady state economics require a steady population. Oddly, there is no explicit discussion of a steady population in Callahan's work on sustainable medicine, although the topic is broached in some detail in other works. It is sufficient for our purposes to note that a stable population is necessary for a steady state medicine insofar as it is based upon steady state economics. Roughly defined, steady state economics is a system of economics with a stable or steady population with a slow or no rate of growth, featuring a steady or slow growing economy. Furthermore, Callahan argues that we must also abandon our current idea of medical progress in favor of an idea of medical progress

that is not dependent almost solely on technology. Rather, he calls for a medical progress dependent upon creating a better life, a higher quality of life. He gives an in depth analysis of technology and whether technology can give us the life it promises, a life that is ever more free of disease and suffering. In the end, Callahan concludes that we often celebrate technology before we've given justification for its use; if we cannot explain how a particular technology will make our life better, then the technology should not be used. Callahan links our addiction to technology to our view of nature as something be dominated and argues in favor of accepting some of the limitations that nature puts on us. The effect of this acceptance is that some disease will be expected, as will the natural biological limits of life.

According to Callahan, this acceptance creates another view of life: a view of life from which a steady-state, sustainable medicine can grow (1999). In his vision of a new life, we are critical of medical technology. A focus on family and community brings dying out of the hospital and into the home, resulting in a decreased phase of morbidity at the end of life. There is more responsibility for individual health, but an impetus to provide everyone with health care within the confines of his sustainable medicine. Under Callahan's model, *ideally*, individuals should voluntarily strive to make medicine more sustainable because it is in their own best interest.

Callahan's work is motivated by several observations. First, Callahan observed that the rising cost of health care would soon outstrip our ability to pay. Second, he observed that, no matter the gains made in health care, they were never enough. Third, our definition of disease had grown to seemingly include death itself. In our struggle against disease, we began to throw more time, energy, and other resources at preventing

the "disease" of death. The resulting extension of the morbid phase of life served only to exacerbate the economically unsustainable practices of medicine. Finally, Callahan observed that the struggle against disease and death was a struggle against nature itself—a rejection of our own fate. Our attempt to dominate nature had spread to medicine, which now sought to dominate nature within the context of the human body. According to Callahan, if medicine is to become sustainable, these issues need addressed. To this end, Callahan develops three keys to sustainable medicine:

1. To live within the boundaries of nature, to respect and defer to that nature and be prepared to learn from it.
2. To recognize the human need to struggle against those aspects of nature that bring pain, illness, a loss of human functions, and a premature death.
3. To manage that struggle in some affordable way (1999, 130).

Callahan argues convincingly that the tension between living within the boundaries of nature and the human need to struggle against nature will need to be resolved within the practical constraints of economic considerations (1999, 130). To understand why, let's take a look at each step toward the realization of Callahan's sustainable medicine in turn.

In order to live within the boundaries of nature, Callahan argues that we must recognize that our lives are limited and finite. This change, he argues, is based in taking personal responsibility for our own health so that we may still have a good quality of life even though it may not be full of high technology fixes and end of life intervention. Though not rigidly fixed, our lives follow a natural cycle of life and death within a definitive time frame. Callahan recognizes that, while it is true that we have extended the time frame of that natural cycle, all attempts at defeating the cycle ultimately fail.

Further, the longer the time frame is extended, the more health problems occur at the end of life that need to be solved in order to extend the time frame even further. With increasing cost, we are able to research, and treat these illnesses, but such behavior is not sustainable for long.

Callahan's second point recognizes the human drive for survival. Our lives are riddled with various illnesses that we overcome, but eventually it will likely be some sort of illness that causes our death. According to Callahan, medicine has struggled to dominate those aspects of nature that contribute to and cause human health problems. These are aspects of nature that humanity will continue to struggle against because of our desire to prevent illness and death. This struggle, however, may blindly lead us to attempt to fight against disease at all costs. Instead of accepting the natural limitations of human life, we seek to treat illness even when the benefits are marginal and the cost is high. Such behavior is at the root of our drive for technological solutions and the medicalization of death.

Finally, Callahan argues that medicine needs to become economically affordable. Economic affordability will work in concert with the first two points to make a theory of sustainable medicine that works in practice, if Callahan is right. Our struggle against nature must happen within the boundaries of economic affordability. One way to make our struggle against nature economically affordable is a central feature of Callahan's theory: the idea that, though we need to struggle to survive, there's no reason to treat at any cost, or to needlessly prolong life. Callahan proposes that, as a form of age based rationing, we give no more than palliative medical care for serious illness in the elderly

(Callahan 1987). Callahan concedes that age based rationing will not be accepted now, but still advocates that medicine should re-evaluate end of life care. Callahan writes:

> Medical research has found no decisive cures for the diseases of aging, but it has found myriad ways of keeping sick and frail people alive longer and longer. Unfortunately, that success — if anyone wants to call it that — increases the odds for Alzheimer's. Something or other will get us in the long run, but a great deal of money can be spent getting us there (Callahan 2008).

Technology, economics, and our struggle for survival are recognizably entwined in Callahan's theory. The catalyst for this change lies with all of us—in taking responsibility for our own health, we will request and expect fewer technological fixes, we will be more likely to live within the natural boundaries of our lifespan, and our lives will, overall, be healthier (Callahan 1999, 173-207). There is little I have to add to Callahan's analysis, in part because I agree with so much of it. Time will be more wisely spent discussing the parts I disagree with, and it is to these that I turn the discussion.

I deeply sympathize with the emphasis on individual change and responsibility that we find in Callahan's model of sustainability. However, I fear that the emphasis places too heavy a burden on the individual. It is asking the individual to change, but gives little extrinsic motivation for making the necessary changes. Though taking personal responsibility for one's health, expecting less technology (and expecting less to be offered), and living within the boundaries of nature may be in each person's best interest, and even society's interest, it remains unclear how such measures could be implemented. In part, this is because the long term gains from enacting the kind of

changes Callahan suggests are less motivating than the short term benefits from unsustainable health care. The old order Amish offer just such an example.

The old order Amish arguably embody the mindset Callahan espouses more than any other culture. They turn a critical eye toward technology, but remain surrounded by technological fixes, modern medicine, and unsustainable choices. It is perhaps not surprising, therefore, that they are seeking out unsustainable medicine and learning to live with the economic debt such actions create (Girod 2002). In "A Sustainable Medicine: Lessons from the Old Order Amish" Jennifer Girod uses the old order Amish as a counterexample to Callahan's argument, i.e. if we attain the proper mindset, then we will make individual choices that are, at the very least, more sustainable than previously. According to Girod, the Amish are an example of an entire community or group that are comfortable with death and dying in just the ways that Callahan wants us all to be. They resist progress, evaluating each technology individually by virtue of whether it will positively affect their community or harm it; then, after deciding, they admit or reject the technology.

Further, each member of the community leaves the community upon reaching adulthood and chooses to remain apart from the community or to return. The lifestyle is entirely voluntary. Still, Girod studies four cases (there are more, but these four are particularly poignant) in which each person is between the age of 24 and 29 years old from two neighboring church districts in Indiana. The cases span an eight year period. In each case, the individuals received life-saving or life prolonging organ or bone marrow transplants. These communities are tightly knit—friends and family visit the hospital regularly. When one dies in the community, the community takes care of the family of

the deceased for up to a year after death. They eschew outside health care, depending instead upon a principle of Mutual Aid, which states that the community will provide for whatever the community needs. Each member pays into an account for medical care each month at the church.

No other community embodies the kind of mindset that Callahan argues that we need for his model of sustainable health care to work better than the old order Amish. The Amish live according to a set of rules called the *Ordnung.* These rules are the blueprint that the Amish swear to live by. Yet, these four individuals, after choosing to remain in the community and follow the *Ordnung*, received transplants the community cannot afford (Girod 35). As a result, some of the individuals signed up for Medicaid in order to pay for their care despite the fact that the community as a whole decided against the use of Medicaid because it would erode community bonds. When one or a few members choose to use outside assistance, the assistance historically results in an erosion of community bonds. In other cases, the individuals receiving care left their communities with debt which, as a result of their simpler lifestyles and lower income, takes even longer to repay than usual. Their actions are clearly economically and socially unsustainable, yet they chose life, in many cases with the blessings and pleadings of their loved ones.

Girod's example is cause for caution in adopting Callahan's theory of sustainable medicine. If Callahan fails to address the struggle against nature that he identifies so that considerations for human survival do not always (or even quite often) trump environmental concerns, then Callahan's theory may not contain the foundation for the implementation of a medicine that is sustainable in the long term. Considerations for

human survival will remain strong, and this seems likely to undermine Callahan's vision of sustainable medicine. Indeed, while the example of the old order Amish is a problem for any theory of sustainable medicine, it would become a crippling problem for any theory of sustainable medicine which fails to remove or at least come up with a system for dealing with unsustainable yet tempting treatment choices. As we find in the example from the old order Amish, even those people living in a community critical of technology, who possess an acceptance of their own mortality, and who have sworn to abide by certain rules will break oath and rule in favor of economically unsustainable medical treatment if it might stay death a while longer. The old order Amish show us that unless unsustainable choices are not available, there will be a significant temptation to choose treatment. Such temptation undermines the entire enterprise of sustainable medicine. Some way of removing the temptation, or to mitigate the effects of choosing such a temptation must be considered.

There are several aspects of Callahan's vision of sustainable medicine that are indispensable to sustainable medicine. To conclude my discussion of Callahan, I will list the aspects to be used and include a justification for the inclusion of each aspect. The aspects are as follows:

1. People should take personal responsibility for their health.
2. People need to learn to live within the boundaries of biological life-spans.
3. We must maintain the affordability of health care.
4. We must remain critical of our use of technology in medicine.

Personal responsibility for health is, in my mind, the starting point for sustainable medicine. Note that earlier I criticized Callahan on this point. My criticism, however, is

based upon the weight that Callahan gives to this aspect of sustainable medicine. Personal responsibility of health is a starting point for medicine, but it is not a keystone for sustainable medicine in the way that Callahan argues. People who take responsibility for their own health will, on the whole, be healthier than those who do not. Though healthier people do not necessarily make health care more affordable, people responsible for their own health are conscious enough concerning decisions that affect their health that they may also make environmentally sound health care and lifestyle decisions, especially in cases where those decisions have a direct effect on their environment. If one takes responsibility for one's own health, then many health problems will become less prevalent, allowing research, resources, and energy to be used elsewhere to help make medicine more sustainable. Furthermore, it is likely that one who feels a deep responsibility for their own health will, by extension, not want others to make decisions that may be harmful to their health or the health of others. By avoiding harm to oneself and others when making health care decisions, one step is made toward making medicine more sustainable.

For example, there is often pressure put on physicians by patients with viral infections to prescribe antibiotics. If prescribed, the antibiotics are of marginal help to the individual. Antibiotics used in this way may prevent secondary infections by bacteria, but will not aid the immune system in defeating a virus. Moreover, the antibiotics may weaken the natural bacteria that are helpful in the daily functioning of the body and cause problems in their own right, including new infections. The potential for harm is clear, even before we consider the wider effects on the environment, such as the creation of antibiotic resistant bacterial strains (CDC 2014).

There also seems good reason to believe that our struggle against the biological end of life is not sustainable. From a monetary standpoint, health care dollars spent on marginally beneficial end of life care are misspent. There is far greater justification to use those health care dollars on maximally beneficial care at other stages of life and provide excellent palliative care at the end of life. Emergency care for someone not expected to live very long, while laudable in intent, results in unjustifiable consequences. Higher health care cost and marginally beneficial procedures are not only bad to perform from the standpoint of monetary capital, but of social and environmental capital as well. Doctors and nurses must use precious time and effort, while the use of energy and other natural resources contributes to waste and environmental degradation. By studying only a few waste streams, researchers found that hospitals in America create 5.9 million tons of trash annually and produced 215 million tons of carbon dioxide equivalent waste in 2007 alone (Chung and Meltzer 2009). Cessation of marginally beneficial care is a start to waste reduction.

While reducing the environmental impact of health care may require the cessation of marginally beneficial care, we must also be careful that innovations aimed at reducing the environmental impact of health care do not create an environmentally friendly medicine that is unaffordable. Health care that is not environmentally harmful but is unnecessarily burdensome to the population due to cost is also unjustifiable. Though we could enter a debate over whether health care is now already unjustifiably expensive or not, everyone can agree that health care must remain affordable. Just what that means, and how to pay for it, is a complex matter that is somewhat outside the scope of this

work. Aspects of making health care economically sustainable for the present and future generations will be part of later discussions.

Finally, it is necessary to foster the thoughtful use of technology. When using technology thoughtfully, medical professionals and, to a lesser extent, patients need to ask whether the technology in question will be used wisely. That is, they might ask, "Do alternatives exist?" and "Will this technology cause undue harm to the environment despite the benefits to humanity?" The effects of using technology thoughtfully are at least beneficial insofar as technology which is marginally beneficial should not be included for widespread medical use. Furthermore, technology that causes great harm to the environment should be closely scrutinized to determine whether the aggregate effects of its use will cause more harm than good (at least on a consequentialist view), or make the use of the technology marginally beneficial. One example of a technology or application of technology that might be considered marginally beneficial because of environmental impact is a historical example that everyone is familiar with, namely, the use of mercury in medical equipment. According to a recent EPA report, the incineration of contaminated medical waste is responsible for 13% of all atmospheric mercury (EPA 2002, 2). As a result, hospitals are actively looking for alternatives to equipment containing mercury.

2.5 Contributions to Sustainable Medicine from the Literature

In reviewing a variety of theories on sustainability and sustainable medicine, the careful reader will note that each theory has at least some possible contribution to make

toward envisioning a theory of sustainable medicine. By way of summary, here are the lessons being carried forward from the two theories of sustainable medicine:

From Jameton and Pierce:

1. Human well-being is dependent on the intact functioning of earth's ecological systems relevant to human well-being.
2. The well-being of individuals and families is dependent on access to health care and public health, together with other basic social goods.
3. The provision of health care for present generations must not undermine the ability of ecosystems to support future generations.
4. Health care practice must reinforce the restoration and maintenance of global ecosystems.

From Callahan:

5. People should take personal responsibility for their health.
6. People need to learn to live within the boundaries of biological life-spans.
7. We must maintain the affordability of health care.
8. We must remain critical of our use of technology in medicine.

The points above and at the end of the section on sustainability literature are essential to envisioning a theory of sustainable medicine. They are detailed bullet points for addressing the difficulties in making medicine sustainable. In order to be successful, a theory of sustainable medicine must take into account economic, ecological, and social factors that influence sustainability. Furthermore, we must address concerns for justice. Both theories of sustainable medicine address concerns over justice in different ways. For Jameton and Pierce, justice in health care focuses on just access and distribution, as

applied to particular cases, institution by institution rather than a broad, across the board prescription or principle. For Callahan, justice is largely contractual: once sustainable measures are agreed upon, then those outliers that are unfortunately stricken with disease that cannot be sustainably treated are indeed unfortunate, but their denial of care is not unjust because the re-envisioning of the good life he advocates allows people to voluntarily desire this mode of medicine.

We must determine what levels of care are appropriate given concerns of justice and the boundaries created by finite resources and other natural limitations on human activity, including ecological health, population, and concerns for future generations. In order to decide what levels of care are appropriate, we must agree on a definition of health that includes within that definition a recognition that human health is dependent on ecological health. We must also recognize and try to fix some of the social factors that contribute to the deleterious relationship health care has with the environment. This effort begins with our definition of health.

CHAPTER III

3.1 SUSTAINABILITY AND THE PRINCIPLES OF MEDICINE

Unless otherwise noted, this discussion remains focused within the confines of long term anthropocentric environmental concerns, including moral consideration for future persons, i.e. intergenerational ethics—especially as pertains to sustainability and more particularly, sustainable medicine. In this chapter, I discuss the principles of medicine in relation to sustainability and by extension, sustainable medicine. Medical professionals may worry that sustainability is not compatible with medicine, because the principles by which medicine operates seem to be in tension with the goals of sustainability. In order for medicine to be compatible with sustainability, there must be consistency between the principles of medicine and sustainability. Each principle is discussed, though some require more detail than others. Crucial to understanding the principles of medicine and their link to sustainability is the link between public health and sustainability. Environmental risk factors for health affect the health of the population. These risk factors will be, in general, higher without sustainability than if we achieve some level of sustainability because the environmental determinants of those risk factors will trend toward fewer negative impacts on health. Two principles of medicine require extra attention. In particular, there is great tension between autonomy and public health measures, meaning that we must examine whether sustainability is compatible with autonomy. The second principle is justice. Concerns over justice in medicine are often concerned with just distribution, but not often concerned with the transgenerational

distribution of goods. Our discussion begins with a brief introduction to the principles of medicine.

Medicine already has strong moral traditions. The Hippocratic Oath, though partially inapplicable to the practice of medicine in today's society, still encompasses the spirit of medical practice; in short, to do no harm; to do good whenever possible; and some measures to ensure standards of professionalism (North 2002). Today the Hippocratic Oath has evolved into the code of ethics endorsed by the American Medical Association. The American Medical Association has no form of the oath, but instead focuses on the ethical practice of medicine in modern society. Their code of ethics, however informative, is quite lengthy, and is meant as a practical guide instead of an explication of theoretical underpinnings. Perhaps the best theory for the practice of medicine is the principles of biomedical ethics.

The most well-known and widely accepted principles of medical ethics were developed by Tom Beauchamp and James Childress. There are four principles: autonomy, beneficence, nonmaleficence, and justice. Each of the four principles may override the others, depending on the situation. For example, under most circumstances, nonmaleficence is given priority as a primary principle of medical ethics. It may become secondary, however, in a situation where causing some harm is necessary to save the life of the patient, such as in cases of surgery or chemotherapy. In cases of public health, public health measures might decrease autonomy but be beneficent measures overall in spite of the harm caused to some affected by the public health measure, where public health "refers to all organized measures (whether public or private) to prevent disease, promote health, and prolong life among the population as a whole" (WHO 2014).

3.2 Autonomy

In medical practice, respect for autonomy is often referred to as respect for persons. The two phrases are used as synonyms for one another. One famous report, the Belmont Report, was published in the 1970's in response to previous abuses of human test subjects, including the infamous Tuskegee syphilis experiments. The report is meant to provide greater protection for human test subjects in an attempt to prevent a recurrence of past test subject abuses. The report outlines ethical guidelines for human research and identifies three principles by which all human research should be guided: respect for persons, beneficence, and justice. Respect for persons, as outlined in the Belmont Report part B, requires that patient autonomy be respected and that patients with diminished autonomy be offered special protection (Belmont 1979). Autonomy is defined as "the personal rule of the self that is free from both controlling interferences by others and from certain limitations such as an inadequate understanding that prevent meaningful choice" (Beauchamp and Childress 99). Respect accords patients the right to make their own decisions concerning care and treatment.

At first glance, autonomy seems problematic for envisioning a sustainable medicine, if only because any vision of sustainable medicine must respect the limitations of finite resources; in turn, these limitations will limit the choices available to patients, perhaps in ways that their choices were not limited previously. From an anthropocentric standpoint, short term resource limitations are of little worry so long as there is enough for the near future. However, on the long view, resource limitations significantly restrict the choices that can be made. Even if one took the stance that the environment is only

valuable insofar as it is useful to humans, if we are worried about future generations, then resource limitations must be taken into account. We already worry about resource allocation in medicine on a daily basis, even in rich nations. The problem is far worse for poorer nations where there may not be enough resources to give even a minimal amount of care. For these reasons, autonomy seems diminished under a theory of sustainable medicine relative to autonomy as found under the practice of medicine that does not take resource limitations into account. The justifications for restricting autonomy must be very strong to overcome objections to restricting autonomy, especially since some restrictions on patient autonomy pertaining to medicine may result in the deaths of patients that would otherwise be saved. We could easily envision patient requests for a life saving heart transplant at seventy years of age, and deeply sympathize with their situation. We already question the wisdom of approving such a procedure; but if the individual is healthy, there is a chance they receive the transplant. Under sustainable medicine, there is little chance one receives the transplant due to the comparably small increase in life quality that that a transplant provides for an elderly individual. The same transplant done in a younger individual probably yields many more years of high life quality compared to an elderly patient. Spending limited resources on an elderly patient may then not be a viable option if we are to use our resources wisely. Elderly patients have worse health outcomes after transplants, and can expect to live fewer years at a lower quality of life than younger patients. Depending on the level of care sustainable, transplants may not be permissible at all for many countries where basic health needs are not currently met.

Worth noting, however, is that autonomy has not always been an overriding concern of biomedical ethics. That is, the importance of autonomy is perhaps as widely debated as the definition of the term. While autonomy was still important in the medical profession a hundred years ago, it did not garner the attention that it does today or even in the last 50 years, especially given the attention to autonomy in literature surrounding informed consent, competency, and the move away from a paternalistic physician/patient relationship. One might argue that medical practice in the West is too worried about patient autonomy, especially since patients are generally more informed than in the past and doctors are less paternalistic in comparison to the paternalistic practice of medicine that dominated medicine before the last fifty years (approximately). Other cultures, especially in the East, have not always viewed autonomy as an overriding concern for medical ethics. In his most recent work, John W. Traphagan argues that autonomy should not be a foundational principle of common morality because our idea of autonomy is greatly influenced by culture and thus cannot be part of a common morality (Traphagan 2013).

Feminist philosophers have long taken issue with the idea of autonomy used in Beauchamp and Childress. According to a summary of these critiques written by feminist philosopher Carolyn Ells, a common critique is that the concept of persons implied by Beauchamp and Childress' conception of autonomy is false because it overemphasizes independence and rationality. Further, feminists argue that the effects of Beauchamp and Childress' conception of autonomy are pernicious in that those effects are harmful to medical theory and society because they narrow our concept of persons and the moral life. These critiques are damaging and worthy of note because, in using

Beauchamp and Childress' conception of autonomy, one should be aware that this conception of autonomy is only one among many and may not be as "common" as Beauchamp and Childress argue. Theirs is the dominant conception of autonomy, and so it is theirs to which I apply my analysis, though not without reservation. It is outside the scope of this project to pursue these concerns in detail. I leave that debate for dedicated spaces intended to give it proper attention. I will, however, sketch some alternative conceptions of autonomy to see how they differ in important ways from Beauchamp and Childress' conception.

Conceptions of autonomy vary within moral and political philosophy. Instead of noting the variations in such a broad spectrum of literature, it is beneficial to examine competing notions within biomedical ethics. Joel Feinberg's excellent work *Harm to Self* identifies four different conceptions of autonomy, combinations of which may be used to form robust conceptions of autonomy. They are the capacity for self-government, the actual condition of self government, an ideal of character derived from the idea of self government, and the "sovereign authority" to govern oneself (Feinberg 28). These categories of autonomy may have many particular variant conceptions of autonomy that fall within them, and it should be noted that Feinberg does not exclude the possibility that other categories may exist.

Autonomy as the capacity for self government refers to the idea that one is competent to govern oneself. This concept of autonomy depends in part upon the capability to determine one's future, which we possess in varying degrees from person to person. The variance of capability is influenced by many things, including but not limited to our ability to reason, to understand, and our personal values. Competence to

govern oneself is determined in part by the circumstance under consideration; while an Alzheimer's patient is entirely competent to decide what television show they would like to watch or whether they would like to go for a walk, their competence to decide who should have power of attorney over their estate is questionable and a matter of intense scrutiny. This aspect of autonomy is widely recognized within biomedical ethics and is an explicit part of Beauchamp and Childress' conception, which incorporates the first, second, and fourth conceptions of autonomy discussed by Feinberg.

As the actual condition of self government, autonomy refers to being in the state of affairs where one can govern oneself. A person could have the capacity to self-govern and the right to do so, but still lack the condition to self-govern, as in situations where one person is slave to another (Feinberg 31). We aspire to autonomy as an ideal because it is never perfect; there are always outside restrictions on the condition. This aspect of autonomy is recognized by Beauchamp and Childress and commonly within biomedical ethics because it is widely recognized that there are conditions under which one may be unable to exercise their capacity for autonomy, e.g. when one is denied a procedure because of insurance, or when an adult makes decisions for a child.

Feinberg defines autonomy as an ideal of character to strive for. It is not the complete moral ideal, but is part of what would make an exemplary moral character. Feinberg notes that autonomy cannot be the complete moral ideal of character because autonomy can exist as part of one's moral character along with serious moral failings. Importantly, Feinberg argues that as a person is partly made up of experiences as a social animal, discussing autonomy in such an abstract, individualistic sense threatens to undermine the idea that one never exists outside of an ongoing community of one sort or

another. The ideal is "that of an authentic individual whose self-determination is as complete as is consistent with the requirement that he is, of course, a member of a community" (Feinberg 47). This conception of autonomy is very different than Beauchamp and Childress' conception because of both the virtue theoretical aspects and because of the explicit recognition of the autonomous individual as a member of a community.

As sovereign authority, autonomy is conceived as a right to self-determination. This is often the sense of autonomy used by biomedical ethicists in discussions of obligation to patients. The obligation to respect patient autonomy is a recognition of the patient as sovereign authority of their body and life plan. This is the kind of autonomy advocated by Beauchamp and Childress, though elements between the different conceptions of autonomy often overlap. Even a conception that focuses on people and the right to self-determination in biomedical ethics must allow for considerations of patient competency and, at times, justified paternalistic overriding of that autonomy.

In another alternative conception of autonomy, Jameton and Pierce advocate a notion of autonomy that recognizes that humanity is a part of a wider moral community, including the surrounding biotic community. They write, "With a shift in thinking, personal choice can be understood in the context of belonging to and feeling responsible to the biological as well as the human community" (Jameton and Pierce 2004, 119). When thinking about autonomy this way, it is easy to see how our obligations to the community limit our autonomy as they do in any community, but with greater regard for the environment because all creatures are considered "members of a moral community who share common ends" (Jameton and Pierce 2004, 119). Under this view, autonomy

may be restricted due to obligations owed to each other rather than merely through coercive policy measures—though it should be recognized that owing obligations to each other may itself give rise to coercive policies. This sounds a bit more promising, and will be revisited after an evaluation of more common notions of autonomy.

Nonetheless, autonomy enjoys a prominent place in bioethical thought. One's autonomy is diminished if one is unable to make decisions for oneself. Children, the mentally challenged, and people with Alzheimer's or dementia are examples (Beauchamp and Childress 100-105).[4] This diminishment of autonomy may also be a result the patient's volition, as when one signs over power of attorney to some close, trusted individual. At other times, however, the diminishment of autonomy is a result of paternalistic intervention by the clinician because the clinician may deem the patient incompetent. Usually, the justification for paternalistic intervention is based upon the prevention of harm (nonmaleficence), as in a case where the physician is convinced someone is trying to harm themselves or another, or in the name of benefitting the patient (beneficence), where a patient is not making decisions in their best interest. These are hotly debated topics. But for present purposes it is enough to be aware of the debate. The real point is to illustrate the importance of autonomy in medical ethics in the West compared to other moral and ethical traditions.

The implementation of a vision of sustainable medicine requires good justification if it is restrictive of autonomy. The justifications must be stronger, however, if autonomy

[4] There is significant debate over when each of these classes of people may be considered competent and capable of informed consent in bioethics literature. Each has exceptions and borderline cases, with strategies to determine competency—a precursor to determining whether someone can act autonomously on Beauchamp & Childress' definition.

is a dominant part of one's moral tradition. Sustainable medicine may violate the autonomy of an individual who does not consent to sustainable medicine of their own volition while competent. For example, someone may wish to have a bacterial infection treated with antibiotics so that it heals more quickly, but because such treatment encourages antibiotic resistance, doing so would be environmentally irresponsible if the wound would heal well without the use of antibiotics. Sustainable medicine is properly understood as a public health measure, affecting millions (or, if global, billions) of people. Recall that WHO defines public health as "all organized measures (whether public or private) to prevent disease, promote health, and prolong life among the population as a whole" (WHO 2014).

One promising way to think about issues at the intersection of public health and autonomy is suggested by David Buchanan. He argues that public health should seek to expand/enhance individual autonomy by improving population health instead of seeking to diminish autonomy, which often occurs with legislation prohibiting actions. In order to accomplish this, Buchanan argues that public health should focus on clarifying principles of justice rather than focusing on the justification of paternalistic interventions. In clarifying principles of justice, appeals to concepts of justice may be made instead of justifying paternalistic public health policy. Through discourse over ideals of justice, we may determine what capabilities citizens value that they would like public health to strive for—essentially, showing what the will of the people would be, and informing

subsequent public health policy.[5] The appeals to justice that we could make after such discourse would be verifiably in line with public values, at least in theory. As a reason against justifications for coercive public health measure, Buchanan argues that empirically, there is good reason to suggest that public health efforts would be best spent expanding individual autonomy to improve population health by enhancing public discourse concerning public health issues and how to address them. For example, when implementing a public health measure, resistance and noncompliance is often the result of paternalistic implementation. But in terms of justifying public health measures like sustainable medicine, if we can find ways to expand individual autonomy through implementation, then resistance and noncompliance will be lessened, the measures will achieve greater success, and public health will improve (Buchanan 2008). To achieve this goal, Buchanan recommends that public health open public discussions aimed at "clarifying the role and character of justice in America today" (Buchanan 18).

Buchanan goes on to discuss the justifications for public health measures, first identifying three common lines of argument in favor of paternalistic interventions; they are "appeals to voluntary and informed consent, weak paternalism, and utilitarianism" (Buchanan 15). Paternalism is defined by Beauchamp and Childress as "the intentional overriding of one person's preferences or actions by another person, where the person who overrides justifies this action by appeal to the goal of benefitting or of preventing or mitigating harm to the person whose preferences or actions are overridden" (Beauchamp and Childress 208). One obvious issue arises when applying this definition of paternalism

[5] See Figure 1 for the list Buchanan includes of valued capabilities. All figures and tables are located in the Appendix..

to cases of sustainable medicine. In particular, the definition involves an act of paternalism with respect to an individual, not an aggregate of individuals like an entire population. Sustainable medicine, however, is heavily concerned with populations. In the case of sustainable medicine, an institution, government, or other authority may enact sustainable medicine or some other public health measure paternalistically if they act in the best interest of the population because of the effects of that particular public health measure on an individual. We may define paternalism toward a population similarly to paternalism to an individual; paternalism toward a population is the intentional overriding of some individual preferences within the population by another individual or governing body; where the individual or governing body who overrides preference justifies this action by appeal to the goal of benefitting or of preventing or mitigating harm to the target population with at least some individuals whose preferences are overridden. We may understand a population's preference to be a preference held by the majority of the population in question after a reasoned consideration of available options.

Paternalism may be divided into two camps: soft (or as Buchanan puts it, weak) paternalism and hard paternalism. Soft paternalism is rather uncontroversial compared to hard paternalism. Beauchamp and Childress write, "In soft paternalism, an agent intervenes in the life of another person on grounds of beneficence or nonmaleficence with the goal of preventing substantially nonvoluntary conduct. Substantially nonvoluntary actions include cases such as poorly informed consent or refusal, severe depression… and addiction that prevents free choice and action" (Beauchamp and Childress 209-210). By contrast, "in hard paternalism the intended beneficiary does not accept the values used to define his or her own best interests. Hard (or strong) paternalism reflects the benefactor's

conception of best interests and may ban, prescribe, or regulate conduct in ways that manipulate individuals' actions to secure the benefactor's intended result" (Beauchamp and Childress 210). If implemented, sustainable medicine may manifest as a case of hard paternalism toward the current generation. Because many people reject the value of sustainability, their consent will not be given. Sustainability measures running contrary to the consent or values of any individual, and especially many individuals, require justification. What follows is an examination of three justifications that, according to Buchanan, are common justifications for public health measures. I discuss each as a justification for sustainable medicine, understanding sustainable medicine as a public health measure. The aim is to examine Buchanan's ideas for enhancing autonomy in the application of public health measures and evaluate their applicability to sustainable medicine since, as a public health measure, sustainable medicine may be implemented paternalistically, or possibly, nonpaternalistically.

The first justification for public health intervention that Buchanan lists is that public health intervention is justified when individuals provide voluntary, uncoerced, informed consent for some treatment (Buchanan 16). Paternalism is not necessary in such a case at all, so there is no conflict with autonomy such as we find in other justifications for public health measures. In cases of behavior that poses a health risk, medical professionals often feel justified in intervening. This may occur some of the time for procedures done within a system of sustainable medicine. However, such a scenario is unlikely to work to implement any vision of sustainable medicine because of how pervasive and far reaching the changes necessary to make medicine sustainable are.

Buchanan writes, "On another front, public health professionals have, in general, implicitly assumed a form of weak paternalism. Weak paternalists take the position that interventions to prevent people from harming themselves are justified when there is a defect in their decision making that leads them to engage in self-harming activity" (in contrast to strong paternalists, who maintain that interfering is justified even when the decision to participate in unhealthy behavior is fully voluntary and totally unimpaired) (Buchanan 17). Such interventions do involve interfering with an individual's autonomy and are often justified on utilitarian grounds. Expanding on this idea,

> Public health has long been associated with the utilitarian school of moral philosophy. Utilitarianism is essentially consequentialist in analyzing issues, holding that the most ethically reasonable course of action is that which produces the greatest good for the greatest number. Thus, the most common criticism of utilitarianism is that the ends are used to justify the means. This school of thought frequently leads into protracted debates about the apparent costs and benefits of an intervention (e.g., does smoking cessation truly save the government money?) (Buchanan 17).

Sustainable medicine would be good for the environment and, by virtue of ecological interdependencies, good for humans as well. It would not be good for every individual, however. Sustainable medicine may prohibit some actions deemed unsustainable, and so prevent someone from receiving some forms of care that they would otherwise receive. Importantly, sustainable medicine would still be in the best interest of most people despite unfortunate individual consequences; the case for sustainable medicine becomes stronger if we consider what is also in the interest of future generations.

Given strong arguments against paternalistic intervention that may diminish autonomy we should consider options that are autonomy enhancing. Understood properly, Buchanan argues that public health measures may be autonomy enhancing rather than autonomy diminishing. He recognizes the need for a public dialogue based upon mutual responsibility toward the goal of building consensus on public health issues. Autonomy enhancement is possible for the majority of people through measures aimed at decreasing social inequalities, though admittedly there would be winners and losers in such a scenario over the short-term. In the long-term, research suggests that the reduction of inequality may be beneficial to everyone, even those who initially sacrifice so that inequalities may be reduced (Woodward and Kawachi 2000). If the reduction of inequality is at least consistent with the ability to pursue opportunities that citizens value, then reducing inequality is not only a valuable public health measure but a wish of the people that may be implemented nonpaternalistically. To see why, we must better understand how inequality, health, and autonomy relate to one another within society.

Research strongly supports the view that a reduction in social inequality results in better health outcomes for the population in which the inequality was reduced regardless of whether one is rich or poor (Woodward and Kawachi, 2000; Deaton 2003; Subramanian and Kawachi 2004). Reduced social inequality may also result in a greater range of options for one to choose from, according to Norman Daniels' work on fair equality of opportunity (2001). This again is true whether you are poor or nonpoor. We may wonder whether there is no increase in opportunity because of increased competition for the same opportunities. However, competition for opportunity does not decrease the range of opportunity available. Daniels' account focuses on species-typical functioning,

and argues that if it is absent then many opportunities are unavailable. Loosely speaking, this is a reduction in that individual's autonomy. In support of my claims, current research supports the idea that a reduction of social inequality requires an increase in social mobility (OECD 2010). If increased social equality results in greater social mobility, then as social equality increases, more opportunities (jobs, training, entrepreneurism, etc.) are available; such opportunities are just the sort that species' typical functioning also assures one the chance to pursue, and are the opportunities that Daniels argues requires a decent minimum of care.[6] Social mobility is often defined as a measure of how likely one is "to move up or down the distribution of incomes, earnings, and wealth, comparing people and families relative to one another across time" (*Working America* 139). Furthermore, as Figure 1 illustrates, the reduction of many inequalities is justifiable by the fact that citizens value certain capabilities, many of which are easier to enhance or maintain with decreased inequality (Buchanan 19).

The psychosocial effects of material differences create social stratification and distance between people. While competing for the same resources in an unequal society where the bulk of resources are concentrated in the hands of the few, those without abundant resources develop a lack of trust in one another. A lack of trust exacerbates the other problems created because of inequality by increasing stress, one of the primary risk factors for disease and illness. One is constantly faced with judgment, either because they are poor and looked down upon, or because they are rich and faced with jealousy. One always has to protect their social status and their job, leading to increased stress and

[6] For now it is enough to have just a basic understanding of Daniels' position. It is discussed in greater detail later.

anxiety, all of which are harmful for health and causes of health problems for individuals (Wilkinson and Pickett 2010).

Daniels also argues that social inequalities are not acceptable because they produce health impairments. These health impairments reduce one's ability to capitalize upon the opportunities available to them in society relative to their abilities if they were not impaired at all (Daniels 1981, 1985). The effect on health is not just on the poor. A particularly insightful study testing whether health outcomes were related to poverty or inequality found that low income people living in low inequality areas had better health outcomes than low income people living in high inequality areas. Higher mortality rates were found in areas of higher inequality regardless of income (Lynch et. al. 1998). In another study, Frank J. Elgar concludes that "Income inequality might contribute to short life expectancy and adult mortality in part because of societal differences in trust… Societies with low levels of trust may lack the capacity to create the kind of social supports and connections that promote health and successful aging" (Elgar 2315). Trust is important because a lack of trust may be responsible for increasing stress factors that lead to disease and illness (Elgar 2010, Wilkinson and Pickett 2011). As pertains to sustainable medicine, there is also good evidence to suggest that inequalities also lead to greater environmental degradation, which would also result in worse health outcomes for populations living with social inequity (Boyce, 1994; Baland, Bardhan, and Bowles 2006).

Whether the relationship is merely correlative, or whether inequality has causal effects on health (and other areas) is difficult to measure but matters if inequality is

meaningful as a call to action. Salvatore Babones compiled previous research and data to try and determine whether the relationship could be causal, concluding that

> Change in inequality 1970-1995 is significantly related to change in life expectancy and infant mortality, suggesting a causal relationship, but these correlations are not robust with respect to sample or controls. It can be concluded that there is a strong, consistent, statistically significant, non-artifactual correlation between national income inequality and population health, but though there is some evidence that this relationship is causal, the relative stability of income inequality over time in most countries makes causality difficult to test (Babones 1614).

Babones suggests that further research is necessary to positively determine whether relationships are directly causal or merely correlative, though the consistent correlation does suggest a causal relationship in at least some cases (Babones 2008). Given the strong correlations and some evidence of causality, the links between inequality and health are strong enough to call for action.

One of the most prominent researchers of inequality, Éloi Laurent, discusses five macro-ecological channels or pathways by which inequality affects the environment. They are:

1. Inequality increases the need for environmentally harmful and socially unnecessary economic growth (Laurent 5).
2. Inequality increases the ecological irresponsibility of the richest, within each country and among nations (Laurent 7).

3. Inequality, which affects the health of individuals and groups, diminishes the social-ecological resilience of communities and societies and weakens their collective ability to adapt to accelerating environmental change (Laurent 9).
4. Inequality hinders collective action aimed at preserving natural resources (Laurent 10).
5. Inequality reduces the political acceptability of environmental preoccupations and the ability to offset the potentially socially-regressive effects of environmental policies (Laurent 12).

It is not self-evident that inequality increases the need for environmentally harmful and socially unnecessary economic growth. However, there are complex psychological processes at work that produce this outcome. One effect, sometimes called keeping up with the Joneses, is a psychological phenomenon where we compare how well off we are relative to those around us, and if we do not judge ourselves favorably, we participate in conspicuous consumption to make the comparison more favorable (Boyce and Brown, 2010). There are also economic forces at work; Laurent notes that when wealth is concentrated in a small percentage of the population, the rest of the population requires greater economic development and growth to compensate for the concentration of wealth. When wealth is increasingly concentrated, those not in the top concentration either have less wealth (the have-nots), or require more economic growth to maintain the same level of wealth as they had before wealth concentration increased. Often, this concept is understood as analogous to eating pie; if at time T1 Jerry had 80% of the pie and I had 20%, and at time T2 Jerry had 90% of the pie and I had 10%, then for my slice of the pie to be the same size as it was at T1 the entire pie has to be bigger. Economic growth is

often coupled with greater ecological degradation for a variety of factors, including increasing consumption (Laurent 5).

Concerning the second channel, Laurent writes, "Widening inequality exacerbates the fundamental tendency of capitalist enterprises to maximize profits by externalizing cost at the national and international level and to turn socio-economically deprived areas into "pollution havens" (Laurent 7; Hall 2009, Lepawsky and McNabb 2010). That is, because of inequalities, it is easier to displace environmental degradation onto those poorer because of income and power inequalities.

Wealth concentration and its harms are not confined to countries that have high levels of inequality within their borders. Relative to poorer countries, rich nations are better able to adapt to climate change due to their financial wealth, and have little incentive to curb carbon emissions because of the real or perceived threats to economic growth that measures aimed at decreasing carbon emissions are accused of causing (Laurent 7-8). These concerns have given rise to organizations like the Environmental Justice and Climate Change Initiative, who focus partly on the effects of climate change on poor communities and nations.

The third channel is related to the second (and in a way, all are related). Laurent notes that due to pioneers of the research like Richard Wilkinson and Michael Marmot (and as echoed by Norman Daniels) it is already well accepted that inequality has various negative impacts on physical and mental health. The negative effects on health directly result in an increased sensitivity to, and a decreased ability to recover from, environmental stresses like natural disasters. Health cannot be fully understood outside of its environmental and social contexts (Marmot, 2010). This exacerbates the problem

of climate change and its increased effect on the poor, effectively worsening the unequal burden placed upon the poor due to environmental degradation.

The fourth channel focuses on the ability of a population to enact measures necessary to reverse and prevent environmental harms. Laurent notes that many studies demonstrate how inequality frustrates resource management and disorganizes human communities, creating conditions that must be overcome in order to effectively organize populations to preserve natural resources (Laurent 10, Klooster 2000). That is, inequality results in an inability for the poorer to voice their concerns and to advocate for reforms that represent their interests. Since most of the population of the world is not wealthy, this is a significant issue. If the interests of the wealthy concerning the environment are in conflict with those of the poor at any point, and the poor are more populous than the wealthy but less able to effect political change, then the potential for increased harm rises. The poor, being more numerous, will include a greater number of people adversely affected by environmental harm, and will also be less able to effect legislation necessary to prevent or to enforce the prevention of harm to the environment. Being less able to protect the environment, and less able to protect themselves from the negative health effects of a degraded environment, their health will be affected on a greater scale than the health of their wealthy counterparts.

The fifth channel seems particularly pernicious. Inequality, Laurent argues, is harmful to the process of gaining political acceptability for environmental policy measures when those policy measures are seen to be economically harmful, regardless of whether the measure may be economically beneficial in the long run because of the short term sacrifices entailed. When a population does not perceive that they are doing well,

the short term sacrifices seem unacceptable (Laurent 12). Those not well off may think they are already far enough behind the others in society, and so to ask them for further sacrifices is unacceptable. This may be seen as a related but separate effect of the Joneses phenomenon mentioned earlier.

Decreasing inequalities may enhance autonomy for a population even though some medical practices may be prohibited in order to protect the environment. The poor would, in theory, have greater political power to enact the changes necessary to reduce the burden of environmental degradation on themselves, resulting in better educational and health outcomes. Better health and educational outcomes don't just benefit the poor, either; studies show that when inequality is reduced, both rich and poor benefit over the long term (Marmot 2010, UK National Equality Panel, 2010).

Furthermore, restricting autonomy is not an aim of sustainable medicine; rather, when viewed anthropocentrically, the aim is to reduce the impact of medical practice on the environment for human benefit. Any diminishment of autonomy is unintentional but may, in some circumstances, be necessary for the benefit of humanity. There may be situations where a choice is altogether off limits because the cost of the procedure, practice, or technology is so high. The result is a clear abridgement of autonomy at the level of the individual due to the removal of choice. Implementing sustainable medicine may still be justifiable despite the removal of some choices; furthermore, if there is an overall net gain in autonomy due to inequity correction, then our justifications become stronger. It may be that de-emphasizing autonomy in favor of greater social equality isn't necessary if we understand that a decrease in social inequality results in a greater range of

opportunity for the citizens affected and by extension, results in a net gain of autonomy overall.

Still another option is advocated by Jameton and Pierce. Their discussion is not restricted to patients, but also doctors, and involves the concept of autonomy more generally. They propose redefining autonomy to understand autonomous individuals as "members of a moral community who share common ends. This community needs to expand to place humans within their biotic community" (2004, 119). Considered in isolation—i.e. considering an individual separate from other considerations, it is easy to see that denying someone options for care that may otherwise be available in a nonsustainable health care system is objectionable. But if the individual is understood as part of a moral community that shares common ends, a diminishment of individual autonomy may not only be unobjectionable, but obligatory—a conclusion in conflict with Jameton and Pierce's conception of autonomy. On their conception of autonomy we have a moral obligation to recognize duties to each other and to nature, but they fall short of calling for a diminishment of individual autonomy in order to recognize those duties.

Jameton and Pierce note that an obvious objection arises; many suspect that their concept of autonomy simply disguises coercion instead of really dealing with the idea that coercion is occurring if their model of sustainable medicine is used. Jameton and Pierce reply, noting that both "patients and physicians… are already coerced by prevailing interventionist standards and by the ready availability of heroic 'life-saving' treatments and drugs" (Jameton and Pierce 2004, 119). In essence, they argue that coercion would not increase, or expressed negatively, that autonomy would not decrease using their model of sustainable medicine. That physicians are already coerced has no

bearing on whether physicians may be coerced under their model of sustainable medicine, and coercion may be necessary to remove some environmentally detrimental options from doctors unless we leave doctors in a situation where they are both steward and patient advocate. Doctors as stewards and advocates creates a clear dilemma for physicians that may undermine the physician/patient relationship so vital to providing good health care because patients may wonder whether their doctor is heavily weighing stewardship instead of looking out for their individual interests.

Jameton and Pierce also note the typical resistance of individuals to changes in lifestyle, conservation measures, and voluntary cost reducing measures to health care. According to Jameton and Pierce, all these factors add up, meaning that if their model is enacted there is really no increase in the level of coercion in any case—what we really have is a shift from "forcing expansion to supporting stewardship and modest health-care consumption" (Jameton and Pierce 2004, 119). Their option, however, would not create an increase in autonomy, even if it succeeded in averting increased coercion, and I am not convinced that it succeeds.

What we're really worried about is coercion or an objectionable reduction of autonomy that occurs as a result of sustainable medicine. If coercion or an objectionable reduction occurs, then strong justifications are necessary regardless of whether on their conception of autonomy there is no net increase in coercion. Furthermore, a reduction in the autonomy of patients has a far greater net impact than a reduction in the autonomy of physicians. It is unclear that sustainable medicine, or sustainability in general, may be implemented without legislative measures that will necessarily result in a net reduction of autonomy whether the measures are considered coercive, objectionable, or otherwise.

3.3 Beneficence

The second principle of medical ethics that I will discuss is beneficence. Again, my aim is to determine whether the principle of beneficence is consistent with sustainability and, by extension, sustainable medicine. According to the principle of beneficence, medical professionals are obligated to act for the benefit of their patients. Beauchamp and Childress identify two kinds of beneficence.

They write, "*Positive beneficence* requires agents to provide benefits to others. *Utility* requires that agents balance benefits, risks, and costs to produce the best overall results" (Beauchamp and Childress 197). They note that positive beneficence supports many rules, such as: defend the rights of others; prevent harm to others; remove conditions that will cause harm to others; help persons with disabilities; rescue persons in danger (Beauchamp and Childress 197). Sustainable medicine as I understand it is supported by the principle of positive beneficence because it is intended to prevent harm to others and the removal of conditions that cause harm to others. In making medicine sustainable, harm caused by the practice of medicine contributes to illness (via negatively influencing environmental risk factors) in not only the patients that look to medicine for cures, but also those in developing countries that are most vulnerable to climate change. To practice medicine beneficently, medical professionals should consider not only the level of doctor to patient, but the level of health care as an institution.

Utility, understood as a principle of beneficence, is not identical to the more familiar principle of utility found in classical Utilitarianism. Within the principles of medical ethics, utility may be constrained by any other principle of medical ethics

depending upon the contextual features of a given situation. Classical utilitarianism uses the principle of utility as the overriding principle. While the principle of utility may be used to constrain other principles, as it is used in Beauchamp and Childress, utility is only one principle among many.

Still, within their theory, the principle of beneficence understood as utility requires weighing benefits, risks, and costs to achieve the best results. Admittedly Beauchamp and Childress leave what 'best' might mean as vague, due to the problems in defining such a term. Whatever is 'best' must be determined by the agent and justified independently of justifications for choosing to act according to the principle of beneficence as utility (Beauchamp and Childress 197-198). Use of the principle of beneficence in this special sense to justify sustainable medicine is problematic. Some harm is justified in the form of cost and risk if the good produced is great enough. This claim is ambiguous, however. The claim may mean that cost and risk are evaluated in terms of harm to the environment, or the claim may mean that cost and risk are evaluated in terms of harm to the individual, or in terms of harm to the population. Harm to the environment may be justified to heal a patient, while harm to a population may be justified in the name of public health measures that are ultimately beneficial. Harm to an individual may likewise be justified to heal that particular individual, or when the benefit to the environment or to a population is sufficiently greater than the harm to the patient. Whether or not the harm is worthwhile depends on contextual features. Utility is used to weigh benefits and harms, (including benefits and harms to an individual, the population, or the environment) in order to determine whether an act or class of actions performed produce the best overall results. That the calculation of utility is more complex when

used in the context of sustainable medicine is to be expected because there is a greater number of interests involved.

On an anthropocentric view, it may be easier to act beneficently than it would be under a nonanthropocentric view because there are fewer morally considerable beings. The patient is the primary morally considerable agent in our current medical practice. However, even on a long range anthropocentric view it also seems true that there is an obligation to act beneficently toward future generations. There are many circumstances encountered in medicine where there are conflicting obligations to act beneficently; however, these seemingly conflicting obligations are really just considerations when deciding how to produce the most good, i.e. provide the best possible outcome. Usually, when determining the best possible outcome, medical professionals and policy makers err on the side of present and near future people.[7] Nonetheless, acting too beneficently toward a patient in front of us may actually impinge upon our ability to act beneficently in other ways. This is just the case in triage situations, where spending too many resources on a patient who is not likely to survive seems unjust because the physician cannot act beneficently toward patients who have a better chance at survival. By acting too beneficently toward patients today, we may detract from our ability to act beneficently toward patients in the future.

[7] This is likely tied to human psychology. We are not very good at delaying gratification, and so often sacrifice greater gains in the future in favor of immediate gratification. Cf. Mischel & Ayduk, 2004; Metcalfe & Mischel, 1999.

By now the reader may wonder what the difference is between acting beneficently and acting nonmaleficently. Rules of nonmaleficence differ from rules of beneficence in several important ways. Rules of nonmaleficence are:

1. Negative prohibitions of action.
2. Rules that must be followed impartially.
3. Rules that provide moral reasons for legal prohibitions for certain forms of conduct (Beauchamp and Childress 199).

Rules of beneficence, by contrast, are rules that:

1. Present positive requirements for action.
2. Need not always be followed impartially.
3. Generally do not provide reasons for legal punishment when an agent fails to follow them (Beauchamp and Childress 199).

The difference seems pretty clear. First, rules of beneficence are positive rules, while rules of nonmaleficence are negative rules. Prohibitions of nonmaleficence must be followed impartially, but notice how rules of beneficence need not always be followed impartially. This is a recognition that there are some who we have special relationships with that we would normally benefit over others, and that to do otherwise may be seen as a moral defect on our part. However, Beauchamp and Childress argue that a determinate (impartial) obligation to act beneficently toward some person exists when a "person X has a determinate obligation of beneficence toward a person Y if and only if each of the following conditions is satisfied (assuming that X is aware of the relevant facts) (Beauchamp and Childress 202).

1. Y is at risk of significant loss of or damage to life or health or some other major interest.
2. X's action is necessary (singly or in concert with others) to prevent this loss or damage.
3. X's action (singly or in concert with others) has a very high probability of preventing it.
4. X's action would not present very significant risks, costs, or burdens to X.
5. The benefit that Y can be expected to gain outweighs any harms, costs, or burdens that X is likely to incur (Beauchamp and Childress 202).

The above conditions are used to argue that some situations, like saving a drowning person when one has the ability to swim, are obligatory. It is not likely that these conditions would apply successfully to show that a class of actions pertaining to something like sustainable medicine is obligatory. However, these conditions may apply to some actions required to make medicine sustainable, making those actions determinate obligations according to the principle of beneficence.

Let's examine the broad action of making medicine sustainable to see if it fulfills all of the above criteria. Let Y be future generations, and let X be the current generation. It seems that condition one is fulfilled; if medicine is not made sustainable by the current generation, then there will be significant damage to life or health of some (many) future people. There is a long history of literature dedicated to proving that current environmental harm causes harm to future generations. The actions of our generation are necessary to prevent this loss or damage, so condition two is also met. That is, no one

else may perform this action. The first point of contention seems to come when we consider the third condition.

I do not mean to imply the hyperbolic and untrue conclusion that if medicine is made sustainable that the harm caused by environmental degradation to future generations will be prevented. This is not associated with the problem of harming people who will only potentially exist (the nonidentity problem), discussed in chapter two. Rather, the concern is that even if medicine is made sustainable, if other significant changes are not made to realize sustainability in the present—i.e. from a significant majority of humanity--that harms to future generations will occur despite the best efforts of medical professionals and policy makers to make medicine sustainable. If medical care is made sustainable by itself, it may be true that efforts toward making medicine sustainable will lack the impact necessary to benefit future generations. However, if we argue for sustainability in general and see medicine as a part of that sustainability, we need not worry about the effects of only making medicine sustainable. Sustainable medicine is a part of sustainability more broadly, but if we are to mitigate the effects of climate change and other environmental harms resulting from anthropogenic activity then it is sustainability that is required and not merely sustainable medicine.

But if we look at X's action (the current generation) as in concert with other actions, then the third criterion does seem fulfilled. If the current generation makes medicine sustainable, in concert with other efforts at sustainability, then there is a high probability at preventing more extreme loss and damage due to global climate change than we will already experience. Medicine is one institution in society, so even if it is made sustainable, much work would remain to make the rest of civilization sustainable.

The current generation may make human civilization sustainable if acting in concert as part of a global effort.

The fourth criterion, that X's action would not present very significant risks, costs, or burdens to X, sounds at first glance impossible to meet. To make medicine truly sustainable, there will be a high cost. In terms of development, buildings and equipment must be retrofitted or replaced. Some of this work has already begun. In terms of energy, hospitals must switch to green power sources. If the hospitals own these power sources, then the money spent will decrease as the savings add up over time. For example, take photovoltaic electricity production. The return on investment for solar panels varies widely due to the cost of the panels, annual amount of sunlight, government incentives like tax write-offs, the cost of electricity in a given area, and the efficiency of the solar panel or array. Estimates range between less than ten years to nearly twenty years depending on these factors. However, the return on investment is variable but generally well within the lifespan of the product despite sometimes being a decade or more, and well within the lifespan of many medical institutions like hospitals and offices. The EPA writes that "System developers and investors typically realize their investment objectives within 5 to 8 years after realizing applicable tax incentives, depreciation and other financial benefits" (EPA 2009). Furthermore, according to the National Renewable Energy Laboratory, the energy payback period, or the time that it takes for a photovoltaic cell to produce more energy than it takes to manufacture it, is two years according to a 2004 report (NREL, January 2004). Both the energy investment and the monetary investment yield returns on investment.

On a long term view of sustainability, twenty years is not a very long time. Nothing is more expensive than global climate change. According to Sir Nicholas Stern, global climate change will cause a drop of up to 20 per year in the world's GDP by 2050 (Stern 2006). Another economist, William Nordhaus, finds the costs of climate change to be much lower but also finds that the cost of environmentally friendly policies to be relatively small (Nordhaus 1999). It is worthy to note that Nordhaus discounts future values to arrive at this number, opening his work to the criticism of undervaluing future values by over-discounting future value. Though the burden of change would be borne by the current generation, the cost is justified in two ways. One, the current generation has benefitted from exploiting the environment unsustainably, and so bearing the cost of making life sustainable (or more sustainable) is just desert. Second, the current generation would likely see the results of making society or life more sustainable within their lifespan. Compared to global climate change, the risks are small. The fourth condition is met.

The fifth condition, that the benefit that Y can be expected to gain outweighs any harms, costs, or burdens that X is likely to incur, seems proved by the evidence arguing in favor of satisfying the fourth condition. There is good reason to believe that sustainable medicine will provide great benefit to future generations. A cleaner environment will decrease the severity of environmental risk factors and result in an improvement in public health. To prove that the benefit for future generations outweighs the harms and costs to the current generation would require a lengthy review of the costs, benefits, and discounting issues involved with future generations. Even then, depending on the discounting rate used (if one were used at all), and the calculation of costs and

benefits, the results would still be disputable. Instead, I offer the following less particular, but perhaps clearer line of reasoning.

If medicine is to be made sustainable it will have to change, and it will have to change in some significant ways. These changes will sometimes be painful. A procedure that was once offered may no longer be offered, or may have certain restrictions. But a sustainable medicine is not necessarily a worse medicine. The benefits that future generations receive from sustainability and making medicine sustainable will be felt now to a lesser extent. Even if one is already receiving excellent health care under an unsustainable health care system, there are still significant benefits to sustainable medicine even if the level of care possible under sustainable medicine is not as high as on the current unsustainable system. Quantity of life matters, but so does quality of life. It's worth noting that many will receive an increased lifespan as well as a higher quality of life; in those cases, such as populations in developing nations with poor health care the benefits are obvious. If we truly care about others within the global community, it is difficult to argue that there isn't an obligation to make medicine sustainable.

There are many other ways that the current generation may benefit from sustainable medicine. There are three main categories of benefit: health, economic, and environmental. Lower environmental risk factors for health because of a healthier environment means a healthier population. A healthier population means a better quality of life, and perhaps fewer obstacles to overcome in the pursuit of one's goals. A more sustainable medicine means a higher return for health care dollars spent because those dollars will be less likely to contribute to disease causing factors, resulting in funds that may be used for a variety of other goods and services we need or want; particularly those

things not contributing to conspicuous consumption, but that are of some benefit to society, or at least not harmful to society.

It is a different kind of medicine, a different way of caring for the sick. Part of this is accomplished by lowering environmental risk factors for illness. Some of it will rely on technological innovation to make medicine more sustainable. I am here reminded of Callahan's refrain of living within our biological limits and taking a critical eye of technology and its use. But if the benefits of sustainable medicine can be reaped by the current generation, then surely it is a small cost compared to the benefit that future generations will enjoy. By meeting all five criteria, enacting sustainable medicine is arguably obligatory according to the principle of beneficence.

3.4 Nonmaleficence

Nonmaleficence is sometimes seen as the overriding principle of medical ethics. Nonmaleficence differs from beneficence because while beneficence requires helping others, nonmaleficence requires one to refrain from intentional harm to others. Beauchamp and Childress recognize that while nonmaleficence often overrides other principles, in some cases nonmaleficence may be outweighed by other considerations like beneficence (149-151). This occurs in cases where a patient is put at risk through surgery in order to cure them, or where public health measures are enacted despite the costs to society. In both cases, the benefits outweigh the cost. Sustainable medicine is arguably a public health measure because it is meant to benefit the public as a while rather than any particular individual. The point of implementing sustainable medicine is to mitigate and

eliminate, wherever possible, the contributions that medicine makes to environmental degradation because of the direct effects of environmental degradation on human health.

When considering harm, however, an obvious problem arises. A good definition to aid in our analysis of harm is to understand harm to a population to mean a loss of utility for that population. While nonmaleficence requires medical professionals to avoid causing harm, in avoiding causing harm to the population (by practicing medicine sustainably) they may cause harm to some individuals. At the level of a practicing physician, this is avoidable because responsibility may be shifted to the level of policy/law makers. Physicians must act within the boundaries of law, so any policy requiring certain actions from physicians or any policy prohibiting some actions effectively frees the practicing physician from responsibility for harm caused by following policy. It is my position that doctors should not be put into the position of violating the principle of nonmaleficence by the implementation of sustainable medicine. Any other position risks the consequence of causing damage to the physician/patient relationship, which is built upon trust. If a patient must wonder whether their doctor is worried more about rationing resources or saving the environment, then the physician/patient relationship is damaged and the best care possible (all things considered) cannot be given.

Though the tension between the principle of nonmaleficence and sustainable medicine may be solved, the question of whether the principle of nonmaleficence might be consistent with a theory of sustainable medicine remains. Beauchamp and Childress note that the principle of nonmaleficence supports many specific rules, citing the following for examples:

1. Do not kill.
2. Do not cause pain or suffering.
3. Do not incapacitate.
4. Do not cause offense.
5. Do not deprive others of the goods of life (Beauchamp and Childress 153).

Careful readers will note the obvious tension among the rules. The rules, as well as the principle of nonmaleficence (and the other principles of biomedical ethics) are prima facie instead of absolute. The agent's discretion decides what rule is primary at any given time based upon context. Furthermore, the obligation to not cause harm includes obligations to not "impose *risks* of harm" (Beauchamp and Childress 153). This last part is essential to a justification of sustainable medicine using the principles of biomedical ethics, because practicing medicine unsustainably arguably imposes risks of harm on the public through the exacerbation of environmental risk factors for health.

The fifth rule listed by Beauchamp and Childress is the most worrisome to me. Whether nonmaleficence is consistent with sustainability in general depends on what conception one has concerning the goods of life. The same is true for sustainable medicine, just in more particular ways. It would be foolish to hazard a definition when philosophers have pondered what the 'good' is or what the 'good life' is for thousands of years. Instead, I propose a work-around. If doctors are not responsible for withholding care as a matter of policy, then they cannot be responsible for depriving one of the goods of life, because offering such goods is not within the power of the doctor to begin with. Perhaps this proposal is more than just a workaround, because one may argue that doctors really are responsible for harms despite the prohibitions of policy. At the very least, any

practitioner during a transitionary period will know of treatments that were once available that now are not; or treatments that exist, but which aren't permitted due to issues with using the treatment sustainably. If we grant that doctors have such responsibility, then their ability to offer some treatments must be curtailed; otherwise, they are obligated according to oath to find ways to offer whatever treatments they can. Removing their ability to offer some procedures is already routinely done through policy and would not differ greatly in practice from what is already occurring, even though the reasons for the restrictions may be different. A religiously affiliated hospital may decide to only offer procedures consistent with their religious beliefs, while some procedures are banned by federal or state mandate. Physicians already operate within the confines of beliefs, law, and contextual considerations like ability to pay or available equipment. Sustainable medicine, in this regard, differs in the reasons for restriction, but is not especially responsible for the introduction of restrictions per se.

3.5 Justice

There is much discussion of justice in biomedical ethics, which falls into two categories. The first, distributive justice, is concerned with connecting "properties of persons with morally justifiable distributions of benefits and burdens" (Beauchamp and Childress 244). The second is justice as fairness, entitlement, or desert. Fairness, entitlement, and desert are not equivalent in their meaning. This second sense of justice is a broad category that deals with justice largely outside of the concerns of distributive justice (Beauchamp and Childress 241). Note that in this discussion of justice we are not

concerned with how to justly implement sustainable medicine; rather, our concern is merely whether particular conceptions of justice are consistent with a vision of sustainable medicine. There are five kinds of theories of distributive justice identified by Beauchamp and Childress: utilitarian, libertarian, communitarian, egalitarian, and cosmopolitan (244). Not all are relevant to sustainable medicine, and at least one relevant to sustainable medicine, intergenerational justice, is not discussed by Beauchamp and Childress. I will discuss only those that are compatible with sustainable medicine insofar as sustainable medicine is consistent with particular conceptions of justice. Simply put, I am interested in conceptions of justice according to which sustainable medicine can be just. My purpose is not to give a complete discussion of each kind of justice as applies to sustainable medicine—such a project is too lengthy and deserves many volumes. Rather, my purpose is to evaluate whether sustainable medicine is consistent with some particular conceptions of justice that I see as most promising for a vision of sustainable medicine.

Among those conceptions of justice that Beauchamp and Childress discuss that I will not thoroughly consider here are libertarian, utilitarian, and cosmopolitan. I do not discuss libertarian theories of justice because libertarianism seems at odds with the ends of sustainability. Sustainability requires limiting some freedoms in order to meet the goals of whatever conception of sustainability under consideration. A libertarian theory of sustainability would probably require a voluntary model of sustainability—an idea that I find untenable given our unwillingness or inability to voluntarily already do so. A utilitarian theory of justice holds some promise for a vision of sustainable medicine. I reject considering utilitarian theories of justice, since they are not complete; while we are

worried about consequences in sustainability, consequences are not the only factor determining the rightness of an action. Furthermore, it is unclear how to calculate utility with regard to future generations because I cannot anticipate the values of future generations. What seems to have social utility from my current vantage point may not have any social utility for a remotely future generation.

Cosmopolitan theories of justice share many similarities to communitarian and egalitarian theories of justice, and are global in scope. Beauchamp and Childress write that cosmopolitan theories, "take as [their] starting point large and usually catastrophic social conditions—in particular famine, poverty, and epidemic disease. The theory then attempts to delineate which obligations extend across national borders to address these problems. The obligations advanced in the theory are similar to those traditionally found in moral and political theory, but globalized" (2009, 264). This sounds promising at first glance, but the cosmopolitan requirements of other nations to solve problems of justice across national borders requires either giving up some national sovereignty or common cross-national institutions acting autonomously from within different nations. This seems unlikely both from a historical analysis and the current political climate.

Communitarian theories of justice focus on an encumbered concept of the self instead of an atomic self, i.e. they often show the individual as having responsibility to the community, and the community having responsibility to the individual rather than the libertarian view that the individual is only responsible for him/herself. There is little talk of rights or contracts, and principles of justice are regarded as pluralistic. Each community may have a different conception of the good, and so the standards of conduct that an individual should live by are derived from the community. One prominent

example of communitarian health care is that of Ezekiel Emanuel, who argues in favor of community health providers. The health provided is determined by the community and is oriented toward the social goals of each particular community. This is done through deliberative democratic processes within the community and made into health care policy that varies from community to community or from like-minded groups of communities to other groups of communities (Beauchamp and Childress 246-247; Emanuel 2008). A sustainable medicine, should one arise, would find justification if a particular community sought after sustainable medicine as a goal. The problem that remains for communitarian theories based on democratic processes is that sustainability could fail whenever a community or group of communities choose, through democratic processes, medical options that are not sustainable. For communitarian theories to work as a basis for sustainable medicine, there must be some way to either guarantee or to make it extremely likely that communities will choose options for medicine that are sustainable. We might start by recognizing obligations to each other and to future generations as a way to show how people are obligated to choose sustainable practices, giving justification to laws enforcing sustainability.

Avner de-Shalit's seminal work *Why Posterity Matters: Environmental policies and future generations* outlines a communitarian theory of intergenerational justice. De-Shalit reconceptualizes our common idea of a community to include future generations, i.e. a transgenerational community. As members of a community, we have positive and negative obligations toward each other. These obligations mean that "we should consider them when deciding on environmental policies; we should not overburden them; furthermore, we should supply them with goods, especially those goods that we believe

are and will be necessary to cope with the challenges of life, as well as other, more non-essential goods (de-Shalit 13).

Any person belongs to many different communities, some of those being national, cultural, familial, vocational, religions, class, and the like. Regardless, we may consider a person part of our transgenerational community if we share certain things in common with them. These, de-Shalit argues, are cultural interaction and moral similarity. The definition of moral similarity is rather intuitive; moral similarity exists between members of a group whenever they share particular attitudes pertaining to moral and political ideas, values, and norms (de-Shalit 28). Note that moral similarity is only likely to continue for near future generations, because generations far into the future are far less likely to share the same political ideas, norms, values, etc. Remotely future generations are, according to de-Shalit, relevantly different because it is difficult to share the commonalities with that we share with near future generations. As a result, our obligations to remotely future generations are different. Our obligations to remotely future generations are mostly negative obligations based on humanity instead of justice, because with regard to remotely future generations our obligations stemming from membership in our transgenerational community do not apply. Remotely future generations are still morally considerable, however, because they are still people, i.e. our obligations to them stem from their humanity and not from justice. Essentially, this means that we are obligated to avoid causing harm to future generations and attempt to prevent harms, but no more. De-Shalit's theory of justice seems like a very consistent, natural fit for sustainability in general as well as sustainable medicine.

One difference between general sustainability and de-Shalit's version centers on reciprocity. For de-Shalit, obligations to one another are reciprocal—I can expect members of my community to recognize their obligations to me while I recognize my obligations to them. With regard to future generations, I cannot expect reciprocity (de-Shalit 95). I may fulfill my obligations to future generations but will never see a return. However, if we consider that we've already gotten the return from past generations, then we may yet have obligations to future generations based upon reciprocity, at least for near future generations. Having benefitted from the actions of the past generation of our community, we have already received our benefit and are obligated to reciprocate by benefitting future generations (de-Shalit 95-98). My obligations to remotely future generations are much less certain, however, because there is less of a direct connection to my community. The same relationship does not exist to remotely future generations. This is part of why my obligations to remotely future generations are mostly negative obligations based on humanity, rather than positive obligations based on justice. I shouldn't harm future generations, but it is unclear on de-Shalit's view what my other obligations might be. Sustainability may require positive obligations to future generations in some cases, making de-Shalit's view a problematic fit for sustainability, especially in cases where we feel that avoiding harm to future generations is inadequate. A ready example of a positive obligation for a near future generation is saving for our children's college fund. For a remote future generation, we may have obligations to make positive steps in researching green energy so that energy options exist for remote future generations before fossil fuel use makes the planet uninhabitable (Hansen et. al. 2013).

In a different vein of thought, egalitarian theories of justice argue in favor of an equal distribution of some goods. Theories tend to differ on the criteria that determine what an equal distribution might be. The most influential egalitarian theory of justice is that of John Rawls. However, the most influential egalitarian theory of justice as applied to medicine is Norman Daniels', who takes Rawls' theory of distributive justice and extends it to problems of distribution in health care. Daniels focuses on fair equality of opportunity, where the distribution of health care goods should be arranged so that each person may avail themselves of the normal range of opportunities available to them in their society (Daniels 1985, Beauchamp and Childress 248). Justification for sustainable medicine might be found from within Daniels' theory insofar as fair equality of opportunity may be impinged if medicine contributes to environmental degradation, as environmental degradation is linked to various health issues. Furthermore, environmental degradation is worse in socio-economically poor areas, where residents already find a reduced range of opportunities even before health problems arise.

Still, Daniels focuses on present people, not future people. It is easy enough to extend Daniels' theory out to include future generations if we synthesize it with the idea of a transgenerational community like de Shalit's; we end up with an account of intergenerational fair equality of opportunity, where the distribution of health care goods should be arranged so that all people, present and future, may avail themselves of the normal range of opportunities available to them in their society. What those opportunities are, and how that affects sustainable medicine, is a matter worthy of detailed discussion. The next chapter focuses on issues at the intersection of sustainable medicine and how to go about delineating sustainable from unsustainable care, including

a further examination of Daniels' idea and a presentation of a vision of sustainable medicine.

CHAPTER IV

4.1 GLOBAL SUSTAINABLE MEDICINE

In order to continue our discussion of Daniels' ideas of equality of opportunity and a decent basic minimum within the confines of sustainability, it will be useful to define just what kind of sustainable medicine I propose so that we may determine whether an idea like Daniels' is consistent with the vision of sustainability at work. In chapter two, I regarded Nolt's definition of sustainability as a workable theory of sustainability, with one reservation; the problem of defining what counts as adequate care within the confines of sustainability is a particularly worrisome detail. My reason for choosing Nolt's schematic definition of sustainability extends beyond practical reasons to those listed as its virtues in chapter one, among those being the ways in which it avoids the criticisms of many other theories of sustainability while maintaining applicability. The issue of defining a notion of adequacy can no longer be avoided if I am to use Nolt's schematic, however, because the definition of adequacy within his schematic definition of sustainability raises questions concerning justice and resource distribution. Section 4.2 is dedicated to defining sustainable health care. In section 4.3, I outline why there is a baseline of care that adequate health care cannot fall below based on the equality of opportunity account of health care developed by Norman Daniels. In section 4.4 I suggest options for dealing with desired levels of care and the tension between those desired levels and limited resources coupled with burgeoning populations.

4.2 Defining Sustainable Medicine

Recall that Nolt's version of sustainability allows for the consideration of particular values within a model of sustainability:

A global generation G achieves sustainability of value V if and only if:

1. V is already adequate or G raises it to adequacy, and
2. G does not impair the ability of its posterity to maintain the adequacy of V.

Adapted for healthcare as value V:

The present generation achieves sustainable healthcare if and only if:

3. Healthcare needs are already adequately satisfied or the global generation brings about their adequate satisfaction, and
4. The global generation does not impair the ability of its posterity to adequately satisfy healthcare needs.

This adaptation of Nolt's definition differs from Callahan's notion of meeting health care needs:

> 1. Minimum individual adequacy will be achieved when most people have a statistically high probability of receiving over their lifetime the kind and amount of health care they need to survive and to function at the levels common in their society (1999 203-206).

Note that Callahan's definition of minimum individual adequacy neatly avoids the problem of whether people actually access health care when it is available. All that is

required is a statistically high probability, and that may be all that can be realistically achieved. However, as I noted in chapter three, the effects of inequality often result in those who are less well off in society not availing themselves of care that is available. Minimum individual adequacy is not enough to actually push people toward availing themselves of health care to function at levels common in their society. With this in mind, I turn to fleshing out my own vision of adequate care.

It is easy to see but also to underestimate the importance of how my definition posits sustaining a particular value—the value of health care. Instead of uncertainly trying to predict what resources should be sustained for the future, we can sustain the value of health care because for the foreseeable future, health care needs will remain even if particular methods and practices may change. Hinging the definition of sustainability on values instead of objects is advantageous because some values are resistant to technological and societal change. Healthcare is one such value—no matter what society looks like or what technology we have, for the foreseeable future healthcare will remain something we value. However, just how that value must be sustained will change depending on contextual considerations such as current levels of care, population, resources, money, infrastructure, and technology.

By ensuring that "healthcare needs are already adequately satisfied or the present generation brings healthcare needs to adequacy," my theory stresses the impetus to bring a baseline of health care for all people. In some places of the world, the first step will be in bringing clean drinking water and sanitation to the area. In the industrialized world, health problems associated with unhealthy lifestyles must first be addressed by public

health campaigns, many of which are already underway, e.g. campaigns against smoking and campaigns in favor of exercise and healthy eating. Studies show that increasing access to preventative care, increasing activity, tobacco cessation, and eating healthy are major contributors to public health outside of genetics and increased risk factors due to inequalities (Halpin et. al. 2010). But even if we fix health problems related to lifestyles, more needs done to make health care sustainable. For example, someone who is healthy most of their life may use just as many medical resources as one who is leading an unhealthy lifestyle. A runner may have great cardiovascular health but need two knee replacements and assisted living due to their overall health and longevity. Within the context of global sustainable health care, it will be up to us to find alternatives to the use of some health care practices and to curb or entirely outlaw the use or implementation of many other health care practices because the practices are either economically, socially, or environmentally unsustainable.

The first criterion listed for achieving sustainable health care in my vision of sustainability recognizes a positive obligation for health care services for the global generation, creating problems for sustainability because of the increased consumption of medical goods and services required for global sustainable health care. Sustainability constrains adequacy through the second criterion because the second criterion is a negative obligation—the global generation may not impair the ability of its posterity adequately to satisfy health care needs. Exactly what services and procedures may be offered depend on a wide variety of contextual factors, such as available resources, cultural factors such as beliefs, values, and tradition, technological availability, and countless others. Since the information required to sustainably meet standards of

adequate care is best known at the local levels, I will instead develop my vision of sustainable health care so that it may be applied to many different circumstances.

Included in this definition is the idea that health care needs for the global generation must be adequately satisfied, meaning that in some instances, health care standards will have to rise to adequacy, while in other places excessive forms of care preventing the ability for the global generation to meet of health care needs adequately (due to resource depletion or a distribution of resources so unequal that luxury is met in one place while basic needs are not met in another) will need to decrease to sustainable levels, or if no level is sustainable, disappear entirely. Other obstacles that hinder the provision of adequate health care will also need to be overcome, including the cessation and avoidance of war, political corruption, poverty, and inequality. The global generation is the proper unit to achieve sustainable health care because if health care is unsustainable in one particular place but not others, due to the increasingly globalized social and economic systems the entire system of sustainable health care would be jeopardized over the long term. In the short term the system would not be undermined because resource depletion is a consequence of long term unsustainable activity. As a global problem in an increasingly globalized world, health care must reach global sustainability in order to be sustainable at all.

The reasons are not obvious, but one reason is particularly difficult to analyze. In a global market individuals may go to other countries to receive treatment that they could not receive in their home country, or they may elect to have treatment in another country due to higher costs at home. In biomedical ethics, this is the problem of medical tourism. Medical tourism is defined as "the intentional pursuit of non-emergency medical

treatment outside of a patient's home country that is likely to include a pre or post-operative stay abroad during which some tourist activities may be undertaken" (Johnson 2010, 3).

The flow of medical tourists usually comes from the Global North, i.e. developed nations, to the Global South, i.e. undeveloped nations. Rory Johnston et. al. reveal in a recent survey of the effects of medical tourism that "hospitals positioning themselves as leading medical tourism destinations are largely found within lower and middle income countries (LMICs), where favourable [sic] exchange rates have given them a competitive advantage in attracting price-conscious international patients (Johnston 2). Tourists are seeking lower cost care that is highly accessible compared to their country of departure (Johnston 1).

Johnston also points out that there are few regulations of medical tourism, further exacerbating concerns about not only the quality of care, but whether that care has an adverse environmental impact. The system supporting medical tourism is a largely unregulated, for profit system where the majority of hospitals attracting medical tourists are not focused on primary care of the local population. Critics of medical tourism argue that because competition for medical tourists is profit driven, medical tourism commodifies health care and thereby threatens the "equitable delivery of health care worldwide" (Johnston 2). Tourists have to travel before and after care, usually via air, exacerbating contributions to pollution via air travel. In some countries, like India, medical tourism is being encouraged and government funds are being used to build new private for-profit facilities friendly to medical tourists. Subsidies have included providing public land, corporate tax cuts, and the removal of tariffs for the import of

medical equipment (Johnston 5). These public funds, critics argue, are not being used for the benefit of the public and serve to worsen problems of inequality within the destination nations. The effects of inequality are discussed in chapter three.

With regard to resource consumption, medical tourism poses different problems. Just as public funds should be for public use, commonly held resources within a society should be available for those within that society when they are needed. We can easily imagine a scenario where a booming medical tourism industry exacerbates health care gaps between the rich and poor by increasing the demand for some resources and services so that some resources and services are priced out of the range that poor members of a society can afford, despite need and despite the very real possibility that if demand had not been created for those resources and services through medical tourism, they may be affordable. If the reduction of inequality is key to sustainability, then the situation just described is highly objectionable. More research is necessary to determine whether the above scenario is accurate, however, because currently no hard data exists on the matter to the best of my knowledge.

Medical tourism is already accused of exacerbating health care inequalities in other ways. Johnston writes, "The higher wages and advanced technolologies available at facilities offering medical tourism act as a lure for health care providers working in more modest facilities. Because medical tourism facilities are primarily urban, this process also hastens the internal migration of health care providers from rural areas into cities, thereby enhancing rural deprivation" (Johnston 8). Medical tourism frustrates attempts to distribute of health care in ways that would allow for the global generation to receive adequate health care. The solution I recommend is that medical tourism should

be disallowed, with few exceptions. Though prohibiting medical tourism would decrease individual autonomy, those in rural areas in many developing countries would see an overall enhancement of autonomy as choices for medical care become more widely available.

A good definition of sustainability is at least an arguably just definition of sustainability. Nolt's definition is one such definition, as it includes not only intergenerational justice but also intragenerational justice. More importantly, in using the schematic definition of sustainability from Nolt and applying it to the value of health care, the model of sustainability is itself a model of social justice *for that particular value,* e.g., health care. The model of sustainability assures fairness insofar as all people have access to adequate health care relative to my particular definition of health—though it is worthy of note that fairness does not necessarily entail the exact same care, nor even the same level of care if cultural, regional, and economic differences are accounted for.

Adequate health care would be a huge change from our current health care system. In the United States, we have an expansive definition of what counts as a healthcare need. Compared to developing countries, society often counts something as a medical need when in fact the procedure or object in question is a medical luxury. For an example, some medical tests that we regularly perform we have come to think we need, but are actually unnecessary. In a study done concerning unnecessary medical practices in 2012 "The American College of Cardiology is urging heart specialists not to perform routine stress cardiac imaging in asymptomatic patients, and the American College of Radiology is telling radiologists not to run imaging scans on patients suffering from simple headaches" (Rabin 2012, Guest and Cassel 2012). The same study prescribed that

doctors should not "perform annual stress cardiac imaging or advanced non-invasive imaging as part of routine follow-up in asymptomatic patients (ABIM Foundation 2012).

We can now see how we might go about delineating sustainable care from unsustainable care. Under a consideration of global sustainability such as I propose, my model constrains the satisfaction of patient demand for healthcare to cases where the demand does not threaten the structure and health related functions of society and the relevant ecosystems. This will, for example, limit care that is minimally beneficial yet costly (and many other forms of care). But it extends the consideration of cost to include natural capital—i.e. not only the monetary impact of such treatment, but the impact on natural resources and ecosystems as well. In this definition of health, there is recognition that some medical treatments, though beneficial to the individual, are ultimately harmful to the global community e.g., people, ecosystems, etc., broadly considered. Weighed against the harms to the global community then, many more treatments will be unjustifiable. The denial of such a treatment and the decreased health of the individual would, on this view, be *unfortunate* but not *unfair*.

It is unjustifiable to engage in medical practice promoting ecological degradation that will, on balance, create greater health problems for humans either in current generations or future generations. What seems to be excellent, top tier health care may heal some but increase risk factors for others.

Part of this is because the proper spatiotemporal unit of sustainability is the global generation. As Nolt points out, the question is not whether some group can achieve sustainability of some value in isolation. We no longer exist in isolation from one another, but instead are dependent upon not only each other but people in different

nations for some goods and services. Nolt writes, "We might suppose that a person or group is living sustainably if she, he or it adopts a lifestyle that, were it adopted by all people or groups, would sustain *V*" (2010, p.148). But if "all" really is all inclusive, i.e., "all" includes every person, then what is sustainable depends in part upon the population. If everyone is to live sustainably, then when the population grows the ecological footprint that each person may have shrinks, resulting in more demanding requirements for what counts as sustainable (Nolt 2010, p.148). For now, I mean only to mention the problem, but will give it full attention in section four.

If, as Nolt suggests, sustainability is global, then, health care is in serious trouble due to the vast inequities between the health care across the globe. Some countries have an abundance of healthcare, albeit at a high economic and environmental cost. Conversely, developing countries have a shortage of healthcare and often spend little money on it. I do not intend to address the problem of healthcare in developing countries, since such a project would require serious logistical analysis of economies and distribution. It is enough to begin to imagine the changes necessary to bring health care to adequacy. In the United States, the changes would be sweeping and widespread.

To understand the differences between wants, needs, and adequacy, it will be useful to differentiate adequacy from each respectively. First, adequate healthcare is different than a medical need because there are some medical needs that are beyond the scope of adequate care. To many, this sounds counterintuitive because there is a long tradition in sustainability beginning with the Bruntland definition that sustainability fulfills needs but not wants. A medical need is defined as the requirement of an individual to receive medical assistance to return to typical species functioning. In

medicine, however, within the confines of sustainability, what may count as a medical need may be unsustainable. That is, though adequate healthcare is largely made up of medical needs, some medical needs are impossible if adequate healthcare is to be provided for the global generation. Providing treatment for a medical need is a sufficient but not a necessary condition of adequate healthcare.

If a ninety year old person is dying from terminal cancer, but might be saved with extensive surgery, the surgery is a medical need. Although most people are deceased before the age of 90, typical species functioning is a state of life rather than death no matter the age of the individual. Otherwise, a commitment to return patients to species typical functioning would commit one to kill patients after a certain age in a practice that seems obviously objectionable. Regardless, such a surgery would be above and beyond adequate care; in such a case the patient may not want the surgery. Even should the patient wish for the performance of such a surgery, the friability of organs in one of such advanced age makes survival much less likely despite the steady rise in the average age of persons receiving life-saving treatment (Callahan 2008). Even if the individual should freely elect surgery, the fact that resources relevant to medical care could do more good within a health care setting elsewhere remains, regardless of whether an individual spends the money they would have used to elect surgery on consuming some other resource. Wisely using resources relevant to health care within the health care is necessary to satisfy the responsibility of making health care sustainable for the current global generation. This is exactly why when faced with scarce resources like transplant organs, we are so careful in who we give them to. Heart transplantation is not generally performed in patients over 70 years of age because the recovery process is so difficult

that a successful outcome is doubtful (Mehra 2006). In short, our resources—including those of the patient—are better used in other ways. Even though a patient may wish to elect surgery, it is not unfair or unjust to deny the request because they are not a good candidate for various reasons. Sustainability simply adds another consideration for whether or not one counts as a good candidate by forcing us to consider the environmental impact. The patient may live out their life as they wish within their ability; an autonomy affirming act for many when the likelihood of returning to wellness is statistically improbable. Such medical need is beyond adequate medical care. Still, one may argue that all I have done is shown how my vision of sustainable health care deals with marginal cases. In what follows I examine less marginal cases and apply the vision of adequate care.

To apply my vision of adequate care in less marginal cases, it is necessary to consider and directly apply our definition of adequate healthcare. Expressed in a negative way, healthcare that impairs the ability of present of future global generations from adequately meeting their healthcare needs is impermissible. If medicine is to be sustainable, then we must avoid spending too much capital—whether social, ecological, or economical—on any patient or group of patients because such action will impair the ability for the current generation as well as future generations to adequately meet their own healthcare needs. On the face of it, our responsibility to make health care sustainable forces us to choose what health care practices would be offered and which would not. Some of the most resource intensive medical procedures would be impermissible. One example of a class of procedures that are generally capital intensive and likely to be unsustainable is transplants. For example, transplants are generally near

the top of economically expensive medical procedures—and likely to be economically unsustainable if the global generation is to meet their healthcare needs adequately, because they are among the most expensive medical procedures and well beyond the means of an individual earning an average income. Transplants are afforded through insurance, resulting in higher rates and exacerbating existing socioeconomic inequality. According to the Department of Health and Human Services, "the average cost of transplantation in 2008 ranged from $259,000 for a single kidney to over $1,200,000 for a heart-lung transplant" and cost $2,500 per month for immunosuppressing drugs (2014). Such funds could be used for vaccinations, which yield an 18% return due to economic growth from the increased health and longevity of the population (Wolfson et. al. 2008). Though economic growth is in tension with sustainability because it tends to be caused by increased consumption, it is clear that the option yielding better health and reducing inequality is vaccinating or other such public health measures like clean drinking water and sanitation, which are also more economically sustainable than transplants.

Perhaps more clear is the distinction between adequate care and medical wants. One might argue that all medical wants are beyond the confines of adequate medical care. This isn't true either; one can easily imagine a case where someone wants to have a procedure performed that is not expensive, damaging to society, or damaging to the environment. Such a procedure would be at least theoretically permissible unless it were part of a greater trend, whereby as part of the aggregative impact of many such procedures the procedure begins to have a detrimental impact to society, the environment, or monetarily. The procedure may become impermissible at the point where it becomes

detrimental, or other tough decisions, such as population reduction, could be considered. Later in this chapter I discuss the population issue in detail.

Corrective or reconstructive plastic surgery is an easy example of a medical need, as opposed to a procedure involving a medical luxury like elective plastic surgery. For example, a cleft lip and palate may cause various medical problems for the unfortunate person born with it. Problems directly associated with a cleft palate include trouble eating, poor growth, misaligned teeth, frequent ear infections, a change in nose shape, and hearing problems (Pubmed Health 2012). Such problems seriously decrease the quality of life for the individual afflicted, and increase the need for health care. Early treatment is by far the cheapest option over the lifetime of the individual (Cohen, 2008). Contrast repairing a cleft palate with an elective rhinoplasty; such surgeries are often performed because the patient is unhappy with their current nose. In extreme cases the patient's negative perception of their nose may even be a source of mental distress. In such a case, the surgery may no longer be elective; to keep our distinction between need and luxury, I take a clear case of elective rhinoplasty to be a case where the patient has no psychological issues present that may be cured by the surgery, and who is otherwise healthy. That is to say, the patient merely wishes to have a different nose, or to have their current nose shaped more to their liking. Clearly, the former case of the cleft palate is a case of medical necessity, while the latter case is an example of medical luxury.

Still, all I have done is to point out two points on a spectrum. On one side, there is clearly necessary healthcare, i.e., medical needs, and on the other side, there is clearly luxury healthcare, i.e., medical wants. The real debate, however, is where to draw the

line for *adequate* healthcare. If healthcare practices fall along such a spectrum, then without a well justified criterion for determining adequacy, any point may seem arbitrary.

Of great concern then are procedures and types of care that are needed almost universally to maintain at least a baseline of adequacy of care. Prenatal care of some sort is necessary universally, as is palliative care, vaccines, antibiotics, clean water, basic vision care, and basic dental care to name only a *few* of the services needed by everyone to remain healthy on nearly any definition of health. Here is where the greatest task for envisioning sustainable medicine lies. These services are needed just to maintain adequate care. Both public health outcomes and individual health depend upon the continued offering of these services. Bringing health care to adequacy depends upon extending these services to places where such services are scarce in such a way as to promote sustainability and in so doing, benefitting human and nonhuman health.

What if one *can* afford better, yet unsustainable healthcare? It is easy to imagine any number of people who possess the financial, social, or natural capital necessary to fund any medical procedure they choose. What should we do in such cases? There are really three options which I take to be the main options available.

1. Maintain the status quo. Allow the purchase of such services free of costs that are normally (currently) externalized.
2. Deny the purchase of all such services.
3. Pay as you go. Allow the purchase of such services, but include in the cost of the purchase enough capital to offset the aspects of the procedure that make the procedure unsustainable and provide for using the funds raised to maintain sustainability.

If we allow the purchase of unsustainable medical services then we risk undermining the sustainability of the entire system. If any lessons have been learned from the Amish, it is that the promise of a cure is stronger than conviction and oath. The Amish are offered such care, and with increasing numbers they purchase it, to the detriment of their society as discussed in chapter two. If we deny the purchase of all such services then we diminish patient autonomy and risk putting doctors at odds with their patients. Any act that diminishes patient autonomy requires justification that proves the act diminishes patient autonomy for ethical reasons. If patient autonomy is diminished, then the autonomy of one of the most vulnerable parts of our population, i.e. those who are ill or diseased and at the mercy of medical care, is diminished at a time when autonomy affirming and autonomy reinforcing actions are most needed for patient health.

Furthermore, denying the purchase of healthcare outright creates unnecessary philosophical tension within my view. It may be unjustifiable to deny care in all cases on the basis of the procedure being unsustainable because what determines whether a given procedure is sustainable or not is whether the practicing of a given healthcare procedure or service creates a trend. One procedure or the sporadic operation of a procedure in your average circumstance will not create massive environmental harm. Rather, the practice of an unsustainable procedure on a large segment of the population is what creates massive environmental harm. Denying certain individuals access to a procedure that would not constitute a trend seems indefensible on my view. Instead, I propose that luxury health care be taxed to provide basic health care for those who need it, and to offset the environmental harm done.

If we allow the purchase of unsustainable medical services but include a program of offsetting the sum total environmental impact of unsustainable medical services then we might find a compromise between allowing the purchase of unsustainable care in a way that at least promises not to undermine the system of sustainable medicine, so long as we ensure that the funds raised through the offsetting program go toward maintaining sustainability. The idea of an offset would be to negate impact of unsustainable procedures by using capital gained from the procedure to result in no net loss of protected environmental values, e.g. climate stability, streams, forests, or particular biota. Like any market solution, any program to offset environmental degradation from human activity is subject to the well documented problems of economic analysis and valuation. Problems include how to provide the offset (taxes or other compensation?), the loss of original habitat that cannot be offset at all because the habitat cannot be easily replaced or replicated elsewhere, and whether the compensation given is really adequate (Campbell 2014). In principle, a luxury tax program works to protect the environment while at the same time allowing healthcare institutions to meet patient demand. The danger of a luxury tax program is that existing inequalities between the rich and poor may worsen because many of the poor will not be able to afford such a program.

There are admittedly many practical problems with the implementation of an offsetting program. A limiting factor to an offsetting program within my theory of sustainable medicine would be that all offsetting must cease at the point where continuing to allow consumption of some environmental good compromises the ability of the current or of future generations to adequately meet their healthcare needs. In the case of scarce resources, it will be necessary to have some resources like old growth forest, Mt. Rainier,

etc., that are entirely off limits, even for a system of offsetting. Still, such a system may allow for adequate health care for all, which may result in greater equality of opportunity. In the next section, I return to a discussion of Daniels' idea as applied within the confines of sustainability.

4.3 Equality of Opportunity

More needs clarified about Daniels' argument concerning opportunity and health care. Central to Daniels' position is that equality of opportunity requires a decent basic minimum of care because health care is a positive right. According to Daniels, society has an obligation to offer a decent basic minimum of care because health care is a special good—while we may do without other goods, doing without health care is harmful not only to our bodies, but also the range of opportunities available to us (Daniels 1982, 78-79). A health care need is something needed to "maintain, restore, or provide functional equivalents (where possible) to normal species functioning" so that people may avail themselves of the normal opportunity range for their given society (Daniels 1981, 158).

What counts as normal species functioning is a matter of debate and crucial to understanding Daniels' position. Normal functioning is achieved when there is a lack of physical or mental impairment hindering people's ability to avail themselves of the range of opportunities available to them in their society. This optimal range of opportunity is theoretical; each person has an effective opportunity range, which is a subset of the overall opportunity range and includes all contextual limiting factors (Daniels 1981, 159). Fair equality of opportunity is defined as equal access to jobs and offices, including

prohibiting barriers to access and requiring corrections for the negative effects on opportunity resulting from a variety of factors like social discrimination, lack of training, and socioeconomic inequalities (Daniels 2001 3). The things necessary to allow for a normal opportunity range are divided as follows:

(1) Adequate nutrition, shelter

(2) Sanitary, safe, unpolluted living and working conditions

(3) Exercise, rest, and other features of healthy life-styles

(4) Preventative, curative, and rehabilitative personal medical services

(5) Non-medical personal (and social) support services (Daniels 1981, 158).

Daniels intends for this list to categorize the relations between goods, services, and our opportunities, since a wide range of variables may affect our opportunity range. If Daniels is correct, then there are strong obligations to ensure the offering and availability of all five categories, though medicine would most obviously be involved with the first four, while the third category carries a strong requirement of personal responsibility so long as facilities are available to all. With deficiencies in the distribution, offering, and use of services in nearly every category, it is important to note that Daniels is most concerned with offering services and ensuring that there are as few hindrances as possible to availing oneself of the services in each category.

Daniels notes the need to differentiate how to determine whether something is part of a decent basic minimum of care or not, and proposes the ability of people to avail themselves of the normal opportunity range as a rough measure for how to determine the decent basic minimum. Ruud Ter Meulen rightly argues that "since what constitutes a

decent minimum of care is heavily dependent on individual conceptions of the good life, defining that the decent minimum of health care can only be created (not discovered) in a process of negotiation [sic]" (Meulen 2011, 614). Still, for my purposes the continuation of the possibility of having a good life is essential so long as an individual's conception of the good life does not preclude or contradict obligations to future generations. Whatever my conception of the good life, it should be likely that my children could also live in comparably good ways. At present, given the rate of climate change and human contributions to that change, we are obligated to do what we can to allow future generations to also live a good life. Constrained within the bounds of sustainability, we can define adequate health care by building upon Daniels' account of fair equality of opportunity and a decent basic minimum of care.

When considering equality of opportunity between societies within the current global generation, it is easy to argue that gross inequalities exist. Though many factors affect life expectancy, when life expectancy is low in a country health outcomes are worse over the lifetime of an individual and adversely affect the ability of those living within that country to avail themselves of the normal range of opportunities than they may otherwise have if health outcomes. According to Dwyer's figures, countries that have a higher ecological footprint also tend to have higher life expectancies. This trend is also observable using the Happy Planet Index, which tries to measure sustainable well-being. The index determines sustainable well-being by multiplying life expectancy by experienced well-being and dividing that number by ecological footprint. Citizens of a country are surveyed and asked to report their experienced well-being on a scale of 0-10, with ten being the best life possible. Comparing Tables 1 and 2, we see that countries

with high life expectancies tend to have unsustainable ecological footprints, while countries with low life expectancies tend to have sustainable ecological footprints but experience less well-being (Abdallah, Shah, and Marks 2012). Much of this is related to global inequality, as countries processing natural resources tend to be wealthier and the countries where the natural resources are extracted tend to be poorer, tend to have worse health, and tend to have a lower ecological footprint (Harris 2010).

In an increasingly globalized world, worse health outcomes lead to very real inequalities in the opportunities available to the citizens within nations, but also between nations. Intragenerationally there is inequality of opportunity and inequality of access; moreover, there will be inequality of opportunity intergenerationally if resources are used to the extent today that future people cannot maintain adequate levels of health care at a decent basic minimum or above.

First, I'd like to point out that equality of access to care, whatever contested definition one means by the term "equality," is an ideal to strive for—an ideal that may not be reachable, but which is a more than worthy goal. As I use the term, "equitable access" means access to a decent basic minimum or baseline of care, below which adequate care cannot fall in order to remain considered "adequate." In *Equity of Access to Health Care*, Daniels notes that when people speak of equal access to care, what they mean is that barriers to care like financial limitations and geographical location should play little or no part in whether one who needs care can get care (Daniels 1982, 55). This is part of the problem, but it is an oversimplification of an incredibly complex issue.

Equality of access to care does not mean that everyone has formally equal access to care; rather, each individual must have substantively equal access to care. Formally

equal access to care would guarantee nondiscrimination and equal access to care for all, without taking any action to correct existing inequalities (such as accidents of birth) that will hamper the ability of health care institutions to care for members of society. Under a substantively equal system, not only is care available to all but that systems are put in place that encourage people avail themselves of health care in order to overcome pre-existing inequalities to health care access. Instead, I advocate substantive equality because it is clear that simply providing access to health care would not be enough to provide adequate health care for all. Well documented distrust of science and medicine on the basis of cultural barriers and a misunderstanding of the procedures involved is enough to show that substantive equality is necessary to provide adequate health care to the global generation (Daniels 1982). There are many documented cases where due to cultural and linguistic barriers, people such as the Hmong distrust western medical practice. When positive steps are not taken to overcome this distrust, the Hmong (a hilltribe living in the area around Laos) and other cultures with similar cultural and linguistic barriers to western medicine will have worse health outcomes (Fadiman 1997). In order to provide substantively equal care to the global generation, there must be attempts to rectify pre-existing inequalities in health care access and usage.

There must also be constant vigilance that inequalities in access of care do not worsen. While changes in lifestyle and in our expectations from health care are necessary, we must ensure that in the process of rectifying existing inequalities that new inequalities are not created either intentionally or inadvertently. A careful balance must be struck to ensure that the standard of adequate health care does not worsen income

inequalities, since income inequality is linked to poor public health outcome (Subramanian and Kawachi 2004, 2006).

With regard to intergenerational justice, because adequate health care is subsumed within the confines of sustainability, future generations must have the ability to maintain their own level of adequate care. As with intragenerational justice, intergenerational justice requires that health care inequalities do not worsen from the passing of the current generation and into the next, as a worsening of health care inequalities would impair the ability of future generations to maintain their own adequate levels of care. Part of adequate health care is to ensure that the current generation acts on their responsibility to make medicine sustainable so that they do not impair the ability of future generations to also maintain adequacy of care.

We may measure whether health care inequalities worsen within systems of medicine today. Current methods for measuring access to care are already in place and used; the same methods could be used to comparatively measure trends in access to care and help ensure that future generations have comparably easy access to care compared to the current generation. Current methods do not take an environmental approach to the problems, however, and instead focus on the individuals. But if the sustainability of health care requires the reduction of inequality in general and not just inequalities in access to care, current methods will need to expand to ensure that the current generation fulfills obligations to posterity.

Admittedly, there are many barriers to access to care that developing nations encounter that make my vision of sustainable health care practically problematic. The vision of sustainable health care that I have in mind requires improving the access to care

that people in developing nations have to the point that their access to care allows them to avail themselves of the normal opportunity range in their society, and maintain comparable access to care for future generations. When the normal opportunity range within a society is insufficient to live a minimally decent life, efforts to assist in the implementation of public health measures are necessary from the global community. If done within the confines of my vision of sustainability, both the countries giving and receiving aid will benefit from investing in societies in need economically, socially, and with regard to health. The obligation to give aid to other countries is clear—if greater inequality within a country is destructive in the ways outlined in chapter three, and if pollution and illness are able to cross borders, then many countries are obligated to help countries in need to prevent harms to their own population, as well as to prevent harm in the population of the country in need. In particular, providing care in this way allows us to account for the particular conditions encountered in different nations, and allows for health care itself to be unequal among nations while improving access to care for those nations that are still developing.

I propose the following criteria for determining adequate care, as differentiated from health care needs and wants. I take these criteria to be a starting point for defining a baseline, rather than the final word. Furthermore, aside from their theoretical usefulness, these criteria are only meant to help states and institutions decide what minimal care to give within the context of sustainability. That is, some kind of care may not meet all of these criteria, but a state or institution may value it enough to include it anyway. I also consider these criteria essential to a transgenerational account of Daniels' ideas. It is a wedding of sustainability to Daniels equality of opportunity:

1. Health care necessary to ensure access to the opportunities one's society offers for the current generation and to ensure that the ability of future generations to do the same is not impaired.
2. Care that raises the opportunities one's society offers to a minimum baseline or better for all in the current generation and does not impair the ability of future generations to have at least a minimum baseline as well.

Both criteria are aimed at accomplishing Daniels' idea of access to care and equality of opportunity for the current generation while recognizing the obligation to refrain from impairing the ability of future generations to do the same. The first criterion is a recognition that without one's health, the opportunities that one's society offers may become inaccessible. This, Daniels argues, is unjust according to Rawlsian egalitarian principle. I need not adopt the same theoretical backing; ensuring access to the opportunities that one's society offers is morally defensible according to many ethical theories. In borrowing the criterion, I do not mean to suggest, as Daniels is sometimes criticized for doing, that health will always increase one's opportunity range (Cust 1993, 156). This is a dubious assertion because of the myriad of circumstances affecting one's opportunity range; though one may have optimum health, other factors may exist that do not permit health to contribute to an increased range of opportunity. I do, however, maintain that without care, many opportunities that may otherwise be attainable to an individual are not. Recall that Daniels defines a normal opportunity range as "the array of life plans reasonable persons are likely to construct for themselves" (Daniels 1985, 33). Health may enable one to make and follow those life plans, circumstance allowing.

More certainly, health can hinder the making and following of such life plans, even when circumstances otherwise allow.

There is an additional concern when considering the current generation that the first criterion raises. Some people live in places where they do not have even basic opportunities. The current generation is responsible for ensuring that basic opportunities are available to all. For example, basic opportunities are things like making a family, to have a life expectancy high enough to see grandchildren, to have a vocation, and to learn skills that enrich life beyond mere survival. This obligation is rooted in the idea that we are part of a global community, and should treat one another as citizens of the same community—an idea that is increasingly accepted as we become more globalized. This idea applies to health care as much to opportunity due to the close relationship between health and the opportunities that are available to us.

I agree with Daniels that health care, insofar as justice requires, must be "universal" as health care is a positive right—though the justifications for my view are the transgenerational considerations for justice required by sustainability, and what is meant by "universal" is more expansive. Daniels' concept of universality means health care for all of at least some sort within a society, but the scope of his discussion remains within national borders. If, as I have admitted, sustainability must be global, then a global scope is the appropriate scope for sustainable health care. Intragenerationally, the first criterion obligates us to restrict all health care in developed nations to levels that actualize the responsibility to make health care sustainable in the current generation, unless technology and innovation make it possible to achieve health care sustainability worldwide and still provide for luxury care in developed nations. This would in theory

allow for all other nations to likewise have adequate health care if and only if the current generation accepts and acts upon the responsibility to make life sustainable more generally, freeing up resources for the developing world. Otherwise, there may be a tendency to spend the money and resources not spent on health care in other ways just as detrimental to sustainability and sustainable health care. The developing world would then have to avail themselves of those resources, however. Because adequate care is necessary for a normal opportunity range, adequate care must be possible for all nations and societies—if health care uses too many resources in one area, it may impair the ability of another country to raise health care to adequate levels in the same way that a society that is unsustainable will impair the ability of other societies to attain an adequate standard of living.

Intergenerationally, the first criterion, (that health care necessary to ensure access to the opportunities one's society offers for the current generation and to ensure that the ability of future generations to do the same is not impaired) restricts the health care levels and activities of the current generation so that future generations may also have the health care necessary to ensure a normal opportunity range. Moreover, the current generation should also have health care at a level that allows them a normal opportunity range as well, so long as all health care in any case is constrained within the limits of sustainability. In examining transgenerational notions of adequate health care and equality of opportunity, levels of care remain a central concern. It is there that I turn my attention next.

4.4 Levels of Care

First it may be beneficial to understand levels of care in the other visions of sustainability first discussed in chapter two, beginning with Jameton and Pierce and to consider the differences between their approach and my own. Key differences occur in the placement of authority for making decisions concerning levels of care, and where the emphasis lies concerning the responsibility for making medicine sustainable.

The level of care advocated by Jameton and Pierce isn't defined so much as it is framed. Jameton and Pierce lay the responsibility for becoming environmentally oriented on institutions themselves. Institutions, they say, must independently establish a "background of material standards for patients and clinicians" (2004, 84). Individual choices are then subject to the materials and standards deemed environmentally sound by particular institutions. What care is offered, and what form that care takes, is defined by the individual institutions. As an example of what individual institutions might look like under Jameton and Pierce's vision of sustainable medicine, they offer the hypothetical Green Health Center.

Jameton and Pierce argue that an arrangement like the Green Health Center will allow patients to make more meaningful choices. Choices, they argue, are important not because of the number of choices but the meaningfulness of choices. By allowing environmentally conscious choices to be made, they argue that the subsequent choices made will be more meaningful (Jameton and Pierce 2004, 84). Jameton and Pierce claim

that patients would not be disempowered; rather, they would be even more empowered than previously, because the choices made are more meaningful than before because more factors are taken into account when making the choice—in effect, trading moral individualism for a community based view of a self that is encumbered with concern not just for the self, but for others as well. Jameton and Pierce argue that "by taking global resources into account, the institution allows clinicians and patients to make choices that are more realistic, and thus more significant, in respecting our place in the world" even though the number of choices available may be fewer (2004, 84). For example, when choosing what kind of care to offer or what kind of care is desired, clinicians and patients could choose between services that affect the environment in different ways and consider the environment as a factor in their decision.

One such decision important to conserving resources and using resources wisely occurs during end of life care. At the end of life, Jameton and Pierce advocate allowing patients more readily to choose less care, or more labor intensive but low technology care. Additional choices would not only enhance autonomy, but depending on what the choices available are it is possible to enhance autonomy and sustainability simultaneously. In other circumstances however, there are fewer choices available to patients, but the choices available carry a different, or perhaps greater meaning. According to Jameton and Pierce refusing to attempt to cure a dying patient at the end of life is not a rejection of the sanctity of life; rather, it is an affirmation of the sanctity of life in the highest regard, as a realization of the interconnection between people, and a way of respecting the peaceful passing that anecdotal evidence suggests is desired by the majority of patients at the end of life. When viewed as an example of how a green health

center may enhance the meaning of the decisions made by patients and empower them to make environmentally responsible decisions, one can see how institutions like the green health center may prove to be sustainable. However, I remain unconvinced that the restrictions placed upon autonomy are justifiable because the choices are more meaningful. Rather, if an authoritarian removal of choice is necessary at the institutional level, it seems better to be forthright with the removal of choice when such a removal is required to make health care sustainable.

Jameton and Pierce leave room for the medical professional to join in the greening of hospitals as well. They argue that clinicians can and should be talking about these issues with patients, "perhaps deciding to pursue one form of treatment rather than another, based on environmental considerations balanced with the needs of the patient" (2004, 88). This suggests that standards of care—what is acceptably sustainable and what is not—are dependent in part upon decisions made between clinician and patient. To deal with this added burden, Jameton and Pierce advocate an openness between doctor and patient, where the patient is aware that environmental concerns have entered the bedside, and the physician has been given the necessary tools to consider the environment when deciding on options for care. Jameton and Pierce view this as an increase in the autonomy of the patient, rather than a decrease in the autonomy of the patient because the autonomous individual is properly understood as one person within a moral community. This moral community includes the biotic community of which the autonomous person is a part (Jameton and Pierce 2004, 119).

Paul Carrick argues that Jameton and Pierce actually undermine autonomy. Concerning the Green Health Center, he writes, "if adopted, it could undermine the

autonomy of patients and their families, cheapen the respect for human life ethic, and impose on our caring communities an autocratic system of medical management that smacks of environmental paternalism" (Carrick 454). Families, Carrick argues, will be forced to choose from environmentally friendly options whether they want to or not, resulting in a loss of personal liberty (Carrick 457). With regard to Jameton and Pierce's system, I believe Carrick is correct. Regardless of whether the choices that patients make are more meaningful, a net loss of available choices is a diminishment of autonomy. On my view, though, there is admittedly a loss of autonomy for affluent individuals due to limiting medical options, there is a net gain of autonomy due to the reduction of inequality, as the reduction of inequality increases the ability of others to avail themselves of a normal opportunity range. Without such a mechanism in place, Jameton and Pierce cannot answer Carrick's objection to their view.

As pertains to my vision of sustainable health care, a decrease in the autonomy of affluent people is still objectionable despite a net global gain in autonomy that I argue would result from making health care sustainable. While a reduction in the autonomy of the affluent is unfortunate, the obligation to make health care sustainable for the current global generation demands a decrease in their autonomy when necessary to achieve sustainability; the reduction of their autonomy need not be permanent, however, because circumstances determining what levels of care are adequate fluctuate according to many factors including but not limited to population, technology, and innovation. Further, it is largely unobjectionable to constrain autonomy in the prevention of harm; this gives justification for legislation constraining health care that would undermine sustainability, and in terms of sustainability supports duties each of us has toward one another and

toward future generations. The prevention of harm occurs in reducing environmental risk factors for disease by maintaining or achieving sustainability.

Another point of agreement with Carrick is that Jameton and Pierce's view undermines the relationship of trust needed between physician and patient (457). Placing the responsibility for making sustainable decisions on patients and clinicians places the physician in a conflict of interest between environmental stewardship and the wishes of the patient. To ensure that environmental concerns are attended to in decision making without undermining the physician-patient relationship, discussions concerning what types of care are sustainable should occur before the options are presented at the bedside as part of public dialogue, as discussed in the section on autonomy in chapter three. Restrictions on types of care that may be offered would be at either the governmental or the institutional level.

On the institutional level, competition tends to promote unsustainable business practices so that goods and services offer better value for consumers. Without legislative constraint, it is unclear that communities or individual hospitals will voluntarily choose sustainable health care practices. Patients are also unlikely to voluntarily choose sustainable health practices when faced with health problems, as is evidenced in the willingness of the Amish to abandon beliefs and community obligations in favor of life saving health measures (Girod 2002). While individual decisions and institutions play an important role in making health care sustainable, public dialogue and legislative measures are a necessary and unavoidable part of making health care sustainable and achieving sustainability in general despite issues with building the political will necessary to pass sustainability legislation.

In contrast, Callahan's approach to levels of care bears some similarities to my own, in that to help determine levels of care he develops criteria for differentiating levels of care and envisions a framework within which those criteria are meant to operate. First, let's take a look at the criteria he sets forth. Callahan argues that sustainable health care needs to focus more on health promotion and disease prevention, such as projects to understand and change unhealthy human behavior. The level of care that Callahan proposes is tied directly to what kinds of technology, how much technology, and what levels of technology should be provided. Three criteria are offered to define the boundaries/kinds of care that should be given:

1. Communal Sufficiency: A sustainable medicine and its accompanying technology will provide a community with a level of health sufficient for that community to function well and to provide its members with a fair chance at an adequate life in the community.
2. Minimum Individual Adequacy: Minimum individual adequacy will be achieved when most people have a statistically high probability of receiving over their lifetime the kind and amount of health care they need to survive and to function at the levels common in their society.
3. Technological Economy: Technologies that strengthen public health programs, improve health and prevent disease, and help to motivate people engage in healthy behavior should be given top priority. (1999, 203-206).

Note that Callahan's first criterion pertaining to communal sufficiency is community based. The focus on community is important because it shifts the focus of sustainable

medicine from the institutional level to the level of individual communities. By focusing on communities, Callahan is able to envision a way that might enable individual communities have an adequate life—though what counts as an adequate life is left undefined. There are, however, examples of what the communal sufficiency criterion entails. Technology that satisfies this criterion will be aimed at public health rather than individual health. Communally sufficient technology will "help the majority of citizens avoid a premature death, and to protect them from epidemics, contaminated food and water, correctable environmental hazards, and the like" (Callahan 1999, 204). Furthermore, technologies that strengthen public health programs, improve health and prevent disease, and help to motivate people engage in healthy behavior should be given top priority" in order to achieve a cost effective use of technology (1999, 203-206). Technological fixes tend to be expensive and focus on individual emergency care, while public health measures tend to benefit the population in general and have the added benefit of being cost effective. Individual need, however, is second in priority to communal need. Since individual need is secondary to communal need, personal responsibility for health becomes supremely important for the maintenance of individual health. As a result, education programs promoting good health habits toward the promotion of personal health responsibility would need implemented.

In the discussion of his definition for minimum individual adequacy, Callahan notes that such measures will mean that some people fall outside the boundaries of care, i.e. some individuals will have needs that medicine, if it is to be sustainable, cannot provide. Furthermore, Callahan notes that sustainable medicine requires *equal access* to

basic services, but not equal health outcomes. He rightly points out that different health outcomes at the individual level are acceptable and unpreventable—the most one can do is to grant equal access to care. In his concept of minimum individual adequacy, Callahan advocates that medicine need not meet every health need—only the most common. The goal of such measures as he proposes is simply this: that "Sustainable medicine's main goals will be to help most people avoid a premature death and, when they are old, to provide primary and palliative care, not the means to avoid all possibilities of death" (1999, 205, 241).

The role of technology in aiding the realization of the first two criteria is of the utmost importance. Technologies that are efficient, i.e. give good health gains for low cost, should be given priority. Technologies that benefit only a few at high cost, or are of marginal benefit at a high cost, i.e. inefficient technologies, should have a lower priority. Finally, technology should "become an adjunct" to public health, "reserved for those medical conditions in which only a technological intervention can preserve health" (Callahan 1999, 206).

There is, in Callahan's work, a sense of how this may affect the environment. The illuminating discussion above that I've pulled from his work is originally placed within a discussion of the ways in which technology might be used by medicine sustainably and *complementarily*, i.e., as an equal approach among many approaches, and not the primary approach. The focus of technology in Callahan's work again turns upon the idea of our struggle against nature—the idea that humanity must conquer or dominate nature. He writes, "Medicine went on the attack, seeking through research to find the

causes of disease and through technological diagnosis and therapy to rid us of those causes and relieve us of those symptoms" (Callahan 1999, 244). However, this technological approach to curing disease leads to a never ending arms race against nature that is economically unsustainable due to the increasing investment necessary to combat diseases that we have thus far been unable to cure or treat. For Callahan, whether technological use is sustainable relates primarily to economic sustainability, and not environmental sustainability. Economic sustainability is the ability to continue to afford spending the capital to use some technology; environmental sustainability concerns whether the technology has an adverse environmental impact and if so, whether that impact is enough to impair the ability of the current generation to raise health care needs to adequacy. There are many technologies that are not costly in monetary terms but contribute significantly to environmental degradation. By focusing too much on economic sustainability, Callahan misses the mark on environmental sustainability.

The role of technology and its effect on medicine is constrained by Callahan's first criterion of communal sufficiency, which has two parts. First, people have a statistically good chance of receiving the health care that they need. Second, this care will reduce the likelihood of premature death and physical or mental disability. This is meant to introduce cost-effective strategies to health care, because the emphasis placed upon care is in favor of care that improves the health of populations as a whole, but which does not guarantee care for rarer cases. Note that the focus here is on the health of the population and not the individual; individuals, so far as they are addressed in the criterion, are mentioned, are only guaranteed a statistically good chance at care. But a

statistically good chance at care as Callahan uses the term only means that medicine will treat those diseases that people have a statistically high chance to develop. Such measures will leave marginal cases, i.e. rare diseases and illnesses, without care. Finally, Callahan iterates that the intent is to foster a sense of responsibility for one's health, because there are no guarantees that the highest standard of technological care will be available (1999, 242). In essence, since a lifestyle of a certain sort may give you a higher risk for diseases of a certain sort, and since you know there is likely little recourse should you develop such a disease, there is ample motivation to adjust your lifestyle.

While I agree with Callahan's effort to motivate personal responsibility for health, if medicine continues to act as an enabler for bad lifestyle choices, then we will continue to suffer the consequences of those lifestyle choices. Counseling and psychological therapy should be available for those with unhealthy lifestyles as cost effective measures that treat not the symptom of the illness but what is very often the cause of self-destructive behavior. Medical intervention for diseases linked to unhealthy lifestyle choices should not be available when the unhealthy lifestyle choice is made through the exercise of one's own autonomous and uncoerced will, and individuals should be notified via their health care professionals. Many people are victims of circumstance, and so are forced into unhealthy lifestyles through no fault of their own; care should only be denied when a reasonable person would agree that the unhealthy lifestyle was freely chosen. When an individual is not treated because of such measures, the results may be unfortunate but are not unfair because treatment for the underlying causes of those decisions was available and their lifestyle decisions were made of their own volition.

Nonetheless, there is much debate among health care professionals concerning to what extent individuals are responsible for their lifestyle choices, and more clarification is necessary. Our socioeconomic status predisposes us to some lifestyle choices or another; for example, low socioeconomic status increases the likelihood that an individual will use tobacco (Hiscock et. al. 2012). Alternatively, lifestyles that were once a choice may no longer be because of addiction, while debates concerning whether addiction is classifiable as a disease or not continue. If addiction is classifiable as a disease, then addicts should not be held responsible to the same degree for their actions in feeding the addiction. Given these concerns, should we hold someone of low socioeconomic status who ends up smoking, or an addict who feeds their addiction responsible for their choices and actions? As a practical matter, we must. Unhealthy lifestyle choices contribute to increased risk factors for disease, decrease ones opportunity range, and at least indirectly contribute to ecological degradation while reinforcing inequality.

While we must hold people responsible for unhealthy lifestyle choices, there are still obligations stemming from the principle of beneficence to treat these individuals regardless of those lifestyle choices. In order to be justified in holding people responsible for lifestyle choices, programs must be available to treat the underlying physical, mental, and environmental conditions causing the unhealthy lifestyle to begin or continue. Not only are such measures effective at preventing illness and disease as a result of the unhealthy lifestyle, they are more cost effective and often less resource intensive; for example, we can easily imagine the benefits people have from seeing a psychiatrist to

help them deal with self-esteem issues causing self-destructive behavior like continuing an unhealthy lifestyle.

Returning to Callahan, the remaining details of Callahan's discussion pertaining to standards of care are found in his idea of what a sustainable medicine looks like. Callahan sees a sustainable medicine as a steady-state medicine, i.e. a medicine that "in both research and health care delivery, aims for a steady-state plateau, at a level that is economically affordable and equitably available, and also at a level that is no less psychologically sustainable, satisfying most—but, of necessity, not all—reasonable health needs and expectations (1999, 26). Specific aspects of this idea show just what level of care he advocates, however.

1. Clear Benefit: The only care given is of clear benefit, in that for care to be offered over 50% of patients will show significant improvement in their medical conditions and where the costs of that improvement are not excessive in the context of competing medical needs and possible alternative expenditures.
2. No deliberate extension of life expectancy in developed countries.
3. No research to save low-birthweight babies beyond present limits (450-500 grams).
4. An obligation to educate patients and to give incentive to encourage patients that they need to accept personal responsibility for health and that they will die.
5. Maintain decent basic care (Callahan 1999, 245-252).

Let's briefly examine what each of these aspects of the level of care within Callahan's vision of sustainable medicine mean. The first aspect, pertaining to clear benefit, is intended to make medical technology and medicine more generally an adjunct of public health. This particular criterion—perhaps more so than any of the other aspect—means that many people will fall outside the kind of care given according to Callahan's vision of sustainable medicine. Those afflicted by rare diseases and defects will be most affected by this aspect.

Secondly, Callahan advocates a cessation of the deliberate extension of life expectancy in developed countries. This too is tied to technology, because Callahan (correctly) identifies the rising cost of health care with longer life spans. End of life care is a significant source of health care cost expenditure, while the research and development poured into increasing lifespan has met with diminishing returns in recent years (Callahan 1987, 1999). Callahan targets developed countries rather than undeveloped or underdeveloped countries because in much of the world, increases in lifespan are achievable through public health works such as clean drinking water, sewage treatment, and other measures related primarily to increases in quality of life rather than life extension for the sake of life extension.

Callahan calls for a moratorium on research for low-birthweight newborns, classified as 450-500 grams. As at the end of life, the care of low-birthweight newborns is expensive. Rather than cut back on care for low-birthweight babies, Callahan merely calls for a halt to research involving saving babies of even lower-birthweight—an important distinction, perhaps because such measures would incur less backlash from

patients and the population as a whole. In recent years, though, more dollars have been spent on such research. Small gains in successfully lowering the weight at which a newborn can survive have been associated with greater and greater costs.

The obligation to educate patients and encourage them to accept personal responsibility for health and a recognition that they will die at the end of a biological lifespan stems from the need for patients to tolerate the limits of the health care offered by Callahan's vision of sustainable medicine. There is a limitation of choice imposed when operating within the finitudes of a sustainable medicine. Callahan writes that "the limits may be on the treatments that physicians may use, or for which insurance coverage may be provided, or on the availability of some treatments at all" (1999, 251). Still, he also argues that a sustainable medicine must maintain enough choice to allow patients the comfort and security necessary for seeking out and maintaining care.

Lastly, Callahan discusses the necessity for the maintenance of decent basic care. Insofar as his vision of sustainable medicine is a steady state medicine, those aspects which currently make medicine unsustainable must be curtailed. The highest levels of care will no longer be offered because there is no obligation to pursue unlimited progress—the only obligation is to provide care that is equitable, gives a good quality of life, and ensures a reasonable life span for most people.

To a large extent, I agree with Callahan's approach. His assessment of technology, including the benefits and costs of its progress and use, are largely correct. He is also correct to point out that sustainable medicine will require a movement toward public health initiatives and personal responsibility for our own health. My largest

disagreement with him pertains to equal access to care. Callahan defines equitable access to care as "the availability of affordable health care to a population as a whole, where all citizens have a (1) statistically good chance of receiving, over their lifetime, the kind of health care they need to (2) reduce the likelihood of premature death and of physical and mental disability" (1999, 241).

There are, however, several different ways to measure equity of access to care. It is not clear that Callahan's definition of equitable care is equitable in some ways that may be important. Care is only made available, but not necessarily taken advantage of. That is, though the care is available and there are no formal barriers to care, some populations may not avail themselves of care for a variety of reasons. For example, a population may have a stigma against health care because of religious faith or other belief, and so although care may be available and affordable, they may nonetheless opt not to use health care services. One example of the refusal of such affordable services is those that refuse vaccinations on the basis of religious belief. Though problematic, we should ask the question whether such refusal violates equitable access to care based upon disparities in health outcomes for vaccinated populations versus health outcomes for unvaccinated populations. Health care is just despite inequalities in the use of available services, but where inequalities in the use of available services exists, good justification is necessary for inaction pertaining to the resolution of inequitable use of available services.

If unvaccinated populations have worse health outcomes, and vaccinations are available and affordable, then there is a serious question as to whether the refusal should be tolerated, even on the basis of religious belief. In essence, though one can make the decision to take the risk of not being vaccinated on the basis of religious belief, doing so

may affect others if illness strikes, including those too young to make such decisions on their own. The effects of one's religious belief involve others who are not represented in the decision making process directly, or are only represented paternalistically, e.g. children. An example is the recent record-setting outbreak of measles in Ohio was caused by Amish missionaries who opted out of vaccinating their children on religious grounds despite there being no rule in the *Ordnung* forbidding the use of vaccinations. The missionaries traveled to the Philippines and brought the disease back to their community. No choice is given as to whether one remains Amish until the age of 16, during the *Rumspringa.* At this time, an Amish youth may decide whether to remain part of the community, or join the outside world and be shunned (Amish Studies). Vaccinations would then be a possibility, but sixteen years of vulnerability exist before they may choose.

Non-religious examples abound as well. A 2011 outbreak of measles in Minnesota began when one unvaccinated two-year old child traveled abroad to Kenya. The child came home carrying the illness, contacting friends, family, and members of the public who were unaware that he carried the illness. In total 19 children and two adults contracted the measles; 3,000 were exposed to the virus. Nine were old enough to have been vaccinated but had not been (CDC 2011). The decision not to vaccinate affected others who had decided not to become vaccinated, but ten children were also affected who were too young to receive the vaccination, had little choice in the matter, and who were likely not considered when the decision to forego vaccinations was made. According to one study, exemptors were 35 times more likely to contract the measles than those who received a vaccination, while "if the number of exemptors doubled, the

incidence of measles infection in nonexempt individuals would increase between 5.5% and 30.8%. Disease in non-exempt individuals could be a result of a lack of vaccination for a reason other than non-medical exemptions or vaccine failure" (Salmon 2). Trusting individuals to take personal responsibility for health is at the heart of vaccination exemption, yet it puts everyone at risk.

Another objection to Callahan's proposal is worth mentioning. Giving a population a statistically good chance at receiving the care they need over the course of their lifetime to the end of reducing the likelihood of premature death and mental or physical disability may only be achievable in developed nations. If medicine is to operate within the boundaries of sustainability, then it may not always be possible to ensure that medicine will be able to reduce the likelihood of premature death or mental and physical disability. For example, in some areas of Iraq it is well documented that the ammunition and other materials during the first Iraq war that the United States was involved in have greatly increased the instance of birth defects (Al-Sabbak et al. 2012). One study notes that

> Mercury and Pb, two toxic metals readily used in the manufacture of present-day bullets and other ammunition, were 6 and 5 times higher in hair samples from Fallujah children with birth defects compared to Fallujah children who appeared normal… Though statistically not significant, the hair of parents of children with birth defects had more uranium, Pb and Hg than the hair of parents of normal children (Al-Sabbak et al. 2012).

The population of this area would put a significant burden on the health care institutions in the area and their government if the health care equity that Callahan advocates is to be

attainable. This population surely falls outside the majority and so outside of the realm of those covered under Callahan's version of sustainable medicine insofar as expensive, life-saving and life-altering services are concerned. Still, it seems a violation of our sense of justice to allow this population to suffer simply because the region has "exotic" health care needs, even though the need is common for that region. A greater sense of regional sensitivity to diverse health care needs is necessary.

My strategy on the reduction of inequality also differs from Callahan's. While Callahan focuses on inequality as pertains to medicine, the inequalities he focuses on are inequities of access to health care and levels of care. There is no mention of how socioeconomic inequalities affect health, or a recognition of how health, the environment, and inequality affect each other and reinforce the negative effects of one another, as outlined in chapter three.

Callahan addresses the problem of how to implement sustainable medicine by focusing on personal responsibility for care, but as I outlined in chapter two, it is unclear that personal responsibility will remain a point of primary concern when faced with life threatening illness. If there are not mechanisms in place to prevent our decisions from undermining sustainable health care, then history shows that we will make the decisions in our own best interest or the interest of our loved ones more often than not, even at the cost of others.

4.5 Population

One final note of worry that applies to both Callahan's approach and to Jameton and Pierce's approach is necessary. In any discussion of levels of care, population should

play a central role. In chapter two I noted that as population increases, the demands on resources increase as well; in a world of limited resources, increasing resource demands will eventually result in fewer resources available for each individual on average absent innovations that make the resources in question no longer relevant, or make our use of the resource in question more efficient. Critics of concern over resource use argue that technological innovation has avoided the catastrophic failure of resources in the past. Famous among predictions foiled due to innovation are the predictions of Thomas Malthus, who failed to predict innovation in farming practices and technology that increased the production of food each farmer was capable of. These innovations are widely credited as the reason why Malthus did not end up correct in his prediction of widespread famine due to an increasing population and the environmental limits to growth. My concerns here are about a burgeoning population worldwide and the resulting resource depletion. It is not out of some misanthropic sense that I say we must reduce the population—it is out of compassion for those who will live in a world of depleted resources if we do nothing.

Paul Ehrlich and Julian Simon engaged in a bet during the 1980's concerning whether resource depletion was a legitimate concern. They bet a total of $1,000 on five different metals; copper, chromium, nickel, tin, and tungsten. Ehrlich bet that the cost of all five would increase based upon the idea that as the population continued to grow resource scarcity would drive prices upward , while Simon bet that all five would decrease because there was no resource scarcity in the first place. The winner would pay the difference in prices for purchasing $200 of each metal at the time of the wager.

Ehrlich sent Simon a check to settle the debt, having lost on all five commodities (Schneider n. pag.).

Though Ehrlich lost the bet for the decade spanning the 80's, the bet only covered 5 measurable commodities. What Ehrlich's concerns are really about, however, are that the population will grow to a point that exceeds the carrying capacity of the Earth. His original predictions were often labeled alarmist, and his critics cite that his "doom and gloom" predictions never came to pass; a global die-off due to overpopulation that results in massive starvation on neo-Malthusian scales unless we limit population has never come to pass (Ehrlich 1968).

Julian Simon, it seems, was the victor who in the end was correct with regard to the bet. Food supply is not the problem (it's largely distribution and politics) and commodities are as cheap as ever in general, though oil has risen substantially in price. The problem is the scale at which goods and services are needed; if there were fewer people, consumption and pollution would not be the problems that they are today. Even if civilization doesn't experience a massive die-off because of resource shortages, the basic premise of his argument may remain true. Population still results in an altering of conditions on Earth that are symptomatic of exceeding the carrying capacity of the planet for the standards of living involved. Let's examine this empirical claim.

Limits on the availability of resources like fresh water and arable land are some of the most likely limiting factors that may determine the carrying capacity of the earth. Groundwater depletion, a measure of how quickly we deplete reserves of groundwater faster than it is replaced, rose 25% between 2001 and 2008 in the U.S. alone according to a survey of groundwater depletion from 1900-2008 (USGS 2013). The largest aquifer in

the U.S., the Ogallala Aquifer, has decreased 14.2% since we began drawing from it for widespread irrigation, (or what they call predevelopment) with increasing pressure put on the resource in recent years (USGS 2011, 13). The period between 2001 and 2008 is reported to be 32% of the total depletion since predevelopment (USGS 2013).

Globally the situation is bleak. The population more than tripled during the last century while water usage has grown at twice the rate of population growth (FAOUN 2007). While technology may alleviate many apparent scarcities with technological innovations that allow for more efficient resource use, relying on the development of such technology is dubious business because its development is not guaranteed. Consider an extreme example that is clear enough but an obvious oversimplification; if population growth is 2.1 children for every woman, then on a long enough time scale the biomass of people would be larger than the Earth itself. But prior to that point, there is a point where we are likely unable to produce enough water or grow enough food to support such a massive number of people. The carrying capacity is exceeded, but when?

Edward Wilson speaks of a bottleneck for population growth created by population and lifestyle. In 2002, when the Earth's population was roughly 6.2 billion people, he wrote that

> If everyone agreed to become vegetarian, leaving little or nothing for livestock, the present 1.4 billion hectares of arable land (3.5 billion acres) would support about 10 billion people. If humans utilized as food all of the energy captured by plant photosynthesis on land and sea, some 40 trillion watts, the planet could support about 16 billion people. But long before that ultimate limit was

approached, the planet would surely have become a hellish place to exist" (Wilson 2002).

Why, you ask? The reasons are already manifest. If we look to Beijing, China, we can see the products of overpopulation when coupled with unsustainable development and consumption meant to sustain a rapidly growing economy—diminished clean water, air pollution, and reduced biodiversity to name just a few problems that become greater as population increases if factors like consumption and standards of living remain the same. Or we can look closer to home in the US, and see the declining Ogallala Aquifer in its decreasing capacity to fuel the breadbasket of America—or perhaps more worrisome, climate projections predicting that the Great Plains will be too hot and dry to produce grains..

If sustainable medicine is realized on a global scale, however, serious consideration must be given to population growth in order to address resource scarcity. If poorer nations with higher growth rates see a decline in mortality rates because of improved health care, the population will grow—at least for a time. Cultures are slow to react to changes in death rates and birth rates; observations of worldwide death rates and birth rates between 1875 and 1950 show that while death rates declined beginning in 1875, birth rates did not decline until 1950 (Soubbotina 18). The decrease in death rates is largely credited to modern medicine and the control of infectious disease (Soubbotina 17). Globally adequate health care would therefore exacerbate population problems and the resource issues that they entail.

If health care needs must be adequately satisfied, there is a limit to the population possible due to the available resources. The population limit has global and local aspects;

locally, population limits rely more heavily on regional and national resources and their sustainable use. Global resources may affect a local population limit through the market, as countries import and export goods and materials necessary for maintaining standards of adequate health care. Rare resources tend to be more costly than common resources when the market is allowed to fluctuate according to supply and demand, so a local population that is resource poor will have to import many resources for their medical care at a higher cost than if they were able to use resources of their own. The role of the market in such a scenario should be minimal, however. While demand for health care goods will always remain high, the limits on that demand are not market limitations, which tend to allow those with sufficient capital to consume almost as they please—the limitations are moral, and obligate us to restrain demand far more than what the market would bear.

Tough choices must be made, but must not be arbitrary. Many factors affect the sustainable population limit of a country, including life expectancy, levels of health care, and the distribution of resources. Moral obligations to current and future generations require that societies make these decisions and implement policies to enforce them. For example, if a society values high levels of health care (and whether they do or not), the amount of resources required to support those levels of health care entail a moral obligation to limit the population to sustainable levels. If lower levels of health care are acceptable, then the population limit may be higher. Exceptions to the relationship between health care levels and population size may be due to innovation and invention, where because of more efficient resource use, new technologies, new applications of old technology, or alternative medical practices increase health care levels without increasing

the resources used. Alternatively, a population may opt to increase in size without raising levels of health care because of the same developments.

In chapter one I mentioned that James Dwyer developed a metric for determining a just and sustainable life expectancy. Dwyer explicitly objects to anyone using a metric like his own to determine policy because while such metrics add perspective they are imperfect. His metric is meant to facilitate deliberation on the issues surrounding life expectancy and sustainability rather than to substitute for public deliberation (Dwyer 501). He is correct that better metrics and indexes are necessary. Calculations of ecological footprint are rough, largely because the variables involved in the calculation are difficult to measure, and because what variables should be included are a matter of intense debate. Nonetheless, relatively few metrics are as intensely scrutinized or undergo as many revisions to increase accuracy as ecological footprint measurements. As a practical matter, although all metrics for measuring things life ecological footprints or just and sustainable life expectancy are imperfect, better options do not exist to the best of my knowledge.

In calculating a just and sustainable life expectancy, Dwyer assumes that "a just or fair share of the Earth's biocapacity is 1.8 gha per person" or the average amount that the current population could use so that the Earth provided enough resources for each person on the planet (Dwyer 501).

The data for a nation's life expectancy Dwyer uses comes from the 2008 WHO report entitled *Life Table for WHO Member States, 2006* and is reported in Table 3. The ecological footprint data used is from the 2006 *Living Planet Report* conducted by the World Wildlife Federation, available in Table 4. Dwyer calculates a just and sustainable

life expectancy for each country listed by dividing the life expectancy for an individual of each nation by their average ecological footprint. Each person, it is assumed, is entitled to resources equal to the resources necessary for all people on Earth to use the same amount of resources during their life expectancy—anymore and they are using the resources of another. Table 5 shows the staggering results (Dwyer 2009).

That countries like the United States or the United Arab Emirates are consuming an unjust share of resources or are outliving their just and sustainable life expectancy on average may seem obvious to some, but if we're to take Dwyer's index as a call to action and a basis for policy discussion, then decisions must be made to make medicine more sustainable, some of which involve population reduction tied importantly to what standards of living we choose to have. There is some research, notably from the Bill and Melinda Gates Foundation using data from the World Bank, which suggests that as infant mortality rates decline population rates decline (Gates 2014, World Bank 2014). Earlier I mentioned that if health care improved in poor nations, the decline in mortality rates would result in an increased population. However, if mortality rates in general fall, the population will live longer, and this would result in at least a short term spike in population that we can expect to level out and fall according to historical precedent. If this is true, then the case for sustainable health care is even stronger because sustainability could lead to slow population growth over time, or perhaps even a decline. Such conclusions are premature however, because the prevailing opinion has traditionally been that increasing health and saving lives would exacerbate population problems.

One way to ameliorate population problems may be the widespread use of contraceptives, which would also increase the autonomy of women by allowing them

more control over reproduction. No effective contraceptive for men is widely available at the time of this writing (though some are in the research phase), so the discussion of contraception focuses on women and usage of contraception. In developing nations especially, an estimated 222 million women worldwide would either like to delay or prevent having children but do not currently use any form of contraception (WHO 2013). A reduction of inequality as proposed in chapter three would help women in situations cited in a WHO study done in 2011 that found a low rate of use of contraceptives among poor women in Africa (WHO 2011). The study found that

> when childbearing intentions are controlled for, women in the richest wealth quintile appear to be more likely than women in the poorest wealth quintile to use long-term contraception, which is more expensive than short-term contraception and usually provided at clinics. Thus, closing this particular gap between the rich and the poor in developing countries will entail addressing women's access to contraceptives and making all methods affordable (WHO 2011).

While helpful to reduce population, contraception is most often used to space out children rather than to prevent births altogether, so the impact of contraceptives for controlling population should not be overstated. However, if the use of contraceptives allows women to become more educated in developing nations by preventing untimely births, the resulting societal benefits of their contributions may lead to the development of their society. Though developed nations tend to consume more resources per capita than undeveloped nations, birth rates also tend to be lower in developed nations in correlation with higher rates of the use of contraceptives (WHO 2013).

The availability of abortions may also reduce population growth. S.D. Mumford and E. Kessel found in an observational study that any nation wanting to reduce its growth rate to 0% or 1% cannot hope to do so without abortion (1986). The high birth rate in poverty stricken areas could be alleviated by making abortions available along with the use of contraceptives. Perhaps the most effective means of controlling population through voluntary efforts is through developing nations, thus affording more opportunities for women outside of child rearing and educating women so that they may avail themselves of these opportunities. These are some of the reasons cited as determinants of the reduced birthrate in developed nations (World Bank 2000).

We may, if we can reign in population growth, establish levels of care that we find appealing. Public dialogue within and between societies is necessary to determine the levels of care a society deems acceptable, but levels must remain within the boundaries of sustainability. The suggestions of Callahan and Jameton and Pierce are all parts of the puzzle, but do not go far enough in recognizing the human preference for the present when faced with problems. By focusing on public health initiatives, population, and the reduction of inequality, I have envisioned a way for policy makers to enact legislation that will help make medicine more sustainable, and society more sustainable as well. At the institutional level, I have developed a method for delineating between sustainable and unsustainable care and shown that the distinction is necessary and must be clear for policy makers and health care professionals. In presenting my vision of sustainable medicine, I hope to have demonstrated a theoretical way forward. In the next and final chapter, I offer some closing observations about this project and areas of future research that may aid in making health care sustainable.

CHAPTER V

5.1 CONCLUSIONS AND RECOMMENDATIONS

I have argued that health care contributions to environmental degradation frustrate the very ends that health care seeks to achieve. To accomplish this task, sweeping changes must be made to health care, but those changes must remain sensitive to the contextual limitations of the areas becoming sustainable. Though much will change, much will also remain the same.

Human well-being is dependent upon well-functioning ecosystems relevant to human health. Yet, without access to health care the full benefits of healthy ecosystems cannot be recognized effectively, because health problems will persist despite decreased risk factors. Access to health care is only possible for everyone when it is economically affordable and available to everyone. At the same time, while working to take care of ecosystems and individuals, we must also be sure not to undermine the ability of future generations to do the same. Health care can accomplish this goal by reinforcing efforts to restore and maintain global ecosystems rather than participating in their degradation.

My vision of sustainable medicine commits me to the view that health care is a positive right that everyone is entitled to, and therefore a moral obligation. One might hold the position that health care, even adequate health care, is not a right and therefore not a moral obligation. To the contrary, the provision of adequate health care is a moral obligation to one's self as well as to others, *pace* arguments presented by Daniels in *Just Healthcare* and other works. There is a long standing debate in biomedical ethics as to

whether health care is the kind of positive right that entails an obligation to provide health care for bearers of that right. In my estimation, health care is a right for the global generation as well as for future generations. We should not perform actions that deny people their right to health care. If one denies that there is a right to health care, then they must accept the consequences of that view—namely, that at some time in their life, they will be faced with a medical crisis that they cannot afford for some reason, and that the severity of that crisis will determine whether they live, die, or become disabled. Such consequences are not enough to dissuade all objectors however. I wish the consequences of the objector's view ended with only personal consequences, because then the question becomes a more practical matter of personal choice—one could opt into, or out of, health care providing services, so that through choosing to receive none they do not contribute to the care of others. But the consequences are far reaching and require us to expect a different sort of care.

One may question whether my vision of sustainable health care is synonymous with maximizing quality adjusted life years in order to make health care sustainable while ensuring that people have a high quality of life. Making health care sustainable is not synonymous on my view with simply maximizing quality adjusted life years. Quality adjusted life years (QALYs) are a tool of cost-utility analysis used to determine the ratio of the cost of any particular medical intervention to the number of healthy years gained as a result of the intervention. Couching sustainable health care as a public health initiative does share some elements with QALY calculations. In particular, medical practices that are cost-effective and yield quality care within the limits of sustainability are permissible according to my vision of sustainable health care. However, being constrained only by

cost-utility analysis to determine ratios of quality adjusted life years could undermine efforts at making health care sustainable because the calculation does not typically include environmental considerations in the cost. Even where it does, it is very difficult to evaluate the value of some environmental goods like ecosystem services and biodiversity. Less clear are efforts at translating goods not distributed and valued on the market but which must enter into cost-utility evaluations like the aesthetic value of natural areas. Finally, my view is not reducible to cost-utility analysis because sustainability requires a wider array of considerations including societal influence and cultural differences, a critical view of technology and its use regardless of cost or benefit, and a just use of resources.

A related concern of cost utility calculations and quality adjusted life years surrounds vulnerable populations. If the most effective use of resources is the use that will give the highest payout, then the greater return on the investment of our resources will most likely come by treating the healthier person over the less healthy individual, many of whom are disabled or are otherwise part of a similarly vulnerable population. A real concern is how to distribute scarce resources justly without unfairly targeting or discriminating against vulnerable populations. I advocate the reduction of inequality due to its adverse effects on health outcomes, ecological degradation, and opportunity range. Doctors should, wherever possible, remain steadfast advocates of their patients. Policy to reduce inequality should include consideration for vulnerable populations and the circumstances affecting their range of opportunity. In order to reduce inequality, it will sometimes be necessary to provide care that would normally not be offered under my vision of sustainable health care precisely because without providing that care we

reinforce the very cycle of inequality, decreased opportunity, ecological degradation and worse health outcomes that undermine sustainability. For example, while a costly lung transplant may be considered unsustainable depending on circumstance; even if it were unsustainable it may be in the best interest of keeping health care sustainable to give a lung transplant to a coal miner in the mountains of Virginia. Suppose the miner has a family and no other choice for employment. Without providing care the miner will not be able to support his family. Every member of his family would experience decreased opportunity and will be unlikely to have the means to move out of the area, subjecting them further to the negative health and environmental effects of living near coal mines and continuing or beginning a cycle of poverty and negative health outcomes. Instead of denying these procedures outright, initiatives must be taken to ensure that the provision of these services does not impair the ability of future generations to meet their health care needs adequately.

Unfortunately, for those who are poor, both health inequalities and the health of many individuals both poor and not poor will worsen in a vicious cycle, as outlined in chapter three. Some will have the inability to pay for important health care services, and the system would have fewer healthy people paying to subsidize the care of the sick. Fewer treatments will be paid for, or each treatment will be paid for less. There will be many who have worse health problems and a lower quality of life due to an inability to afford basic preventative medical services earlier in life, which will result in worse health outcomes later in life. The opportunities lost as a consequence of suboptimal health will cause income inequality to worsen—a factor which many studies have shown to worsen the health outcomes of the general population. There is a strong case for the provision of

some form of health care to all, argued in the literature and supported throughout my position.

However, there is a related concern in the provision of health care. Suppose there were a disease predicted that would significantly threaten human populations in the distant future. The disease could be an unintended, long-term consequence of health care; as more people have health care, those who would not have lived to pass on their genes due to genetic disease may live long enough to do so, and over time weaken the gene pool. The current generation must decide what to do about this foreseeable consequence. According to my vision of sustainable health care, so long as the current generation does not impair the ability of future generations to adequately meet their health care needs, the current generation fulfills their obligation to future generations.

Does the current generation need to do anything about this foreseeable consequence? The responsibility of the current generation is to ensure that they do not impair the ability of future generations to meet their health care needs adequately. The second criterion implies that the current generation has negative obligations toward future generations, but it does not imply any positive obligations to benefit future generations. However, acting upon negative obligations may result in a benefit to the party the obligation is held to (future generations). In the example of a weakening gene pool, the current global generation must take positive steps to ensure that their health care is not impairing the ability of future generations to meet health care needs adequately. These positive steps may be research and development or the enactment of policies aimed at preventing foreseeable consequences of current health care practice that would result in an impairment of future generations to adequately meet their health care needs. Such

policies could include gene therapies designed to fix defective DNA in a living individual, germ-line therapies designed to pass along DNA that does not carry disease (or as much disease) to future generations, and genetic screening to determine which couples are in danger of passing along diseases to future generations and assist couples in determining how they might best procreate while passing on as few as possible genetic diseases.

5.1.2 Suggestions for Further Research

Genetic modification, in all its controversy and the misgivings over the use of such technology carries great potential for making health care sustainable in the long term. Different procedures exist for altering the human genome with the intent of eradicating disease and illness. Regardless of the procedure, the potential for genetic modification to alleviate disease and illness cannot be discounted. Current gene therapy focuses on treating the individual, by attempting to replace an abnormal gene for a normal gene. This use of gene therapy is still in the experimental stage at the time of this writing, though many successes have been reported (University of Utah Health Sciences 2014).

Another, even more promising yet controversial therapy exists. Through germ-line therapy, illnesses can be identified and the responsible genes treated so that the modification can be passed on to future generations. The benefits of such a modification are clear, but the potential dangers are very real and worthy of scrutiny. More research is needed on not only the science of germ-line gene therapy but also the morality of such modifications. The most obvious benefit, however, would be an overall increase in

human welfare. Germ-line therapy is currently illegal in the U.S. and will remain so for the foreseeable future, but the responsibility to make civilization sustainable means that we have a moral obligation to consider all options, whether they are adopted or not.

Another avenue of further research necessary to make health care sustainable pertains to life cycle analysis for health care products. According to the EPA, a life cycle analysis or assessment is LCA is a technique to assess the environmental aspects and potential impacts associated with a product, process, or service, by:

- Compiling an inventory of relevant energy and material inputs and environmental releases
- Evaluating the potential environmental impacts associated with identified inputs and releases
- Interpreting the results to help you make a more informed decision (EPA 2012).

Performance of life cycle analysis on health care practices is essential to provide the empirical data necessary to determine whether each practice is sustainable. Furthermore, without the requisite empirical data moral judgments cannot be made regarding whether one practice or another is permissible within the confines of any vision of sustainability, including my own. Though life cycle analysis of health care practices is a daunting task, it is not impossible, and it is necessary if health care is to become truly sustainable.

Ongoing research into the variables dependent on inequality is also essential for both making health care sustainable and for continuing sustainability once it is achieved. Psycho-social factors with social gradients are dynamic and change over time, becoming more or less worrisome and more or less detrimental to sustainability. Ongoing research

is necessary to not only understand these mechanisms but also to figure out how to best address these problems within the confines of sustainability.

5.1.3 Concluding Remarks

Although I have outlined a vision of sustainable medicine, it is up to us all, as part of the global generation, to make any vision of sustainable health care, and sustainability more generally, a reality. Buchanan mentions a way forward through public dialogue, but in many countries public dialogue isn't permitted, or is inefficacious. We must not only ensure that health care is made sustainable within our own country, but we are obligated as part of the global generation to support the efforts of others to make health care sustainable in their countries as well. We are increasingly, as Peter Singer writes, part of one global community. The time is past for recognizing our role as citizens of that community, both individually and collectively. The future will be better for us all if we do.

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APPENDIX

Table 1: Countries with High Life Expectancies

Country	*HPI*	*Experienced Well-Being*	*Life Expectancy*	*Ecological Footprint*
Japan	47.5	6.1	83.4	4.2
Hong Kong	37.5	5.6	82.8	5.8
Switzerland	50.3	7.5	82.3	5.0
Italy	46.4	6.4	81.9	4.5
Australia	42.0	7.4	81.9	6.7
Iceland	40.2	6.9	81.8	6.5
Israel	55.2	7.4	81.6	4.0
France	46.5	6.8	81.5	4.9
Sweden	46.2	7.5	81.4	5.7
Spain	44.1	6.2	81.4	4.7

Table 2: Countries with Low Life Expectancies

Country	*HPI*	*Experienced Well-Being*	*Life Expectancy*	*Ecological Footprint*
Sierra Leone	28.8	4.1	47.8	1.1
Congo, Dem. Rep. of the	30.5	4.0	48.4	0.8
Central African Republic	25.3	3.6	48.4	1.4
Afghanistan	36.8	4.8	48.7	0.5
Zambia	37.7	5.3	49.0	0.8
Chad	24.7	3.7	49.6	1.9
Mozambique	35.7	4.7	50.2	0.8
Burundi	30.5	3.8	50.4	0.8
Angola	33.2	4.2	51.1	0.9
Zimbabwe	35.3	4.8	51.4	1.2

Table 3: Life Table for WHO Member States

Country	*Life Expectancy*
Japan	82.6
Sweden	80.9
Canada	80.6
Costa Rica	78.2
Cuba	78.0
USA	78.0
United Arab Emirates	77.8
China	73.4
India	62.8
Cambodia	62.0
Côte d'Ivoire	52.5
Sierra Leone	40.4

Table 4: Living Planet Report

Country	Footprint in gha	Footprint in earths
Cambodia	0.7	0.4
Côte d'Ivoire	0.7	0.4
Sierra Leone	0.7	0.4
India	0.8	0.4
Cuba	1.5	0.8
China	1.6	0.9
Costa Rica	2.0	1.1
Japan	4.4	2.4
Sweden	6.1	3.4
Canada	7.6	4.2
USA	9.6	5.3
United Arab Emirates	11.9	6.6

Table 5: Just and Sustainable Life Expectancy

Country	Life Expectancy	Ecological Footprint (in earths)	Just and Sustainable
Cuba	78	0.8	78
China	73.4	0.9	73
Costa Rica	78.2	1.1	71
India	62.8	0.4	63
Cambodia	62.0	0.4	62
Côte d'Ivoire	52.5	0.4	53
Sierra Leone	40.4	0.4	40
Japan	82.6	2.4	34
Sweden	80.9	3.4	24
Canada	80.6	4.2	19
USA	78	5.3	15
United Arab Emirates	77.8	6.6	12

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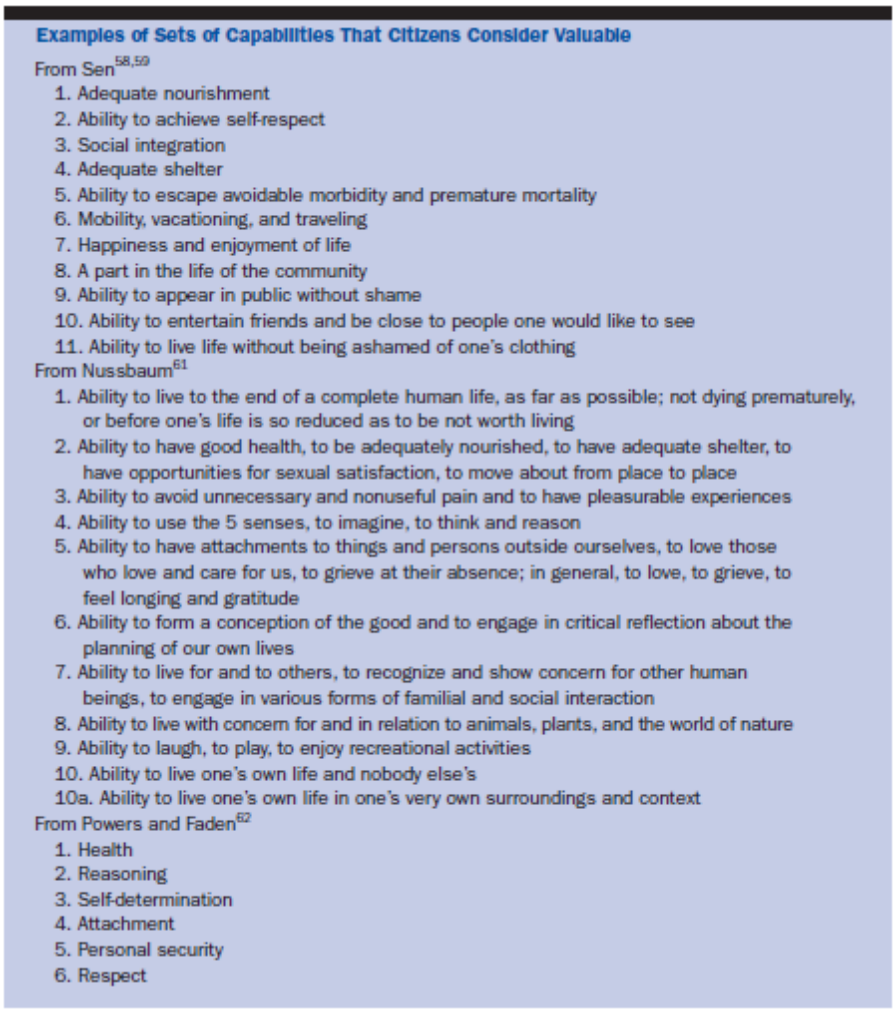

Examples of Sets of Capabilities That Citizens Consider Valuable

From Sen[58,59]

1. Adequate nourishment
2. Ability to achieve self-respect
3. Social integration
4. Adequate shelter
5. Ability to escape avoidable morbidity and premature mortality
6. Mobility, vacationing, and traveling
7. Happiness and enjoyment of life
8. A part in the life of the community
9. Ability to appear in public without shame
10. Ability to entertain friends and be close to people one would like to see
11. Ability to live life without being ashamed of one's clothing

From Nussbaum[61]

1. Ability to live to the end of a complete human life, as far as possible; not dying prematurely, or before one's life is so reduced as to be not worth living
2. Ability to have good health, to be adequately nourished, to have adequate shelter, to have opportunities for sexual satisfaction, to move about from place to place
3. Ability to avoid unnecessary and nonuseful pain and to have pleasurable experiences
4. Ability to use the 5 senses, to imagine, to think and reason
5. Ability to have attachments to things and persons outside ourselves, to love those who love and care for us, to grieve at their absence; in general, to love, to grieve, to feel longing and gratitude
6. Ability to form a conception of the good and to engage in critical reflection about the planning of our own lives
7. Ability to live for and to others, to recognize and show concern for other human beings, to engage in various forms of familial and social interaction
8. Ability to live with concern for and in relation to animals, plants, and the world of nature
9. Ability to laugh, to play, to enjoy recreational activities
10. Ability to live one's own life and nobody else's

10a. Ability to live one's own life in one's very own surroundings and context

From Powers and Faden[62]

1. Health
2. Reasoning
3. Self-determination
4. Attachment
5. Personal security
6. Respect

Figure 1: Examples of Sets of Capabilities That Citizens Consider Valuable

VITA

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