Blue Zones: Rethinking the American Landscape

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Table of Contents

I. Abstract

Research in public health, urban design and planning has examined associations between the physical environment and community health and well-being. National Geographic Fellow Dan Buettner, along with a team of experts, including anthropologists, historians, dietitians, and geneticists, studied various hotspots of longevity across the globe called "Blue Zones." In this paper, the Blue Zones research will be analyzed through a spatial lens, attempting to find correlations between health and wellbeing, Blue Zones' longevity, urban design, and the environment. Implications of the Blue Zones research are outlined for general understanding. One of the main questions of this research is how can we apply the common habits and practices found in the Blue Zones to the United States? After thorough analysis, environmental and community factors appear to add to variance in longevity far beyond individual factors. Complications the study illustrates and future research directions are detailed in the conclusion. The Blue Zones, public health, urban design and planning literatures provide a valuable starting point for further multidisciplinary research on environmental contributions to longevity and public health outcomes.

II. Introduction

Current trends predict that by the year 2030, 75 percent of the American population will be obese and 50 percent of us will suffer from diabetes (Buettner, 2015). Although our healthcare systems seem to be flourishing with new medicines, immunizations, and surgical techniques being introduced each and every day, the American people are tormented with life-threatening illnesses, suffering with disabilities and dying from diseases that were primarily caused by personal lifestyle decisions. Medical students are moving to the United States from foreign countries across the globe to learn the latest and greatest medical practices, yet ironically some of the longest living humans are in their own backyards scattered across the globe (Rao, 1998). Why is there such a disconnect between the places with great healthcare practices and the places with great healthy lifestyles? Could it be that there is too much of a focus in the United States on treating people once they are already sick during these "extreme" events and not on keeping them healthy on a regular basis? The American "system" put in place seems to be completely backwards and has received quite a bit of criticism due to this (Menino, 2012). Instead of profiting on sick days, why aren't doctors instead profiting from keeping people healthy and out of doctor's offices, clinics and hospitals? What is the difference between health and healthcare and are they no longer synonymous? It all comes down to one point that Archelle Georgiou, a doctor on the research expedition to Ikaria, Greece with Blue Zones author Dan Buettner, mentioned very clearly in her TEDx Talk: Health is a choice (Georgiou, 2014).

The Danish Twin Study came to the conclusion that about 80 percent of how long we live is due to how we live including our lifestyle, habits and culture. The remaining 20 percent is based off of our genetics or access to basic healthcare (Herskind, 1996). The nexus between health, well-being and the environment, also known as livability, has been on the radar for a couple decades, but why are current land development practices and outdated policies still hindering our cities? There is not a lack of awareness about what needs to be done to create healthier, more livable cities, but there is a complete disconnect between the awareness and the actions of those responsible for the physical form of our cities (Speck, 2012). Planners only have some control over the city and there is often a lack of trust between the community and leadership. We need a multidisciplinary approach to healthy community design to create change and a lasting impact. A few larger cities in the United States are making big strides towards healthy, walkable community design, while others seem to be stuck with old land development policies and outdated zoning regulations, inhibiting change and growth. Small and midsized cities are where most Americans spend their lives, but the decisions of

their local officials are often making lives worse instead of better (Speck, 2012). There seems to be an absence of planning and a lack of cross-disciplinary communication to plan for the better.

A majority of this paper will be following the research documented in Dan Buettner's *The Blue Zones Solution* as well as other leading researchers in the fields of urban planning, architecture, transportation, community design and public health. Blue Zones, which are defined in the next section of the paper, should be of interest to everyone (planners, healthcare providers, and everyday people), yet few are aware that the research exists. With the help of Buettner's research, I will be asking key urban design and community health questions. How can we learn from the Blue Zones around the world to transform development practices and lifestyle choices in the United States? What similarities and differences are there between Dan Buettner's research and the research of Howard Frumkin, Lawrence Frank and Richard Jackson's *Urban Sprawl and Public Health: Designing, Planning and Building for Healthy Communities*? What are alternative policy solutions for implementing healthy lifestyle changes and are there any case cities in the United States that we can learn from?

As Georgiou stated, healthy living is a choice, but also an option that should not be hindered by our built environment no matter who we are: low-income or high-income, male or female, black or white. Relatively simple design fixes have the potential to reverse decades of counterproductive policies and practices (Speck, 2012). Although I mentioned that a few cities are jumping on board and making drastic changes to their built environment, many are still stuck with these outdated regulations inhibiting change. Currently, there is a growing demand for these simple design fixes to encourage walking, healthy eating, socializing, and overall healthy lifestyle decisions within communities. Jeff Speck stated in *Walkable City*, "We planners are counting on these typical places, because America will be finally ushered into "the urban century" not by its few exceptions, but by a collective movement among its everyday cities to do once again what cities do best, which is to bring people together – on foot." (Speck, 2012). Through a collective mass of these small and simple design fixes to create walkable, pedestrian-friendly environments, and also communities with connected social networks and healthy eating practices, we can transform cities and the overall health and quality of life for residents.

Definition of a "Blue Zone"

Blue Zones are places with high concentrations of 100-year-olds along with clusters of people who have grown old without diseases like heart problems, obesity, cancer or diabetes (non-communicable diseases measured with objective health measures). People living in Blue Zones not only live longer lives, but live *better* lives filled with good health, meaning and love (Buettner, 2015).

National Geographic Fellow and freelance writer, Dan Buettner, coined the term after a decade-long study of these longevity hotspots across the globe. The Blue Zone team consisted of leading medical researchers, anthropologists, dietitians, demographers, and epidemiologists. His findings were documented in *The Blue Zones Solution*, which is analyzed in this paper.

The 5 Blue Zones include:

1. Ikaria, Greece
2. Okinawa, Japan
3. Ogliastra Region, Sardinia, Italy
4. Loma Linda, California
5. Nicoya Peninsula, Costa Rica

Definitions of Health and Livability Terms

Primarily due to the interdisciplinary nature of this research, I found it important to first focus on getting a clear understanding of key health and livability terms that were common in most of the public health readings. There is a disconnect between the jargon used in healthcare, planning and design with expectations from the author that these terms are just understood. It became necessary to understand these definitions and their relationships to each other before attempting to understand the larger research itself. These were the definitions found to be most useful for this particular research.

Human well-being and GDP:

Human well-being is generally the state of being comfortable, happy and healthy, but is a broad term that includes access to basic services, livelihoods, safety, security from disasters, "feeling well", etc. In the conceptual framework, the constituents of well-being are materials, security, health, good social relations and enhancing human capabilities. GDP is the total value of the goods and services produced by the people of a nation during a year not including the value of income earned

in foreign countries (Merriam-Webster). Both terms are connected because they measure the "health" of a certain sector of life, but GDP does not take into account the objective and subjective measures of human well-being and whether the people living in each country are healthy and happy with their lives. There is an interesting link between well-being and GDP shown in the Cantril Self Anchoring Survey (Cantril, 1965) in the *World Happiness Report* showing that often poor areas are categorized as low on life evaluation (suffering), while rich areas are often categorized as high (thriving) (Gallup, 2009). Some of the Blue Zones research shows otherwise and often middle income is the healthiest of all.

Objective and Subjective measures of Health and Well Being

Objective measures of health are direct measures of an individual or population such as blood pressure, life span or infant mortality rates. Subjective measures of well-being directly survey people on their assessment of their life and well-being typically through three types of surveys: life evaluation (think), emotional well-being (feel) or life satisfaction. Both measures are complementary and provide valuable information to researchers and vary in importance depending on what is being studied. Subjective measures are useful in cases where measurement is difficult to do and important outcomes are difficult to capture objectively.

Noncommunicable and communicable diseases

Noncommunicable diseases are non-infectious and non-transmissible among people. Communicable diseases are able to be transmitted from one sufferer to another; contagious or infectious. Both types of diseases increase DALYs (disability adjusted life years) and decrease life expectancy.

Emotional and cognitive aspects of subjective well-being

Emotional aspects of subjective well-being include emotional well-being representing the range of emotions experienced and how we *feel* about our life. Cognitive aspects of subjective well-being include life satisfaction/life evaluation surveys representing how we *think* about our life. Both aspects can be covered in survey results and it is important to be able to separate results into their distinct, different categories of thinking and feeling. Subjective well-being represents a combination of both the emotional and cognitive aspects of subjective well-being.

Health & Well-Being and Livability

Health and Well-being are both the objective and subjective measures that define what people in a community are experiencing, thinking and feeling. Livability is now defined simply as the characteristics of a place that enhances health and wellbeing, broadly defined (i.e., H + W). Both terms are correlated to each so if a place has great health and well-being, then its livability is also greater because of it. Livability is more place oriented and health and well-being is more about the people within that place.

Livability and Environmental Sustainability

Livability is defined simply as the characteristics of a place that enhances health and wellbeing, broadly defined (i.e., H + W). Environmental Sustainability is a state in which the demands placed on the environment can be met without reducing its capacity to allow people to live well now, and *in the future.* Livability can be considered a smaller local, place-based, now factor of the larger, intergenerational, future factor being considered with sustainability (livability is part of sustainability).

Research Questions

There were many underlying research questions framing the initial scope of this paper. Below is a list of questions that better explain what is being asked through this research.

- What qualifies a Blue Zone and what are the similarities between them that Dan Buettner identifies in *The Blue Zone Solution*?
- What is the current health state of the United States? How has the "American Dream" turned into the American Nightmare?
- Where are the Blue Zones located their natural topography and climate have an impact on their longevity?
- How are their lifestyle choices and built environment different from the United States? Is it possible to Blue Zone America to counteract "The American Way of Life"?
- Can we "reverse engineer" our lives to match some of the environmental elements that bring life to the other places in the world?
- How can healthy lifestyle choices and community design positively impact quality of life and longevity?
- What are some policies in the United States that have effectively and successfully changed the built environment?

The “Power 9”: Common Habits and Practices in Blue Zones

Dan Buettner and his Blue Zones team were able to come up with 9 common habits and practices found in all 5 Blue Zones featured in *The Blue Zones Solution* (Buettner, 2015). This paper will address these 9 habits, but will also analyze the factors

Figure 1: The “Power 9” lessons learned from in the world’s long-lived populations (Buettner, 2015).

1. **Move Naturally**

   Right Outlook
2. Purpose
3. Downshift

   Eat Wisely
4. 80 percent rule
5. Plant slant
6. Wine at 5

   Belong
7. Right tribe
8. Community
9. Loved ones first

Determinants of Health and Health Disparities

The range of personal/biological, social, economic, and environmental factors and their interrelationships influence individual and community health status. It is important to understand that there are many interrelated factors that affect individual health and well-being (Healthy People 2020).

Determinants of health fall under several broad categories:

- Policymaking
- Social factors
- Health services
- Individual behavior
- Biology and genetics

"It is the interrelationships among these factors that determine individual and population health. Because of this, interventions that target multiple determinants of health are most likely to be effective. Determinants of health reach beyond the boundaries of traditional health care and public health sectors; sectors such as education, housing, transportation, agriculture, and environment can be important allies in improving population health (Healthy People 2020).

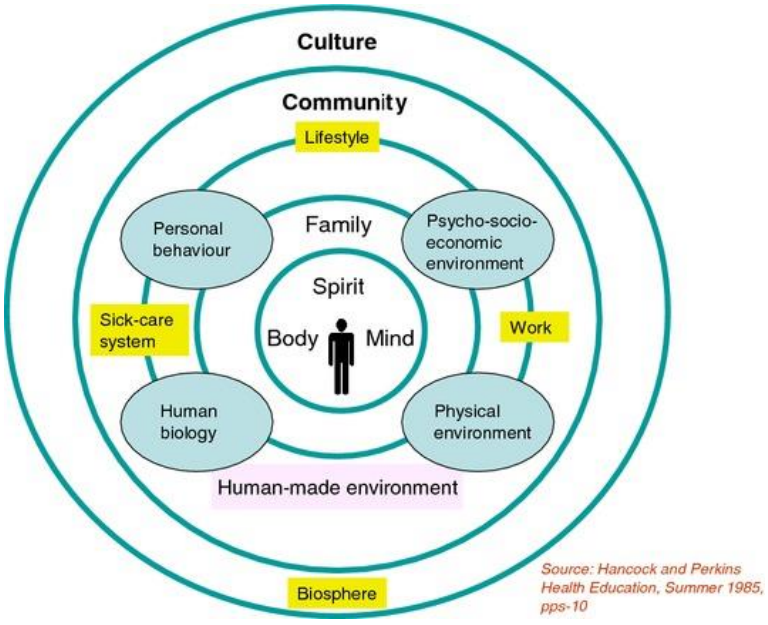


Figure 2: Personal, social, economic and environmental factors that affect an individual's health and well-being.

The Interactivity Theory

The Interactivity Theory is the interactive components of urban design theory and practice covered in *Urban Design and People* by Michael Dobbins (Dobbins, 2009). This theory provides a good framework for understanding how people and place are tied together in the Blue Zones and in the United States.

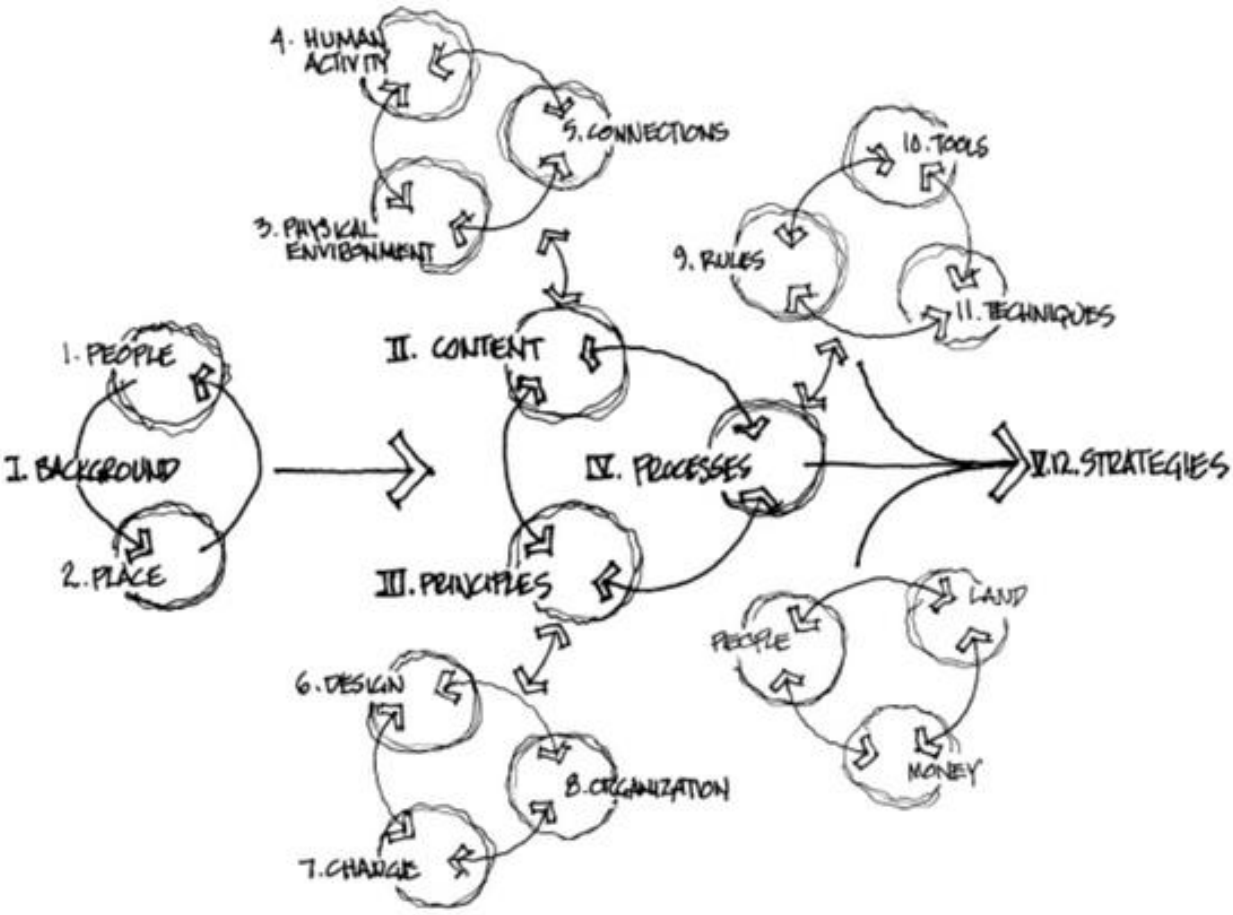


Figure 3: The Interactivity Theory (Dobbins, 2009)

Methodology: Health, Well-Being and Design Metrics

There are multiple metrics that can be used to access a community's objective health, quality of life, subjective well-being and overall urban design.

Objective Health Metrics

Objective health metrics are direct measures of an individual or population such as blood pressure, life span or infant mortality rates.

The Global Burden of Disease Study is the primary resource being used to pull global health data to compare the United States to the Blue Zone regions. Health data is not easy to access, but this specific study provides interactive tools that can be used easily to make comparisons across different populations. The health data found is generalized due to this large scale, yet still very helpful to make general conclusions. In the Global Burden of Disease Study, there were various metrics used to represent health status such as:

- Deaths
- Years of life lost (YLLs)
- Years lived with disability (YLDs)
- Disability-adjusted life years (DALYs)

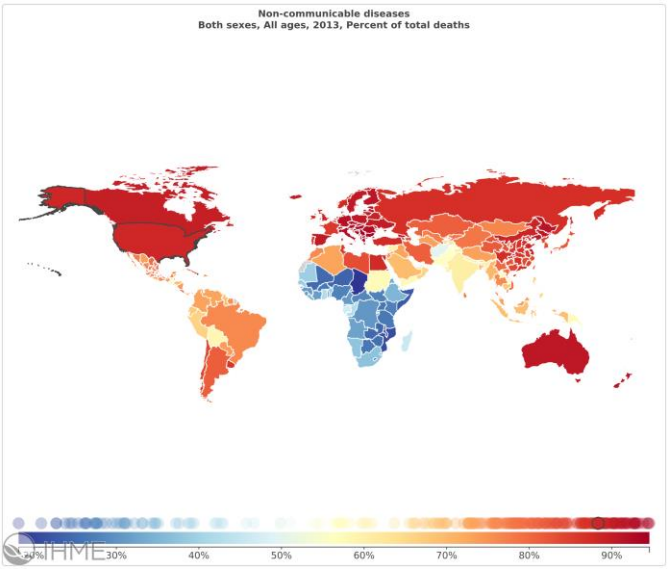


Figure 4: Global Burden of Disease Study; This global map provides a general observation that currently, the countries that suffer the most from non-communicable diseases are often developed countries with the highest GDP. The United States has close to 90 percent of its total deaths caused by non-communicable diseases.

Source: Institute for Health Metrics and Evaluation (IHME). GBD Compare. Seattle, WA: IHME, University of Washington, 2015. Available from http://vizhub.healthdata.org/gbd-compare.

Livability and Subjective Well-Being Metrics

Subjective measures of well-being directly survey people on their assessment of their life and well-being typically through three types of surveys: life evaluation (thinking), emotional well-being (feeling) or life satisfaction. In Dan Buettner's Blue Zone research, researchers studied daily routines of centenarians first-hand by living and dining in their homes and observing how they make food,

interact with their neighbors and go about their day. Objective well-being measures are important on paper to make clear-cut comparisons, but often times there are many indirect factors that are only evident when observing an individual, their environment, and asking them to rate their own lives from their perspective. I will be using the Gallup-Healthways Well-Being Index along with the 2016 World Happiness Report to find interesting information on communities in the United States as well as around the world.

The Gallup-Healthways Well-Being Index was a primarily database that was looked at throughout this research. This index is the most proven, mature and comprehensive measure of well-being in the world. The index claims to use the holistic definition of well-being and self-reported data from individuals with relation to the purpose, social, financial, community and physical aspects of well-being. Increased well-being should be a top priority for leaders of populations because it means lower healthcare costs, increased worker productivity, decrease in obesity, decrease in disease onset and enhanced organizational and community competitiveness (Gallup, 2009).

The 2016 World Happiness report is similar to the Gallup-Healthways Well-Being index in that it is measuring the quality of life of an individual from their perspective. The questionnaire is based on the Cantril Scale, in which people place themselves on a scale of zero to 10, with zero being the worst possible life for you, while 10 being the best possible life for you. The survey measures people's "sense of" well-being rather than their mood at that specific time.

Urban Design Metrics

The two urban design metrics that will be used in this research are walkability and urban form. Walkability is an ends, means and measure (Speck, 2012). It is known to contribute to urban vitality and also serves as an indicator that can be used both quantitatively and qualitatively. While programs such as WalkScore can easily quantitate a score based on a place's access and connectivity, it does not take into account the personal experience and feeling of walking in a certain area. Walking audits and personal surveys can be used to measure the experience of the walk.

In this paper, cities will be analyzed from Google maps. This simple analysis involves comparing the urban form and underlying street network of the cities. By mapping the village, urban city or suburb typologically, I am hoping to find correlations with the urban forms and longevity. There may or may not be a correlation found, but I am curious whether a pattern begins to emerge. Michael Dobbins classified three urban design traditions in his book, *Urban Design and People*. I am

classifying the cities based off of the three traditions: the organic, the formalist, and the modernist (Dobbins, 2009).

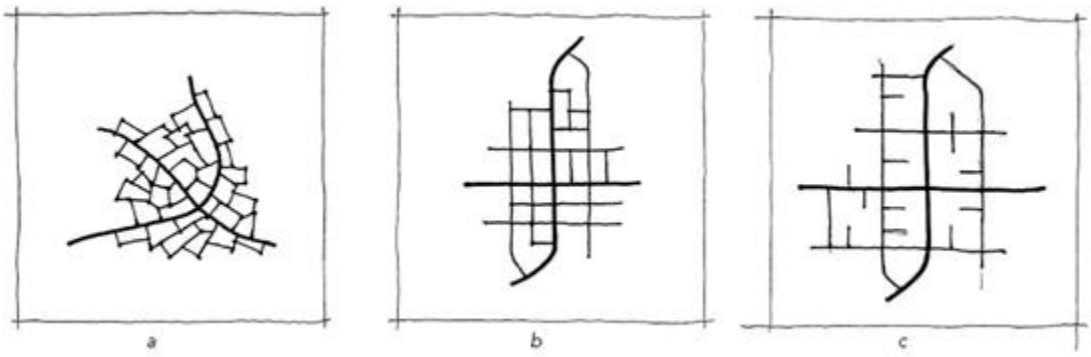


Figure 5: The three urban design traditions: the organic, formalist and modernist (Dobbins, 2009).

The organic urban form was the first tradition and is often thought of as naturalistic, indigenous, vernacular, incremental, and informal. People primarily arrange their activities and connections according to natural systems like water, land, soils, orientation and climate. The work done on the built environment is a cooperative effort using resources at hand across a wide variety of landscapes resulting in a very local feel. The postmodern suburbs have a dendritic street pattern similar to the organic form. With dependence on collector and arterial streets to gain access to otherwise nearby neighbors (Dobbins, 2009).

The formalist urban form is thought of as planned, classical, the grid, monumental, and in the United States in the past and currently, City Beautiful and New Urbanism. This urban form shaped cities all over the world and can be especially present in new urban cities in the U.S. and small towns all over the Midwest. The structure is composed of an orthogonal grid of hierarchically arranged street systems, formal parks, squares, and plazas. Buildings or monuments that are deemed important terminate the views of axial and ceremonial boulevards (Dobbins, 2009).

The modernist urban form is thought of as rationalist, functionalist, technological, utilitarian, systematic and efficient. The modernism movement cast out both formal and organic traditions as inefficient ways of city functioning and put high priority on the automobile as the most efficient means of transportation. Le Corbusier and Mies van der Rohe are two of the famous architects from the modernist movement (Dobbins, 2009).

It is important to mention, as Michael Dobbins does in his book, that it is often rare to find these traditions in their purest form and they are often in continuous interaction with each other within a city because the city itself was built over time. In this research, I am assuming that most

urban forms in the Blue Zones will be organic or formalist, but I wanted to make sure that the modernist tradition was also considered.

III. Background: The American Nightmare

Currently in the United States, we are living in a time where healthcare seems to be flourishing. Compared to decades ago, we now have better treatments, medicines and surgical techniques for just about every health issue out there. We are able to prevent many diseases and there are a variety of immunizations available for fighting measles, hepatitis, pneumonia and others that people generations ago never could have dreamed of. Despite large investments in medical research and treatment, the rising costs of health care are fearsome. Although on paper, the American people seem to have it figured out, Howard Frumkin, Lawrence Frank and Richard Jackson, three of the nation's leading public health and urban planning experts make a strong case for how we in fact have got it all wrong. They summarize the evidence linking adverse health outcomes with current American sprawling development, and outline the complex challenges of developing policy that promotes and protects public health. In their book *Urban Sprawl and Public Health*, Frumkin, Frank and Jackson explore one key question that will also be addressed in this paper: How does the physical environment in which we live affect our health?

Poor Health Outcomes

The current adverse health outcomes in the United States are somewhat disturbing. We spend around a trillion dollars a year on preventable diseases but devote only 3 percent of our health care budget to prevention (Buettner, 2015). The proportion of Americans who are overweight or obese is a growing national concern. The percent of Americans who are overweight has increased at an alarming rate from 24 percent in 1960, to 47 percent in 1980 to over 64 percent in 2000. Obesity itself increases the risks of cancer, diabetes, heart disease, stroke, high blood pressure, arthritis and many other non-communicable diseases that known to decrease life expectancy and increase disability adjusted life years. Obese people are 40 times more likely to develop diabetes and the prevalence of the disease has doubled since 1980 (Frumkin, 2004). If current trends continue, three-fourths of us will be obese and one-half of us will suffer from diabetes in 2030 (Buettner, 2015). One in three Americans

84%

of all U.S. medical costs are explained by physical inactivity, food choices and portion size, tobacco and unmanaged stress (Buettner, 2015)

will be diagnosed with the disease within their lifetime. Being overweight has overtaken tobacco as a major cause of death in the United States (Frumkin, 2004).

Asthma rates have also increased in the United States and about 10 percent of the population is affected (Frumkin, 2004). Asthma is an outcome of air pollution caused by increased automobile use. On an average day, about 120 Americans will die in an automobile related accident; a horrifying yet accepted statistic. The amount of Americans being clinically diagnosed with depression, anxiety, inattentiveness and hyperactivity is increasing at an alarming rate and the amount of children being medicated for such problems should be quite eye opening, but big changes in lifestyle don't seem to be taking place.

Also, as Americans age, rates of arthritis, osteoporosis, and disabilities are increasing at a drastic rate compared to other nations across the globe. The Gallup-Healthways United States Well-Being Survey shows the state well-being ranking for older Americans in 2014 and 2015 in *Figure 6* (Gallup, 2014).

The subjective measures of health and well-being also show worrisome results. The number of days on average that an American reports feeling unwell or sick has increased by 12 unwell days a year. In 2001 the United States spent about 14.1 percent of GDP on healthcare, totaling about $1.4 trillion (Frumkin, 2004).

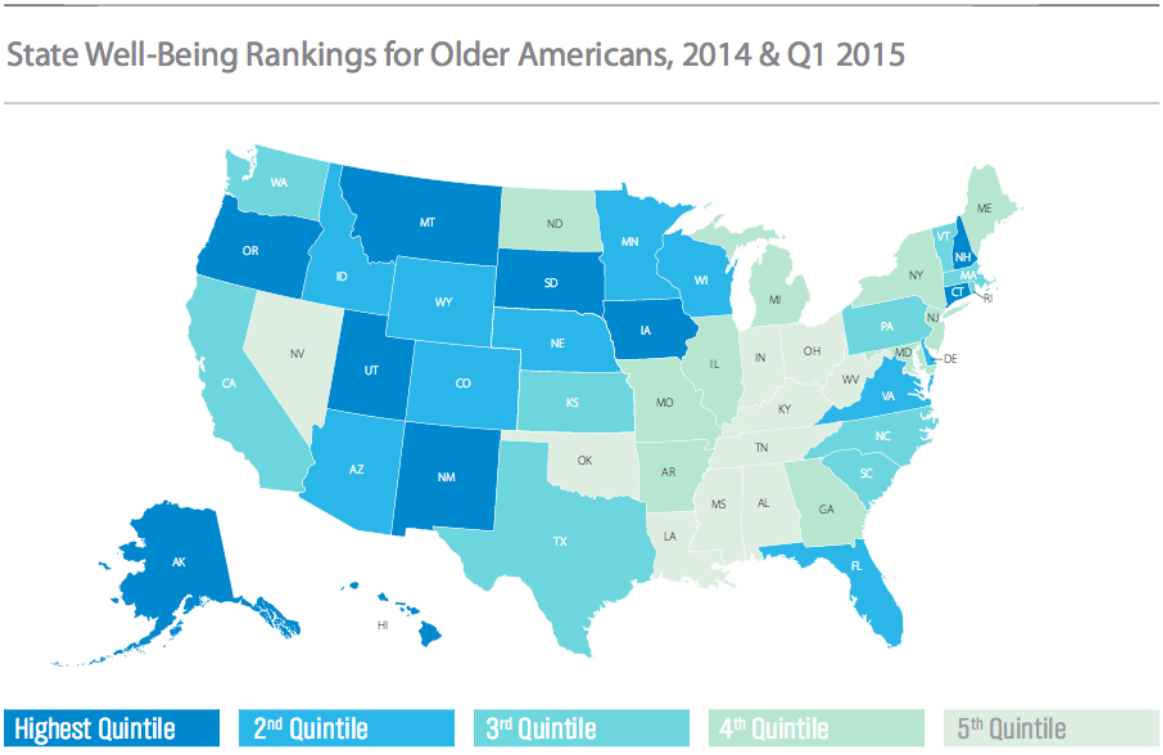


Figure 6: State Well-Being Rankings for Older Americans, 2014 (Gallup, 2014).

Age group:	≤54	55 - 64	65 - 74	75+
Fresh produce consumption*	53.9	60.7	63.9	69.9
Exercise (3 to 7 days in the last week)	53.7	49.5	49.3	46.5
Obesity	26.4	33.1	31.8	21.0
Depression	9.6	14.3	11.5	7.4
Smoking	22.3	19.5	12.9	6.5
Learn or do something interesting every day	65.1	63.5	67.5	67.1
Have enough money to do everything I want to do	35.2	41.1	53.3	61.7
Friends and family give you positive energy	76.3	73.0	78.0	80.8
Health insurance coverage	81.1	89.9	97.6	98.1
Have a personal doctor	69.9	89.1	95.2	96.0

Scoring for age groups: High High-mid Mid-low Low

*Eat 5+ servings of fruits and vegetables 4+ days in last week

Figure 7: State Well-Being Rankings Analysis for Older Americans (Gallup, 2014)

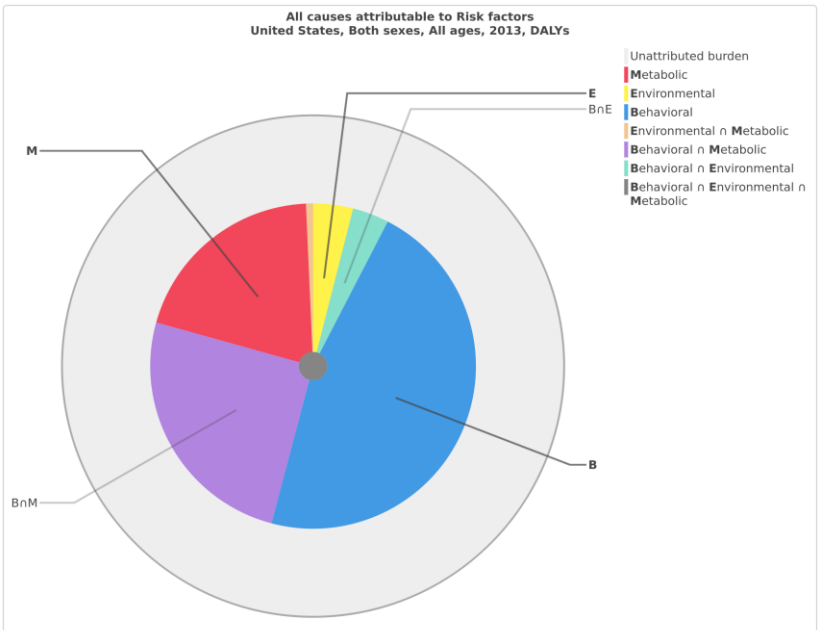


Figure 8: Risk factors in the United States are primarily due to behavioral choices shown in the blue above. "Behavior and metabolic" risks as well as "metabolic" risks are also a large threat

Source: Institute for Health Metrics and Evaluation (IHME). GBD Compare. Seattle, WA: IHME, University of Washington, 2015. Available from http://vizhub.healthdata.org/gbd-compare.

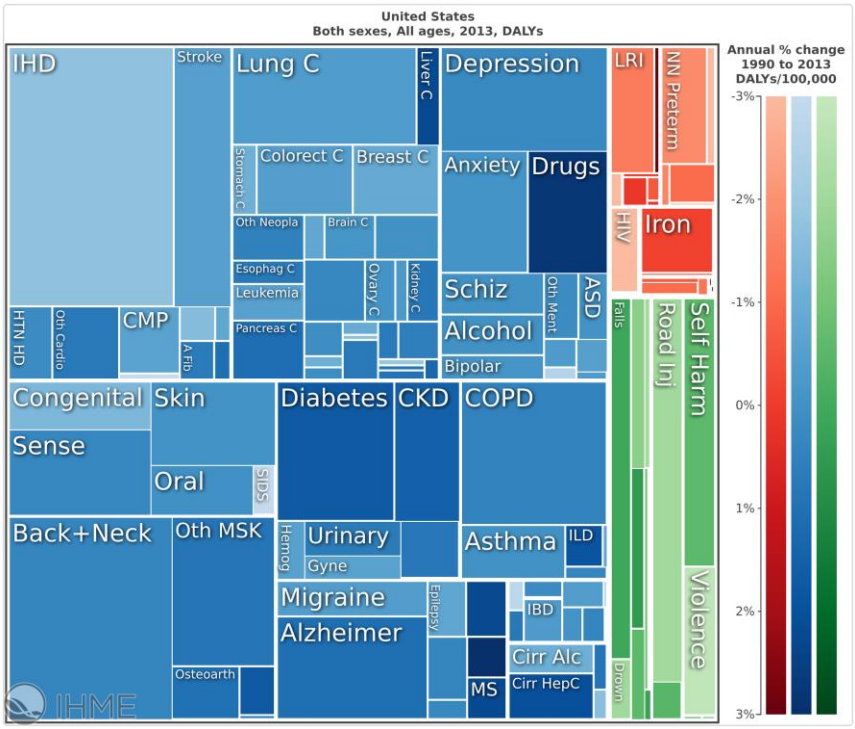


Figure 9: Prevalence of non-communicable disease in the United States compared to communicable diseases (Institute for Health Metrics and Evaluation).

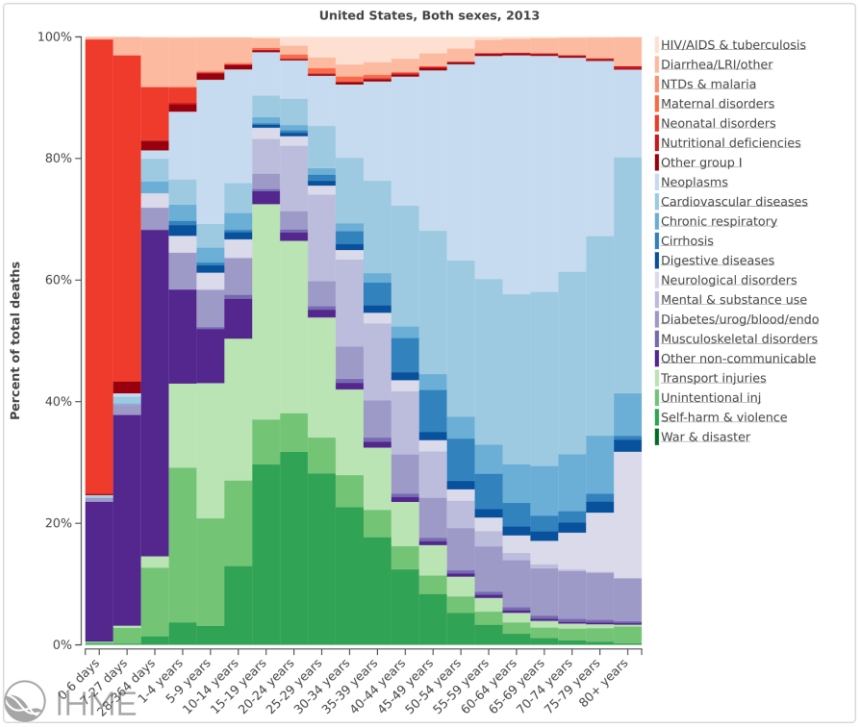


Figure 10: Percent causes of total deaths in the United States for both sexes by age group in 2013. The percent of death caused by non-communicable diseases increased drastically over age groups becoming the leading cause of death by a majority starting in the 30s (Institute for Health Metrics and Evaluation).

Urban Sprawl and Outdated Land Development Practices

Howard Frumkin, Lawrence Frank and Richard Jackson state that the main cause of increased non-communicable diseases and stagnant quality of life measures is due to the built environment and the way the United States has rapidly developed land in the last couple decades. For decades now, growth and development within the United States has been low-density, automobile-dependent urban sprawl. Sprawl has both direct and indirect impacts on human health and subjective well-being through its overall design, land use and transportation.

Urban Sprawl and Public Health states that over the last fifteen years, the United States has developed 25 percent of all the land developed in the entire 225 years of the life of our Republic (Frumkin, 2004). Instead of building density in the urban core, we are continuing to push the urban growth boundary by clearing what was once rural land on the urban fringe into the next ring of suburbs. Cities have sprawled over vast expanses with concentrated poverty in the center and low-income immigrants living in the first of second ring of suburbs that have become the most affordable (Dunham-Jones, 2011).

There are many problems with the way suburban sprawl development impacts the city and its residents but the number one issue is access to public transportation and the increased dependence on the private automobile due to increased commutes. These expanding metropolitan areas are very much automobile-oriented. The majority of American people live in places built for cars and not the pedestrians. In cities like Atlanta, most of its residents live in the suburbs surrounding the city and not in the walkable urban center. This prioritization on the automobile ends with little to no planning for pedestrian infrastructure. It is not uncommon for a family to be living in a place with no sidewalks or walkable destinations. All daily trips must be done in an automobile due to the spread out nature of these destinations (Dunham-Jones, 2011).

The second problem with sprawling metropolitan areas are that they are transient; Americans are not easily able to live in the same community throughout their lives and grow old with the same friends they had when they were just children. Often people end up having to live across country from their family and friends. When they do get to see their relatives, they have to travel long-distances in a car or plane to visit, compared to prior generations that could walk to the other side of town (Frumkin, 2004).

The third problem with urban sprawl is that it results in neighborhoods with lacking diversity. The separated land uses and zoning regulations make homogeneous subdivisions where everybody living in the same area has a similar race/ethnicity and socioeconomic status. Children become bored and alienated if they are not able to walk or bike to school and goof around in the

neighborhood with friends. Today, more than three million children have significant depression symptoms. Aging in place is a major problem in this urban form because when people should no longer be driving, there are few options such as walkable town centers with services and user-friendly transit available (Frumkin, 2004).

This automobile-orientation is not a good thing for society's health and well-being. The average American mother spends more than an hour a day chauffeuring children and running errands, which is much longer than a generation ago (Frumkin, 2004).

Without drastic policy and design changes to the development world, these trends are clearly going to continue. It is important to note that changing demographics in the United States will definitely play a huge role when we look over the horizon into the future. The United States will have double the population at the end of the 21st century than it has today on the same amount of land. It is also important to consider the aging baby boomer population that will be retiring and needing places to live that are walkable when they are no longer able to drive (Dunham-Jones, 2011). In 2020, nearly 20 percent of the population will be over the age of sixty-five years old (Frumkin, 2004). The amount of walkable urban places does not meet the growing demand. Growing number of Americans opting for more urban lifestyles, but city centers don't welcome return of people.

These statistics are actually not that surprising to the average American and although we may not be able to pinpoint the root cause of these poor health and lifestyle trends, we are able to feel that things are not ideal. Based on subjective well-being surveys, America is not the happiest country in the world, although we often think that we have it the best. The average American works 1,821 hours per year, which is more than any other developed country except Korea and Australia (Frumkin, 2004). We spend a huge portion of our free time sitting in our cars driving or sitting in traffic waiting to get to our next destination. Home-prepared meals are infrequent when it is much easier to dine out or pick up food on in-between activities. We no longer have time for community work and have even less time for socializing with neighbors and family. Despite having technology that should make tasks faster and options more readily available so that we have time to live a healthy, balanced life, we are lonelier and more isolated than ever. Children are no longer able to roam around the neighborhood, socialize with neighbor friends, get exercise and have quality experiences that help develop their character.

The saddest part of the current American story is that this did not happen to us by chance, but instead we legislated and planned for society to be this way through zoning, tax subsidies, subsidized highways, etc. When issues do arise, we tend to look at the immediate and direct cause

without thinking further at the larger systems boundary and built environment that is playing a larger role than we think.

Access to healthy foods in the U.S. is correlated to socioeconomic status. The uneven distribution of wealth leads to disinvestment in low-income and often times non-white neighborhoods. A "toxic" nutrition environment is present when there is a sea of cheap, high-calorie junk food and drinks and a saturation of junk-food advertising. The average American now consumes 46 slices of pizza, 200 lbs. of meat, 607 lbs. of milk and other dairy products, and 57 gallons of soda pop annually. They consume 8,000 teaspoons of added sugar and 79 lbs. of fat annually (Buettner, 2015). Neighborhoods can be classified as a food desert when healthy, affordable food options are not available. Sadly, the United States is cluttered with these toxic nutritional environments where residents cannot walk to the destinations necessary for daily life.

American cities have become no-walking zones (Speck, 2014). Without any larger vision or master plan, engineers have turned downtowns into places that are easy to get to but not worth arriving at (Speck, 2014). The American landscape is one of smooth traffic and ample parking, but these characteristics have little impact on livability.

Walkability is a very important aspect of a neighborhood to pay attention to. Larry Frank's research in urban design and public health has shown that in sprawling areas, people drive more, pollute more, and weigh more. When everyday destinations are located closer to home, people walk and ride public transit more frequently. As mentioned earlier, type 2 diabetes is affecting one in three diabetic children. This condition used to be called "adult onset diabetes," but now children are having the condition due to the environments that we live in. One of the best methods for preventing and treating diabetes is weight loss and exercise. Walking is one of the best methods out there to allow for easy and safe exercise without having to pay gym membership fees. Walking for just two hours per week reduces the death rate for people with diabetes by nearly 40 percent (Frumkin, 2004).

Howard Frumkin, Lawrence Frank and Richard Jackson examine both these direct and indirect impacts of sprawl on community health and well-being and suggest ways to improve health through alternative design, land use and transportation approaches. They argue for choices within the built environment, so that people can make decisions about where they want to live without only one choice given to them. Currently, zoning practices separate uses and make it nearly impossible for mixed-uses and housing choices to exist in a neighborhood.

Outdated zoning and building codes create single-use, private buildings with equally boring and uncomfortable public spaces. They also argue for more density when developing. Density allows for more walkable, urban spaces that are aesthetically appealing, environmentally sustainable and

safe due to Jane Jacob's concept of "eyes on the street (Jacobs, 1961)." Smart building designs and codes will allow for all of these changes, so that more people are on the sidewalks and riding public transit. Schools should also be built in the city center instead of off on the urban fringes of town. When a school is located in the city center, its facilities become resources for the whole community to enjoy and take pride in (Frumkin 2004).

Technology Replacing Basic Human Activities

In this digital age, it seems like there is no aspect of life that hasn't been turned into an app. Fitness and physical activity are definitely all over the web and you can now turn what used to be a personal and natural routine into a shareable and wearable badge. In American society, moving naturally has become something that is so rare, that even doing it deserves a pat on the back. There are both pros and cons to new personal fitness tracking devices such as Fitbit, Garmin, Nike Fuel Band, Jawbone, MyFitnessPal, or one of the many others, but the negative effects that technology seem to be having on American society seem to be very heavy.

The first problem with these fitness trackers are that individuals are too busy checking their device and inputting every calories, while losing valuable time just listening to their own bodies and learning how to understand how they are feeling. I find this very similar to the "Downshift" habit that Blue Zones take part in. Americans don't trust ourselves anymore and feel the need to rely on technology for everything, even something as simple as walking. In Johnny Adamic's article "The Dark Side of Your Fitbit and Fitness App" he rants about similar issues that I absolutely agree with. He states that "The act of exercise is no longer a mind-to-body experience but rather a mind-to-fitness-tracker-device-to-body phenomenon (Adamic, 2015)" Fitness tracking devices have the ability to take beauty and fun out of the most basic of human activities.

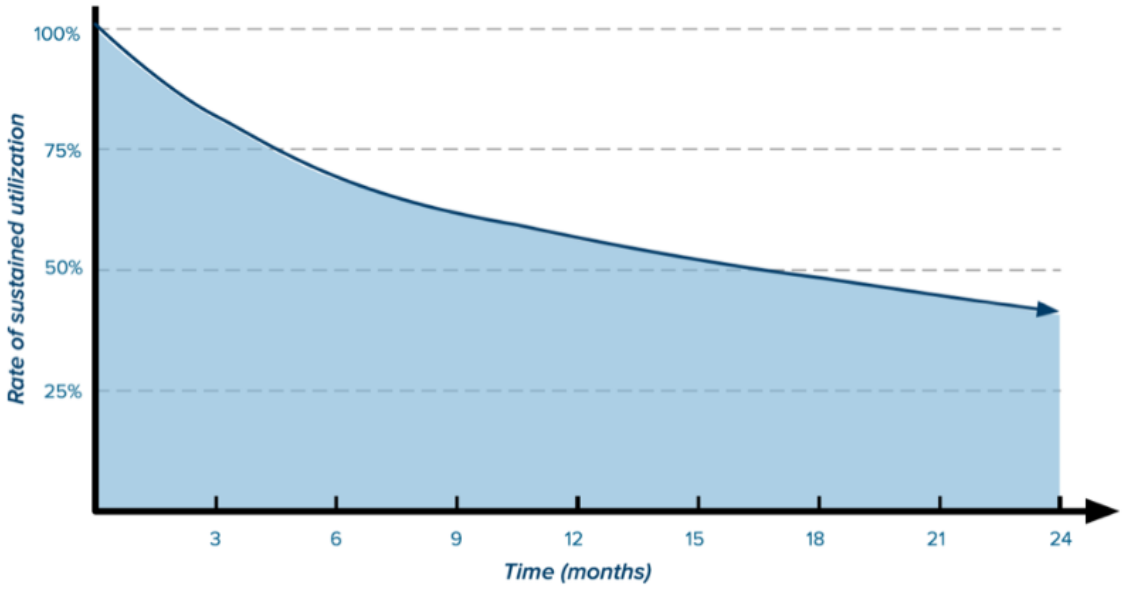
The second problem is that these trackers rely on limited metrics that are simplified down to steps taken, movement, calorie tracking, heart rate monitors, distance traveled, etc. These limited metrics give you a skewed analysis of your health. Your health is very much a composition of many diverse and overlapping factors. These factors can be cultural, genetic or most importantly due to your surroundings. Nearly half of all smartphone users have some sort of health app on their phones and half of all American adults have a smartphone (Adamic, 2015). Twenty-five percent of the population is using oversimplified and insufficient data to make assumptions about their health!

The step that is missing while using a fitness tracker is self-reflection. Americans need to drop the technology and deeply think about how they feel currently and where they would like to be in the next week, month or even year. Instead of using fitness trackers as a distraction or a crutch,

we need to look at our lives honestly and re-evaluate our habits and surroundings that we have control over.

The underlying benefit of the fitness tracker is that it represents a clear recognition that lifestyle choices and priorities are not where they should be and that an individual is on the spectrum of behavior change for health. This is the first step of improving well-being if the built environment remains unchanged. I see it as a call for help. Americans know that things don't feel right, physical activity is getting put on the back burner and poor health is ultimately ruining lives. They buy a fitness tracker with all good intentions of changing their ways. The problem is that these pieces of technology only track behavior, they don't have the ability to change it.

In a way, fitness trackers seem to be even more eye-opening that driverless cars. Instead of technology replacing human effort, technology is now replacing human nature. Technology is ruining the overall experience of the mind-body connection involved in exercise. We should be pursuing fitness activities to please ourselves and not for the fitness app or to share our results on social media. We should be putting down technology to listen to our bodies for a change.



Declining Rate of Sustained Activity Tracker Use Over Ownership
(Endeavour Partners, September 2013)

Figure 11: "Endeavour Partners' research reveals that more than half of U.S. consumers who have owned a modern activity tracker no longer use it. A third of U.S. consumers who have owned one stopped using the device within six months of receiving it (Ledger, 2014). "

IV. The Secret Life of the Blue Zones

As mentioned earlier, Blue Zones are places with high concentrations of 100-year-olds along with clusters of people who have grown old without diseases like heart problems, obesity, cancer or diabetes. People living in Blue Zones not only live longer lives, but live *better* lives filled with good health, meaning and love (Buettner, 2015).

National Geographic Fellow and freelance writer, Dan Buettner, coined the term after a decade-long study of these longevity hotspots across the globe. The Blue Zone team consisted of leading medical researchers, anthropologists, dietitians, demographers, and epidemiologists.

The 5 Blue Zones include:

1. Ikaria, Greece
2. Okinawa, Japan
3. Ogliastra Region, Sardinia, Italy
4. Loma Linda, California
5. Nicoya Peninsula, Costa Rica

Ikaria, Okinawa, Sardinia, Loma Linda and Nicoya Peninsula are all highlighted by Dan Buettner as the key Blue Zones or hotspots of longevity in the globe. Dan Buettner chooses to focus quite a bit of attention on the diet of all 5 Blue Zones. All five regions have a specific diet and interesting dining habits that contribute to longevity, but the secret to eating to 100 lies not only in what the centenarians eat, but how that food fits into their lives. The daily rituals and lifestyles surrounding these people are just as important as the food that they are putting into their bodies.

So you may be asking yourself, what is so special about these Blue Zones? Simply stated, people living in Blue Zones have 12 higher quality years on average than the typical American. People living in the Blue Zones aren't suffering from obesity, diabetes and cancer. Living in a Blue Zone can add 8 or more years to your life (Buettner, 2015). Adopting Blue Zone "solutions," as Dan Buettner calls them, sheds about 20 pounds off the average person, reduces heart disease by one-half and reduces one-fifth the amount of diabetes and cancers (Buettner, 2015).

This section of the paper will briefly cover geography, climate, history, culture, urban form, diet, lifestyle, outlook and health of the 5 Blue Zones. Originally, the main goal of this research section of the paper was to get an overall understanding of the various Blue Zones across the globe and understand how they share the common "Power 9" habits and practices that Buettner has already

identified. As research continued, I began to realize an overarching theme that seemed to be holding all practices together.

Location, Location, Location

Dan Buettner and his Blue Zones team were able to come up with 9 common habits and practices found in all 5 long-lived populations featured in *The Blue Zones Solution*. I would like to argue that there is a direct factor that is influencing all 9 of these longevity practices: the surrounding environment. In real estate, you always hear that the most important three things to consider when thinking of investing in property are:

1. Location
2. Location
3. Location

Where a home is located is typically the most important factor in its economic value. This statement holds true when investing in good health and well-being.

The residents of Ikaria, Okinawa, Sardinia, Loma Linda and Nicoya Peninsula were blessed with a physical setting and built environment that nudges residents into moving, isolates them from surrounding influences, nurtures self-reliance and a healthy mind-body relationship. Most of the Blue Zones did not choose to isolate themselves from the rest of the world, but instead their environment gave them no choice. In the case of Ikaria, the absence of natural harbors forced the residents to live off the land and eat what they grew in their gardens to survive. As a result, their diets are completely organic.

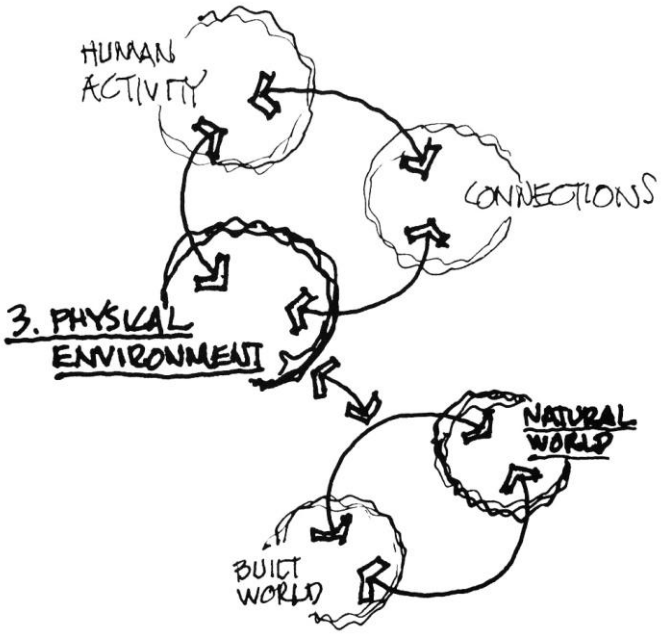


Figure 12: The physical environment's role in the Interactivity Theory (Dobbins, 2009).

Poverty, remoteness and the need for self-reliance are actually underlying reasons for longevity in some of the Blue Zones. The environment caused the longevity.

This argument about the importance of the geography, climate and spatial design factors holds true for all five Blue Zones. The geography and climate seemed to be very similar across the board. Although the regions were scattered all across the globe, they all tend to hug near the equator with warmer, sometimes tropical or Mediterranean climates. All Blue Zones are also very hilly, which makes walking a daily exercise. There is no need to have a gym membership in the Blue Zones because the hilly terrain keeps residents active (Buettner, 2015).

After studying the urban form of each Blue Zone on Google Maps, a trend began to emerge: the organic urban form. These hilly villages are isolated from the outside world, so it is no surprise that they take the shape of a more incremental, organic form. The organic urban form is naturalistic, indigenous, vernacular, incremental, and informal. The residents primarily arrange their activities and connections according to natural systems like water, land, soils, orientation and climate.

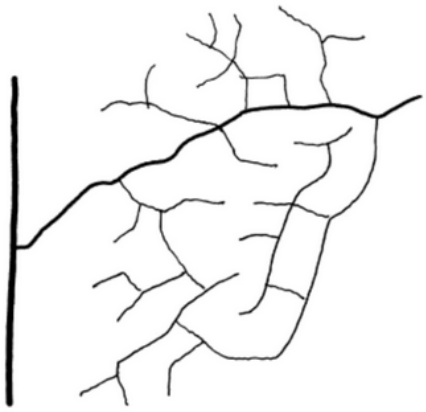


Figure 13: The organic form (Dobbins, 2009).

Figure 14: Ikaria's nexus of the natural and built environments. Source: Google Maps

In Ikaria, the terraced gardens can be seen easily from satellite view on Google Maps in *Figure 14*. The Ogliastra Region, of Sardinia, Italy is so hilly that the shepherds only need to walk at a slow pace to get their daily exercise. In organic forms, the work done on the built environment is a cooperative effort using resources at hand across a wide variety of landscapes resulting in a very local feel. Every Blue Zone studied was very connected with nature.

Residents of Blue Zones all live off the land and choose to eat mostly fruits and vegetables. The Blue Zones are remote and the people have stuck to their traditions and avoided the influence of modern Western eating habits. Dan Buettner believes that food is the best starting point for anyone

seeking to emulate the health, longevity, and well-being found in the world's Blue Zones. Although there is an interconnected web of factors that make up health, longevity, and well-being, food decisions determine a large amount of how we spend our time. The United States has the environment to live off the land, but the lifestyle we have created for ourselves is one of consumption. We live in a time where there are constant temptations to eat unhealthy, salty snacks and processed meals. We have to instill measures to emulate their diet. Buettner believes that in the United States, instead of focusing what to eat to get healthy, we need to start thinking of what we should cut out of our already oversaturated diets (Buettner, 2015). Sugar is an easy thing to start with. In the Blue Zones they don't have a lot of hidden sugars in their diet, so any sugar that is added is controlled.

Power 9 to Power 5: The Ecology of Health

There is a spatial or design component related to all nine habits identified by Buettner, but "moving naturally, plant slant, right tribe, community and loved ones first were found to be the most related to our natural and built environments and this paper addresses them in more detail.

The Blue Zones Solution "Power 9"

1. ***Move Naturally***
2. Purpose
3. Downshift
4. 80 percent rule
5. ***Plant Slant***
6. Wine at 5
7. ***Right tribe***
8. ***Community***
9. ***Loved ones first***

Figure 15: The 5 lessons learned from in the world's long-lived populations that are most correlated to the natural and built worlds (Buettner, 2015).

Ikaria, Greece

"We live a long time, but it's probably just because of good luck," was a quote from an Ikarian newspaper back in May of 2009 as a response to the research being done in the Greek island of Ikaria (Georgiou, 2014). It is actually not luck at all why Ikarians live so long. Their remoteness and self-reliant mentality is the reason for their longevity. The physical environment naturally created a place that gave them the gift of life. Ikarians know their neighbors, are close with their friends and family, and make sure to devote time towards socializing every day (Buettner, 2015).

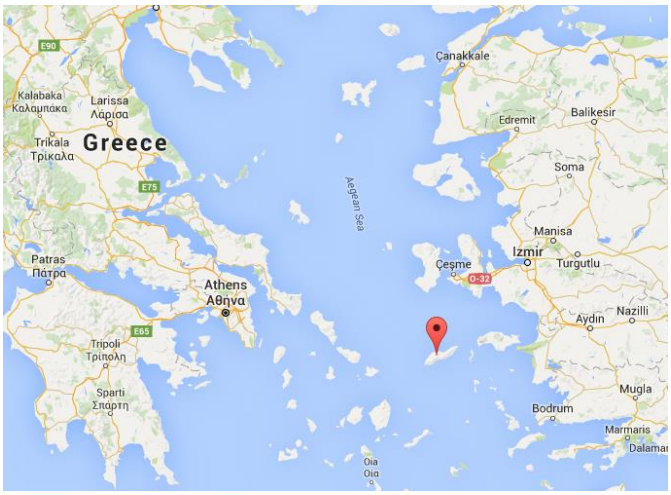


Figure 16: Ikaria context map. Source: Google Maps

Geography and Climate

Ikaria is a small Greek island in the Aegean Sea 8 miles off the coast of Turkey with world's lowest rates of middle-age mortality and lowest rates of dementia. The island is 98 square miles in area with 102 miles of coastline and a population of 8,312 people (Wikipedia). Somehow this remote island managed to become a jackpot of healthy centenarians with almost no records of chronic diseases.

Much of their clean health record is due to history and the geography of the region. The population of Ikaria lives almost entirely in the central area of the island due to invasions by the Persians, Romans and Turks. Primarily due to the hilly terrain and long travel distances to the sea, an isolated culture rich in tradition, family values, health and long life was created. The clean air, warm climate creates a constant growing season for plants and rugged terrain keep residents active and outdoors.

Surprisingly, the longest living Ikarians tend to be lower income people living in the island's highlands. The studies in Ikaria show that more of the 90-plus healthy Ikarians live in the mountains than on the coast (Buettner, 2015). Mountain living means that the typical walk becomes a mindless exercise. Old men can be seen tending their terraced gardens walking up and down the hilly terrain throughout the day. Walking to the neighbor's house for dinner keeps the muscles toned and moving even when going to socialize and relax. The main take away lesson from Ikarians geography is that the natural environment can either encourage or discourage movement and the most successful,

healthy communities are ones in which the geography and environment encourage mindless movement.

Culture and History

The Ikarian islands have always been isolated in geography as well as culture. In 2012, they unsuccessfully demanded their independence from Greece on grounds that the 1912 agreement to join Greece out of fear of Italian invasion was long expired. Ikaria wanted to join Austria and pull away from Greece, but the Greek Embassy in Vienna noted that the 1923 Lausanne Treaty gave Greece the island and surrendering the island was out of question ("Greek island demands independence, right to join Austria," 2012).

Due to the extreme remoteness of the land, in the 1940s after the Greek Civil War, the Greek government actually decided to start exiling communists to Ikaria. At one point in history, there were actually more communists in Ikaria than there were native Ikarians (Georgiou, 2014). Nearly 40 percent of adults still vote for the local Communist Party resulting in a foundation of good socialist ideals that permeate into all aspects of the Ikarian lifestyle (Georgiou, 2014).

Ikaria is not a country full of wealth, but rather full of poverty. The population is fairly young with about 75 percent of the population under 65. It is not uncommon to see multi-generational families all living under the same roof. Younger adults come home after college, live in their parents' houses and everyone has to contribute income to make a living. Without family support, it would be hard to for an individual to survive on their own (Buettner, 2015).

Ikarians have also been known as fierce Greek Orthodox Christians. Their religious calendar requires fasting and caloric restrictions for almost half of the year, which requires quite a large amount of personal self-control as well as conscience mind-body connection.

Outlook

What is most interesting about Ikarian Greek Orthodox Christians is that their spirituality is not necessarily religious, but is more rooted in the rituals and traditions. These rituals give them purpose and a reason to wake up in the morning. In Ikaria, everyone has a purpose and responsibility towards the family whether you're young, middle-aged or aging. As a family-oriented community, the elders are very much respected and viewed as beneficial to society.

Ikarians also do not live for money like many people do in more developed and fast-paced nations. In an article Buettner wrote for New York Times, he interviewed a man living in Ikaria who spoke of the lifestyle of neighboring Turkey compared to Ikaria: "Just 15 kilometers over there is a

completely different world. There they are much more developed. There are high-rises and resorts and homes worth a million euros. In Samos, they care about money. Here, we don't. For the many religious and cultural holidays, people pool their money and buy food and wine. If there is money left over, they give it to the poor. It's not a 'me' place. It's an 'us' place (Buettner, 2012)."

Lifestyle

In the morning, Ikarians wake up naturally and eat breakfast slowly. They typically take midafternoon naps to unwind in the middle of the day, which in turn decreases chance of dying from heart disease by 35 percent (Buettner, 2015). A 2008 paper by the University of Athens Medical School and Harvard School of Public Health researched Greek lifestyles and their napping routines. The researchers found that regular napping decreased a person's risk of heart disease by 37 percent (Buettner, 2015). Simple lifestyle choices like these help decrease stress hormones, rest the heart and in turn add years onto your life.

Socializing

Socializing brings us a fundamental satisfaction. Ikarians value socializing with their neighbors and getting together to enjoy food and good company. Fostering these connections has done wonders for their personal health and longevity. The islanders tend to be less stressed which means they eat slowly while socializing with friends and family. When you eat a meal in a hurry or with worry, stress hormones interfere with the digestive process. This means that the body is not able to absorb nutrients and antioxidants and the calories consumed are more likely to end up as stored fat.

Due to the dominance of communism on the island, socialist ideals are very much prevalent in socializing on Ikaria. Sharing with neighbors and group activities are big on the island so that everyone feels like an equal, the haves and have-nots.

Urban Design and the Built Environment

Christos Raches, Agios Kirykos and Evdilos are three mountain villages mentioned in the Blue Zones Research. Christos Raches was a mountain town that had a large amount of centenarians. When analyzing the town on Google Maps (*Figure 17*), it is clear that it follows the organic tradition most closely.

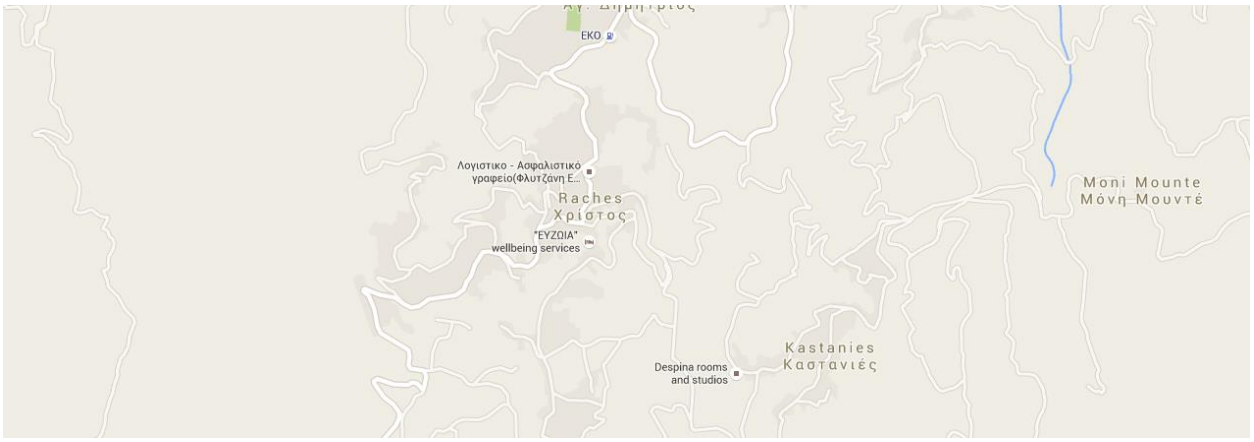


Figure 17: Organic urban form of Christos Raches, Ikaria. Source: Google Maps

Figure 18: Organic street network of Christos Raches, Ikaria. Source: Google Maps

Looking more closely at the street view of the mountain town, Christos Raches, Ikaria, you are able to notice that the roads are fairly narrow and wind around the hilly topography of the area. Houses are small, and tucked away from the road on the hillside. The small homesteads are shadowed by cedar forests and inclined on a rocky terrain. Prickly scrub, rocky riverbeds and unlikely vegetable gardens make up the surrounding land (*Figure 18*).

Diet

Fresh vegetables are always in season on Ikaria due to the Mediterranean climate. Unlike in traditional Mediterranean diets, Ikarians only eat fish sporadically due to the island's famously rough seas. The strong winds that surround the islands, which is mentioned in the "Illiad," and the lack of

natural harbors keep the island outside the main shipping lanes for most of the island's history (Buettner, 2015). Coastal dwellers enjoy swordfish, sardines, anchovies and small, local fish varieties about one to two times weekly, while the mountain dwellers only eat it twice a month due to the natural topography and difficulty of traveling to the coast. The fish that they do tend to eat is often preserved fish such as salted cod or sardines. The supercharged Mediterranean diet of Ikarians is one of the healthiest on the planet. They eat what they grow in their own gardens, forcing them to eat an organic diet with no processed foods as a necessity (Buettner, 2015).

Studies show that foods have a large impact over the type company that we keep, how we choose to socialize, and our underlying belief systems. Dan Buettner makes a great point that "Every time we take a bite, we vote for the world we want to inhabit: Are we supporting a system that favors a healthy climate and environment or are we helping to pollute our surroundings? (Buettner,2015)" Ultimately, the food we choose to eat also correlates to the type of people that we eat around. Healthy eating practices have the potential to create a critical mass movement toward healthier lifestyle choices as a whole.

The typical Ikarian can be seen sitting at a table overlooking the Aegean Sea with plates of fish, black-eyed peas with fennel, Greek salad, sourdough bread, and local wine; food known to some as the Mediterranean diet. Their extreme and unique version of the Mediterranean diet is loaded with fruits and vegetables, whole grains, beans, potatoes and olive oil. Their summer diet is filled with fish and vegetables and their winter diet is filled with pork-seasoned stews, root vegetables and cabbage soup.

Olive oil is used to replace butter and is a key healthy ingredient because it contains cholesterol-lowering monounsaturated fats that are most present in un-heated olive oil. The islanders also use Ikarian honey as a natural sweetener in coffee and tea, as a morning and nighttime ritual by the spoonful and as a natural medicine to treat colds, insomnia and open wounds. More than 150 varieties of wild greens grow all over the island and they are great sources of minerals (Buettner, 2015). Some wild greens contain ten times as many antioxidants as in in red wine. In America, there are plenty of edible wild greens that people are not used to eating, such as dandelion, purslane and lamb's quater, as well as cultivated greens (Buettner, 2015).

Ikarians also drink plenty of herbal tea from Mediterranean herbs, typically wild rosemary, sage and oregano, that are packed with antioxidants and act as natural diuretics, which keep blood pressure low and rid the body of excess sodium and waste. Rosemary on its own is full of rosmaric acid, carnosic acid and carnosol, substances that protect against canters. Red wine helps the body absorb more of the flavonoids, or artery cleaning antioxidants, from the food eaten with it. Red wine

in moderation along with the Mediterranean diet works wonders on the body and is a leading cause for Ikaria's longevity. Ikarians also enjoy two to three cups of Turkish-style Ikarian coffee which reduces mortality rates in both men and women (Buettner, 2015).

Almost everything in Ikarian dishes comes from nearby gardens that terrace down the mountainside. Children in Ikaria are taught traditional cooking wisdom at a young age. The same cooking that their ancestors have done since the sixth century B.C. They grow up learning where the island's 80 varieties of horta, or wild greens are located, which months to pick them and exactly how to bake them. They store dry surplus vegetables on the roof in mesh bags that hang for storage. Just about every mother and grandmother possesses a culinary pedigree on the island (Buettner 2015).

Health

There is an interesting story about a man named Stamatis Moraitis who moved to the United States from Ikaria after the war to be treated for a gun-shot wound. He stayed in America and married a Greek-American woman and had three children. In 1976, Stamatis was diagnosed with lung cancer and was given 9 months to live. Instead of choosing to stay in the U.S. to die, Stamatis moved back to Ikaria with his wife to enjoy the peaceful island life in his last days. To his surprise, moving to Ikaria in fact saved his life. In 2012, Stamatis was able to celebrate his 97th birthday in Ikaria. Moving back to Ikaria was better treatment than chemotherapy, drugs or therapy of any sort. The Ikarian way of life must be doing a lot of things right (Buettner, 2012).

Ikarian longevity has been a topic for centuries, in fact. Greeks traveled to the island to soak in the hot springs near Therma. The people in Ikaria live eight years longer than Americans typically do, with half the rate of heart disease and almost no dementia. In 2009 Greek researcher Christina Chrysohoou and Demosthenes B. Panagiotakos of Harokopio University organized The *Ikarian Study* that surveyed 1,420 Ikarians. Of those 1,420 Ikarians, 673 were over the age of 65 and 79 of them were over the age of 90 (Buettner, 2015).

Their excellent health is not because of access to excellent healthcare. The island has only 2 doctors, one clinic, an almost broken x-ray machine and no helicopter landing pads, but somehow things are working just fine for them. Health and healthcare seem to be no longer synonymous (Georgiou, 2014).

Okinawa, Japan

Geography and Climate

Okinawa, Japan, a prefecture of Japan, is the largest island in the subtropical archipelago located 400 miles south of mainland Japan with the world's longest living women. Okinawa, only 70 miles long and 7 miles wide, is part of an island chain surrounded by the East China Sea on the west and the Pacific Ocean on the east. The island is full of jungles that blanket the mountainsides. Being described as a "Japanese Hawaii", the exotic, laid-back group of islands has warm weather, palm trees, and sugar-sand beaches. The soil of Okinawa is red, rocky soil that takes some personal physical effort to tend.

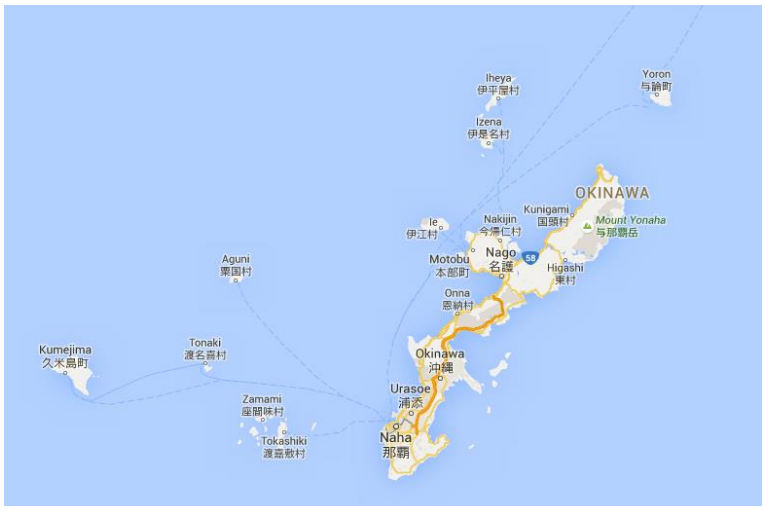


Figure 19: Okinawa, Japan context map. Source: Google Maps

Okinawa's climate is subtropical; temperatures range from a low in the mid-50s°F during winter months to a high in the low-90s°F with a humidity level hovering near 100% in the summer months (Okinawa, 2016). Although it seems that there are many rainy days in Okinawa, there are more good weather days than bad weather days on average. Okinawa also has typhoons during rainy seasons.

Culture and History

Similar to Ikaria, Okinawa has maintained a reputation of longevity for quite some time. All the Okinawan centenarians that are alive today were born in-between 1903 and 1916. Okinawa became Japan's 47th prefecture in 1879. An Okinawa website states:

During World War II the Japanese government used Okinawa's strategic location in the East China Sea to ward off Allied Forces' advances as the war approached mainland. The Battle of Okinawa in 1945 resulted in a devastating loss to the island's resources and population; an estimated 140,000 civilian casualties resulted during the 82-day fight. At the end of the war the United States took over administrative ruling of all the Ryukyu Islands; they were returned to the Japanese government on May 15, 1972. Shortly after the close of the war, American service members and their families found

themselves stationed on this small, foreign Pacific island, with few resources or ways to connect with loved ones back home (Okinawa, 2016).

Today, Okinawa has a local population of 1.3 million, and hosts nearly 50,000 US service members, support personnel and their families. Looking at the diet history of the area, the vast majority of these people ate one particular food, the sweet potato. Before 1940, the *imo*, or sweet potato, made up about 60% of the Okinawan diet. The imo is a yellow and purple version of America's orange sweet potato and was brought to Okinawa 400 years ago from the Americas. Pre-World War II Okinawa was calorie starved besides their beloved *imo* (Buettner, 2015).

Post-war Okinawa was very different from Pre-War Okinawa and is very much in trouble. Following the war, the United States established an army base in the center of Okinawa forcing Western influences and diet onto the land. In just about 10 years, Okinawa's intake of their beloved sweet potato staple went from 60% to just 5% of their daily caloric intake. Rice and bread consumption doubled while meat, dairy and egg intake increased dramatically. The amount of breast, colon, and lung cancer doubled (Buettner, 2015).

Urban Design and Built Environment

The built environment of Okinawa pre-war was very isolated and remote, similar to Ikaria. One of the women the Blue Zones team met lived in a simple, three bedroom house with no furniture in a northern village on the island in Okinawa.

Post-war Western influence on the island caused drastic lifestyle changes. The United States' presence amongst the island caused the Okinawan diet to increase by nearly 400 calories per day. Modern fast food restaurants cropped up across the land, cluttering the mountainous, jungle landscape. When you look at Okinawa today on Google Maps, you see a very different developed environment (*Figures 20 and 21*).

Figure 20: Northern villages in Okinawa. Source: Google Maps

Figure 21: Central Okinawa across from the army base. Source: Google Maps

An American army wife wrote an article describing the current built environment of the island. It is sad to hear that an American is able to find a wide variety of American-style restaurants on the island besides the local Japanese and sushi restaurants. The blogger writes "...Take-out pizza from Primo Kitchen, everyone loves Coco's Curry, my kids love Mister Donut, and Sam's by the Sea is great for a nice dinner or occasion out (Kara, 2013)." The environment has been influenced by Western consumer culture with convenience stores on every corner.

Convenience stores are big here. They are literally on every corner. Family Mart, Lawson's, and Coco's are the holy trinity of c-stores. All of these places sell food, so it's easy to pop in and grab a quick lunch. Some Coco's (not to be confused with Coco's Curry) have bakeries and sell delicious goodies. We had one down the street from our house and we were there a lot… The commissaries here carry everything you need. I know they don't carry everything, but for the most part, they do. The produce section is horrible though. Half of the produce comes from the states and it's icky or

moldy when you buy it. There are small produce shops around or you can go to a local grocery store. There are a few different ones – San-A, AEON, and Union. I didn't go to those as often, but I found much better produce at local stores and I bought fish a few times (Kara, 2013).

Current Okinawa is very much automobile oriented with signage on the main roads. All road signs are in English. Most buildings have been built out of concrete due to the presence of typhoons.

Diet

Hara hachi bu - 2,500 old Confucian mantra spoken before meals reminding people to stop eating when stomachs are 80% full.

There is a time-honored saying in Okinawa passed down to children saying eat something from the land and from the sea every day. The top longevity foods from Okinawa are bitter melons, tofu, sweet potatoes, garlic, tumeric, brown rice, green tea, shiitake mushrooms and seaweeds. As discussed previously, the sweet potato is a giant staple in the Okinawan diet and is high in flavonoids, vitamin C, fiber, carotenoids, and slow-burning carbohydrates. This food is one of the healthiest foods on the planet. Surprisingly, the Okinawan diet is about 80% carbohydrates along with fish, vegetables, grain, and tofu. The diet doesn't include much fruit, meat, or dairy products. Okinawans eat pork, which is quite surprising, but because they stew the meat for days, skimming off the fat, they turn the saturated fat packed meat into a high-protein collagen (Buettner, 2015).

Tumeric, sweet potatoes and seaweed all mimic caloric restriction, which has many longevity benefits. When food is digested, free radicals are created within the body that deteriorate it from inside out, stiffening arteries, shrinking the brain, wrinkling the skin. Caloric restriction throws off fewer free radicals that contribute to aging. Regular consumption of these three Okinawan foods actually provides some of the benefits of caloric restriction without causing the individual to be extremely hunger (Buettner, 2015).

Lifestyle, Outlook and Socializing

Okinawans are very much driven by their daily comforting routines that help shed stress. In the morning they can be found worshipping their ancestors by burning incense and praying. During the cool hours of the day, residents partake in gardening their kitchen gardens for their homegrown food. Gardening can take up to four hours a day, but the personal solitude of that comes from gardening is quite pleasant for many. Okinawan's use fishmeal as fertilizer in their gardens and use

simple gardening tools like a three-pronged hoe to work the land. Gardening by hand without extra equipment is a great form of physical activity worked into daily routines.

Similar to Ikarians, Okinawans also have a great outlook on life by always having a sense of purpose. The term that they use for purpose is called ikigai (Buettner, 2015). This is their reason for waking up in the morning.

Okinawans socialize with their neighbors on a daily basis. *Moai* are lifelong friend groups that are formed at a young age and committed to being there for each other throughout time until death. They tend to meet a couple of times a week to have conversations along with tea. An individual can always count on their *moai* in times of hardship to be there along with the Okinawan sense of social obligation, which is called *yuimaru* to help them (Buettner, 2015).

Health

Okinawan's have the world's highest life expectancy with men on average living until they are 80 and women until they are 88. Men are typically expected to live until they are 84, while women are expected to live until they are 90. Okinawan's also have the highest centenarian ratios with about 6.5 in 10,000 living to the age of 100 (Buettner, 2015). Unlike Americans, Okinawan's are not suffering from non-communicable diseases such as heart disease, diabetes, cancer and dementia.

Sardinia, Italy

The 14 villages of the Ogliastra region of Sardinia, Italy produce more male centenarians than anywhere else on Earth. In most areas of the world, women outlive men; that is not the case in Sardinia. With the ratio of centenarian men to women being one to one. In one village, Villagrande, 5 centenarians live among 2,500 people, while in America, the chances of reaching 100 are 1 in 5,000 (Buettner, 2015).

Geography and Climate

The Italian island of Sardinia is located in the middle of the Mediterranean, equidistant from France, Italy, and North Africa. Sardinia is an island, but for residents of the highlands, the sea is a two-day round-trip distance away, so similar to Ikaria, most residents stay up in the highlands. The residents occupy the rocky, thistle-clumped terrain of the Supramonte Mountains in in the scattered surrounding villages. Although coastal Sardinia is very fertile, the inland mountains are sun-beaten

and covered by prickly vegetation. The people of the land tend to sheep and grow relatively small gardens.

As seen with all of the other Blue Zones so far, there is a great correlation between hilly terrain and longevity. By living and working in a hilly environment, your body is constantly exercising to complete daily tasks, whether it is herding sheep, walking to the grocery store, or meeting up with friends at a social gathering spot in town.

Culture and History

The residents of Sardinia are descendants of a Bronze Age culture. Thousands of years ago their forebears moved into the hills because of Phoenician and Roman invaders on the coastal lands. The land of Sardinia has definite pastoral roots and there is a close interdependence between people and animals. For almost 2,000 years, the villagers have lived in isolation from the rest of the island (Buettner, 2015).

Urban Design and Built Environment

Perdasdefogu and Villagrande were two villages in the Ogliastra region mentioned in *The Blue Zones Solution*. The village Sardinian landscape changed drastically in the 1960s with the arrival of paved roads, improved economic conditions, sanitation and public health.

When analyzing the Sardinian mountain town of Perdasdefogu on Google Maps, you are able to better understand the organic nature of the town.

Figure 22: Village of Perdasdefogu urban form. Source: Google Maps

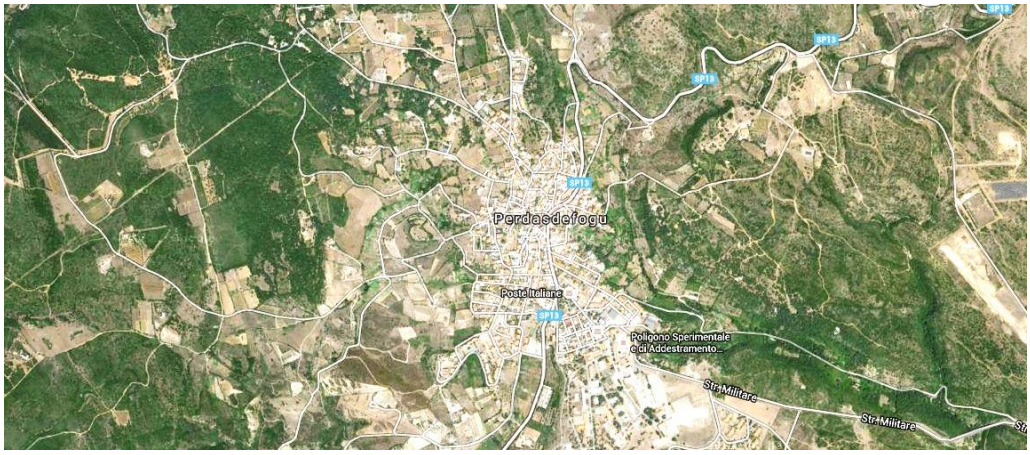


Figure 23: Village of Perdasdefogu urban form from satellite view. Source: Google Maps

Diet

The Sardinian Diet is very similar to the Mediterranean diet found in Ikaria with olive oil, lemons, beans and greens being common foods in both areas. A couple other Mediterranean diet foods for longevity found specifically in Sardinia are goat's milk, sheep's milk, flat bread, barley, sourdough bread, fennel, fava beans, chickpeas, tomatoes, almonds, milk thistle and Cannonau wine (Buettner, 2015).

Nutritional data published in the early and late 1930s states that Sardinian villagers typically consumed 65% of their calories with carbohydrates such as bread, pastas, potatoes or beans. Fat accounted for nearly 20% of their diet through goat's milk, sheep's cheese and olive oil (Buettner, 2015). Sardinians for the most part have a low-protein diet, with only about 15% coming from beans. It may be somewhat surprising that they have such a low-protein diet considering they are a very pastoral area with a large amount of meat to potentially consume. Instead they drink sheep's milk and eat bread, fava beans, and what their gardens produce. Meat, for the most part, is only a weekly affair typically eaten on Sunday or during festivals. The sheep that live in the highlands only eat grass and herbs, so they are very skinny and are not worth killing stated a local Sardinian shepherd (Buettner, 2015).

Lifestyle and Outlook

Sardinian men pasture sheep in the rocky highlands of Sardinia. Typically the men learn their skills from their fathers, grand-fathers or great-grandfathers. The men learn to travel light with foods that won't spoil while tending the land. Pastoralism was found to be highly correlated with longevity even compared to similar farming jobs. A shepherd's regular, low-intensity physical effort, compared

to a farmer's variating high-intensity labor, causes less overall inflammation and serves a model of what lifelong physical activity should be like (Buettner, 2015).

Women, on the other hand, take on quite a bit of the stressful day-to-day duties. They mind the children, tend the garden, wash clothes in the river, repair the house, and handle the finances and business negotiations within the village. It is no wonder that the men are able to live so long!

Elders in Sardinia are held with great esteem and valued for their knowledge in the culture and history of the island. Instead of retiring, elders shift jobs and can be seen working as walking patrol or advising city government.

Perhaps the reason Sardinians live so long is their great outlook of aging. Instead of retiring, they feel that they should contribute something to society and this expectation is what gets them out of bed in the morning and keeps them staying active and thinking.

Loma Linda, California

Loma Linda is located about 60 miles east of Los Angeles and has the highest concentration of Seventh-day Adventists in the US. The city is about 7.52 square miles in size with a population of 23,648 people (Wikipedia). The 9,000 Seventh-day Adventist residents in Loma Linda live 10 more healthy years on average than the typical American (Buettner, 2015). Loma Linda is the only city in the United States identified as a Blue Zone and it was interesting to research why they specifically have been gifted with longevity, while the rest of the United States is not. All of Loma Linda's longevity can be directly correlated to their Seventh-day Adventist religion which emphasizes diet and health.

Dr. Ellsworth Wareham is currently 101 years old, and at the time of the Blue Zones research, he was still practicing in the Loma Linda University hospital as an open heart surgeon. He retired at the age of 74, but continued to assist in training medical students until he was 95. This required him to drive 60 miles to the operations (Buettner, 2015). At home, he still is able to move around his multi-story home, work in his vegetable garden and walk without a cane. He attributed his longevity to his vegan diet and his Seventh-day Adventist faith.

Geography and Climate

The sunny southern town of Loma Linda, California wasn't incorporated as a city until 1970 although its Adventists have century old roots in the area. It is surprising to see such a hotspot of longevity not very far from Los Angeles and Hollywood.

Urban Design and Built Environment

The city of Loma Linda, California has strict controls on the sale of alcohol, has a ban on smoking, and its largest supermarket doesn't sell meat. The Loma Linda Market in the center of town sells fresh, locally grown produce. They sell these whole foods as a delicacy due to the high demand for these foods from the Adventist faith, but these foods can be found around the United States in many supermarkets if you know what to look for. The market also has a wide variety of bean choices that you are able to scoop up load into a bag similar to how typical American grocery stores display their candy.

It was interesting to research Loma Linda's walkability on Walk Score, because although these people are living a long and happy life, their built environment is very automobile-oriented. In *Figure 24* you are able to see that it receives a 29 out of 100 meaning that most errands require a car, unlike the other four Blue Zones Dan Buettner discusses.

Figure 24: Loma Linda walkability score on Walk Score. Source: https://www.walkscore.com/CA/Loma_Linda

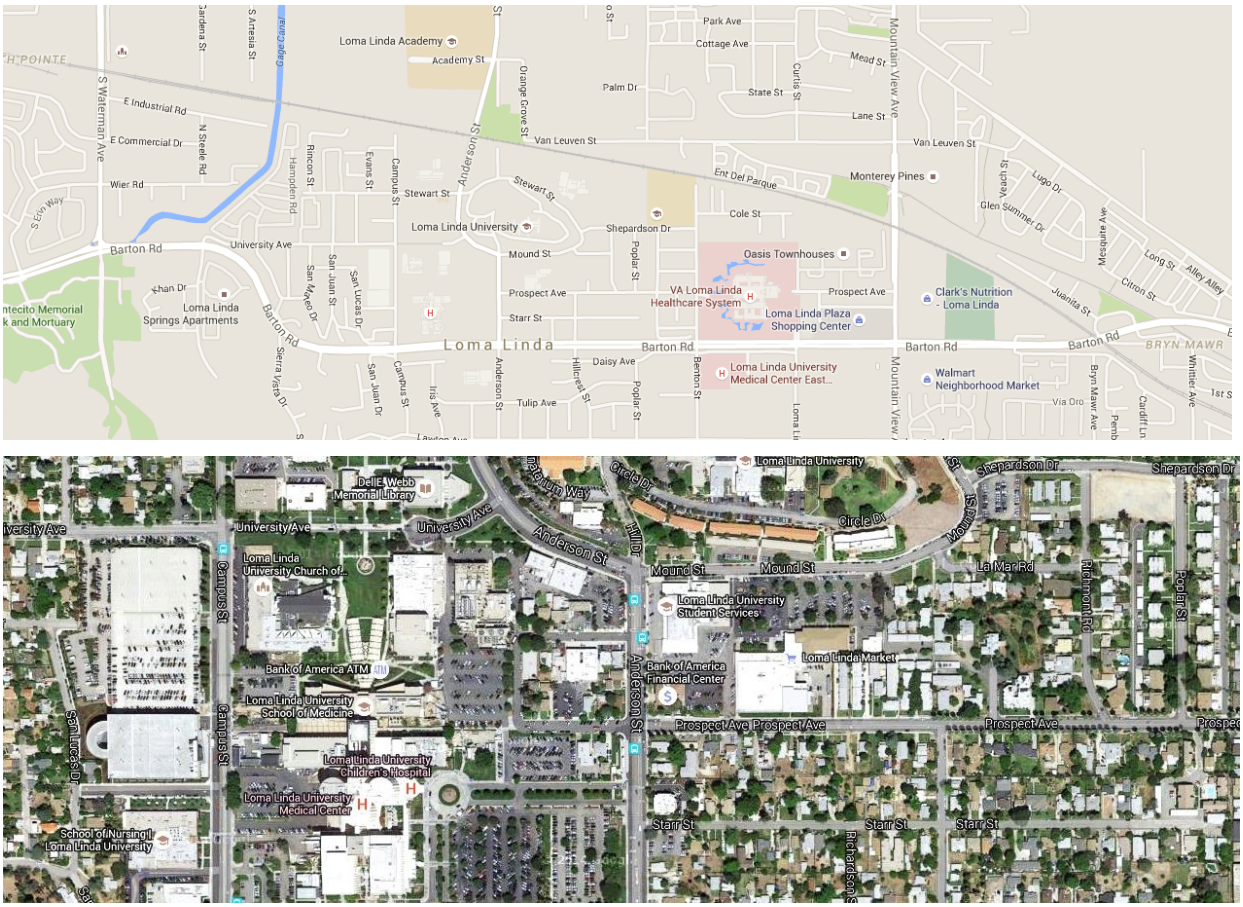


Figure 25: Loma Linda street networks and urban form. Source: Google Maps

Figures 24 and 25 show the built urban form and street network of Loma Linda, which seems to be a combination of the three urban traditions: organic, formalist and modernist. The healthcare institutions serve as anchors for the community with the Loma Linda Market positioned right in the middle.

The Adventist Lifestyle

Genesis 2:3 "And God blessed the seventh day and made it holy, because on it he rested from all the work of creating that he had done."

The Adventist church was created in the 1840s and flourished all through the 20th century. The Adventist church advocates for healthy clean eating similar to the biblical diet and regular exercise. No smoking, no drinking, no eating meat or processed foods. Many Adventists are vegan which means no meat, milk or eggs. The biblical diet is very similar to the Mediterranean diet found in Ikaria and Sardinia.

Seventh-day Adventists observe the Sabbath from Friday night sundown to Saturday night sundown as mentioned in the Ten Commandments. During this time period, there is no checking

emails, no work, no technology, only time devoted to God, family, friends and nature. The Sabbath is a time to recharge, to rest, to spend time with family, and to spiritually reconnect. For 24 hours every week, Seventh-day Adventists forget all of their worldly stress and celebrate the Sabbath day to focus in on their God, family, and community.

Two important lessons that I have learned from Adventists are that they take time in the week to have sacred time devoted to reconnecting with their mind and body. The second is that they see technology as a distraction of this mind-body communication, similar to my view on fitness trackers. By going on regular weekly nature hikes, Adventists appreciate their role in the larger scheme of life and get regular healthy exercise while destressing.

They have a very great outlook on life by believing that a loving and caring God is watching out for them. One doctor interviewed responded that there is no need to sit around and worry when you have an understanding of the greater purpose in life. They don't worry, have insomnia, etc. Being relaxed and at peace with one's life will do wonderful things for your health and well-being. The doctor said that he thinks if you're old, you should keep away from old people. You should stay near young people to stay invigorated and challenged with new ideas.

They have a shared optimistic outlook on life and practice constant thoughts of gratitude. They have made sense with their purpose in life and always remember to find the lesson behind every experience, both good and bad.

One lesson that I have learned is that before retiring it is a good idea to know what your values are, what your gifts are, and knowing where to share those gifts is a great thing to know. In a way, having a purpose is more powerful of medicine than any pills that can be bought.

Adventists in Loma Linda chose to be friends with other Adventists similar to them. Their tight-knit community is a true example of choosing the "right tribe" as Buettner has established. On the Sabbath day, neighbors, friends and family join together and host potlucks full of healthy cuisines. Belonging to a community that has these weekly rituals is a key secret to adding longevity years to your life. It is very important to spend time with like-minded people that help you feel supported and loved.

Health

The Adventist Health Study is an ongoing research project at Loma Linda University that is funded by the National Institutes of Health and examines why Adventists tend to live an average of 10 years longer than other Americans. This 50 plus year study provides a lot of evidence that relates Adventists longevity to lifestyle choices (Adventist Health Studies, 2016).

Nicoya Peninsula, Costa Rica

Nicoya, a 75-mile peninsula just south of the Nicaraguan border. People in this Central American region are more than twice more likely than Americans to reach a healthy age 90. The Nicoya Peninsula region of Costa Rica has the world's lowest rates of middle-aged mortality and second highest concentration of male centenarians in world. Similar to Sardinia, Italy, these men seem to have a wonderful female support system, which may be linked to why they have such great longevity.

What is very interesting is that Costa Rica has a higher life expectancy than many developed countries even though it just spends 15 percent of what the United States does on health care (Buettner, 2015). Quite a lot of their longevity can be linked to their family oriented social network and also their unique diet and dietary habits.

I did not focus as much attention on the Nicoya Peninsula in my research primarily because I could not find a specific town in the peninsula that was referenced in the studies. All of the other Blue Zones had more specific regions within the overall land mass.

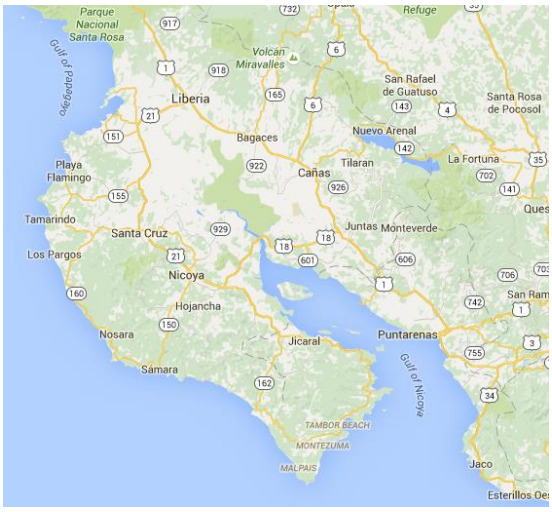


Figure 26: Nicoya Peninsula context map. Source: Google Maps

Urban Design and Built Environment

After analyzing the urban form of a southern, central town in the Nicoyan peninsula near the mountains, I once again found a similar organic urban form due to the terrain. This particular town has a couple of restaurants and different destinations that do appear on Google Maps. These village clusters can be seen all over the Nicoyan Peninsula.

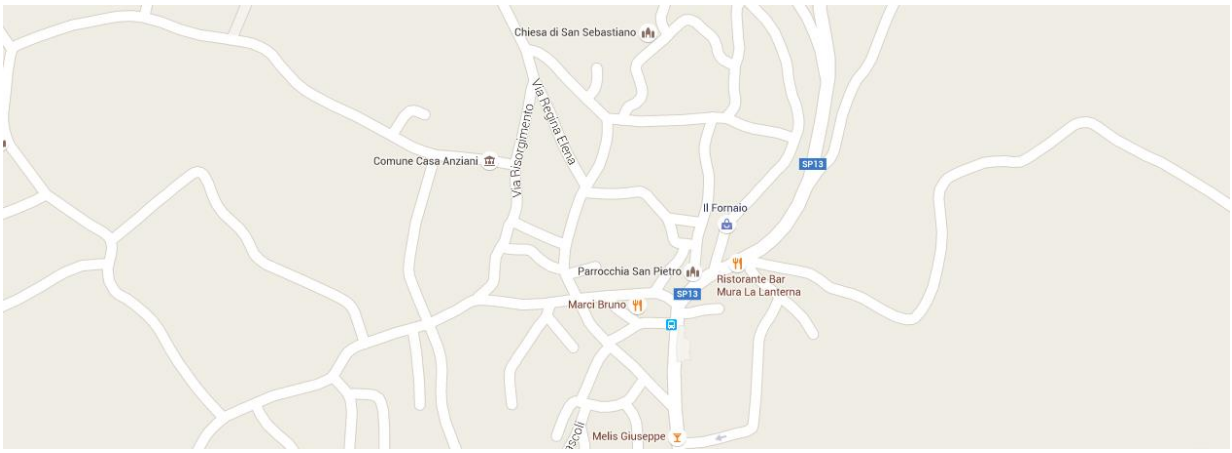


Figure 27: A Nicoyan village's organic urban form. Source: Google Maps

Culture, Lifestyle and Outlook

Faith and family play a strong role in Nicoyan culture. So does *plan de vida*, or reason to live, which helps Nicoyan elders maintain a positive outlook and active lifestyle. Nicoyan centenarians tend to live with their families, and children or grandchildren provide support and a sense of purpose and belonging. Nicoyan centenarians get frequent visits from neighbors. They know how to listen, laugh, and appreciate what they have.

Diet

Their traditional diet of fortified maize and beans may be the best nutritional combination for longevity the world has ever known. Also, eating fewer calories appears to be one of the surest ways to add years to your life. Nicoyans eat a light dinner early in the evening similar to the other Blue Zones.

The Nicoyan diet is 3,500 years old. Nicoyans eat little to no processed foods but plenty of antioxidant-rich tropical fruit. But they also have one unique secret: calcium and magnesium rich water, which wards off heart disease and promotes strong bones (Buettner, 2015). Nicoyan water has the country's highest calcium content, perhaps explaining the lower rates of heart disease, as well as stronger bones and fewer hip fractures.

An ancient corn tortilla recipe cooked in the peninsula is rich in vitamins and minerals using the process of nixtamalization. Nixtamalization typically refers to a process for the preparation of

maize (corn), or other grain, in which the grain is soaked and cooked in an alkaline solution, usually limewater, and hulled.

About 1,500 B.C., cooks in coastal Guatemala figured out that cooking dried corn in alkali water removed the kernels' skins and produced a softer dough than unprocessed ground corn. More recently, food scientists have found that this process, called nixtamalization, increases the bioavailability of both protein and niacin, and radically reduces the toxins often found in moldy corn. The resulting dough, called masa, is the basis for corn tortillas, chips, tamales and other specialty corn foods. Whole corn that has been nixtamalized is called hominy or posole, while the ground form is called masa ("Make Masa: Nixtamalized Corn", 2004)

IV. Blue Zoning America: Simple Fixes, Big Results

> It's not impossible to improve well-being in communities. By focusing on making healthier surroundings, we've been able to help people live longer and better in 26 American cities. The key is identifying evidence-based designs and policies that make the healthy choice, the easy choice. Then having a comprehensive plan to implement those nudges in schools, grocery stores, restaurants, workplaces and with municipal governments.
>
> – Dan Buettner, Blue Zones Founder and National Geographic Fellow

As it was very clearly stated in the "American Nightmare," the United States' built environment is very different from these Blue Zones being studied around the globe. Most of the Blue Zones, besides Loma Linda, are organically formed villages that are somewhat isolated from the rest of the world. Dan Buettner's big question became: how can we reverse "engineer" our lives to match some of the elements that bring life to these other places in the world?

There is quite a bit to be learned from these 5 Blue Zone regions, but how do we maintain our current resource rich lives while gaining the 12 quality life years that the Blue Zones have? The Blue Zones seem so vastly different from life in the United States from their natural and built environments, to their isolated culture and self-reliance. The Blue Zones seem to lack diversity, of both biological genes and culture, while the United States is home to a wide variety of people and cultures.

This section of the paper will briefly look into some of these places, large and small, that have been able to make simple policy, urban design, and lifestyle decisions that have drastically changed the quality of life and life expectancy of the residents. The Blue Zone team has started transforming American towns. In all of the Blue Zones cities you will notice a focus on policy, the built environment, social networks, building design, or "your inner self" similar to the determinants of health and well-being factors outlined in the very beginning of the paper.

Figure 28: Completed and upcoming Blue Zones Projects across the United States. Source: https://communities.bluezonesproject.com/

Completed Projects:

Albert Lea, Minnesota

California Beach Cities

- Manhattan Beach
- Hermosa Beach
- Redondo Beach

State of Iowa

Upcoming Projects:

Honolulu & Hilo, Hawaii

Wisconsin

Indiana

Klamath Falls, Oregon

North Karelia, Finland: "The Miracle Up North"

In the 1970s, North Karelia, Finland was the first "big experiment" in public health. The Finland experiment is documented in the Blue Zones Solution by Buettner as the first successful attempt of "Blue Zoning" a region. North Karelia is a small, New Jersey-sized region of boreal forests in the eastern part of Finland. The region is positioned right next to Russia and the people who live there are farmers and lumberjacks. Public health results were coming in from national and international surveys showing that this particular region of Finland had the worst rates of heart disease in the world.

Pekka Puska, who was just 27 at the time, was able to pioneer a strategy that saved the lives of more than 170,000 Finns that were suffering from heart disease through an innovative, bottom-up approach. Before being selected as the five-year pilot's leader, Puska worked for the Department

of Public Health and had a medical degree and a master's in social sciences. Puska recalled that he was not hired because he was good, but rather because he was young and it was going to take decades to solve the problem (Buettner, 2015).

The main culprit in North Karelia was their high-fat diet with seemingly no fruits or vegetables. Local dairy farms made milk and butter common household staples. Before World War II, the residents lived off the land and had a relatively healthy diet. After the war, veterans were given plots of land where they bought a few pigs and dairy cows and set the stage for the world's deadliest diet. Vegetables began to be considered as "food for the animals."

The Seven-County Study performed at the time came to a conclusion that the farther north a man lived, the more dietary fat they tended to consume mostly from meat and dairy. Geoffrey Rose, a British epidemiologist argued that whether you live a short or long healthy life was a function of the population you belong to more than the quality of your doctor or hospital care. Puska and his team took this to heart and worked directly with local health care systems and community organizations to spread the message of healthy eating and nudged people of the region into adopting a low-fat, high vegetable diet at a community and household level. I found it interesting that the team found the best way to spark cultural and behavioral change was from the bottom up, recruiting usually women who were already involved in other civic organizations.

Puska found a local homegrown replacement for dairy products: berries. The team was able to convince local dairy farmers to apportion some of their pasture land to grow berries. During the summers, blueberries, raspberries and lingonberries grew but the berry season was always somewhat short. Puska and his team supported the establishment of businesses that were able to freeze, process, and distribute berries year-round.

At the end of the five years, the results were quite impressive. The proportion of residents consuming high-fat milk dropped from 70 percent to less than 10 percent and 60 percent of households now cook with vegetable oil instead of butter (Buettner, 2015). Vegetable consumption has tripled and overall salt intake has decreased by 20 percent. The rate of heart attack death among middle-aged men was reduced by 25 percent and lung cancer deaths fell by 10 percent due to a dramatic reduction in smoking. Mortality of all cancers dropped by 10 percent. In the past 30 years, the life expectancy of Finnish males increased by ten total years (Buettner, 2015). This "Miracle Up North," as it is often referred as, has not been replicated to this day. Buettner mentions that he needed to absorb all of the key principles of this model in order to manufacture a Blue Zone in America.

The nine lessons learned from North Karelia include:

- Focus on the ecology of health
- Think operating system, not program
- Work with local health systems
- Push, push, push
- Find a charismatic leader
- Community ownership
- Bottom up, top down
- Measure, measure, measure
- Start small, go big

Albert Lea, Minnesota: The First Blue Zones City

Buettner first consulted public health officials at the University of Minnesota about creating American Blue Zones and they told him to measure each campaign in the process to assess how well it was working because people's lives were affected. A community-wide initiative is not cheap and generally costs around $1 million to conduct. AARP rallied behind Blue Zones Project along with UMN School of Public Health. The pilot project began in 2009 (Buettner, 2015).

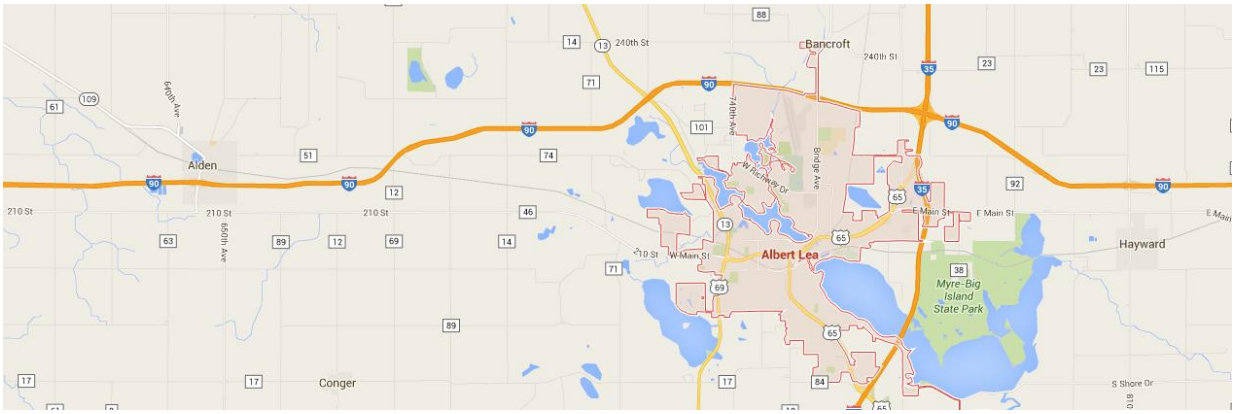


Figure 29: Albert Lea context map. Source: Google Maps

The town of Albert Lea, Minnesota was selected through an RFP process because it represents the "typical" American city; it isn't too big or too small, too healthy or too unhealthy. The 17,931 resident city was small enough to make a difference, but large enough that it could serve as a model for other cities across Minnesota and the United States (Wikipedia). The Blue Zone team decided to focus primarily on a 20 mile "life radius" around the resident's homes and workplaces because that is where most time is spent throughout the day. They analyzed the natural and built environment

surrounding the grocery stores, schools, restaurants, etc. and asked key questions such as is the environment walkable? What type foods are primarily displayed in the grocery stores? Are the parks attractive and inviting? The unique approach to this pilot project was to work on the surroundings instead just of relying on individual responsibility. The experiment was to change the town's whole ecosystem and specifically the social ecosystem.

AARP agreed to partner with the Blue Zones team to provide generous financial support for the first Blue Zones city. National media outlets, such as ABC and USA Today, also had interest in Blue Zones coverage. America was ready to create change.

The residents of Albert Lea were motivated to create change from the beginning. The Blue Zones team started with creating a positive social environment. Research has shown that if your three best friends are obese, there's a 50 percent greater chance that you will be overweight too (Buettner, 2015). The first question that was tackled was: Does the environment promote walking? Walking groups of five to seven people were created that walk and socialize together multiple times a week. These walking groups are similar to Okinawa's *moai*, or support group, while increasing physical activity through moving naturally and having the right tribe and a sense of community support. Another program that was created was the "walking school bus," in which parents and children that normally took the school bus together created a walking school bus instead. This walking group became very popular across town and senior citizens throughout the town actually began volunteering their time to be weekly chaperones of the walking school bus. The walking school bus program engaged the community, increased physical activity amongst school age and adult residents, as well as gave aging residents a continued purpose within the community.

After working on the social environment, the team began to tackle the built environment. The built environment is controlled by budgets and policies. The team began to look at how they could implement change within the everyday buildings across town: supermarkets, schools, etc. In the supermarkets, it was clear to the team that the aisles were set up like any typical American supermarket; healthy foods tucked away out of eyesight, while unhealthy foods displayed at eye level, on aisle ends, central tables and a at final checkout. I began to wonder why is this? Why are junk foods displayed like they are what the American people want most? Why are healthy foods not displayed at eye level? The Blue Zones team created a "Blue Zones Lane" at the supermarket checkout, replacing what was once candy and gum with fruit cups, granola and nuts. Blue Zones foods like beans and sweet potatoes were then called out in the regular aisles with special Blue Zones labels. At school, the team began restocking vending machines with healthier foods instead of the typical soda pop, chips and cookies.

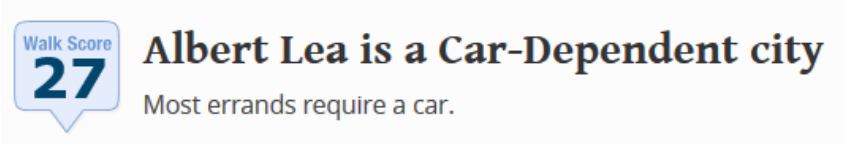


Figure 31: Although it appears to be walkable, the Walk Score shows that it is still a car-dependent town. Source: Walk Score.

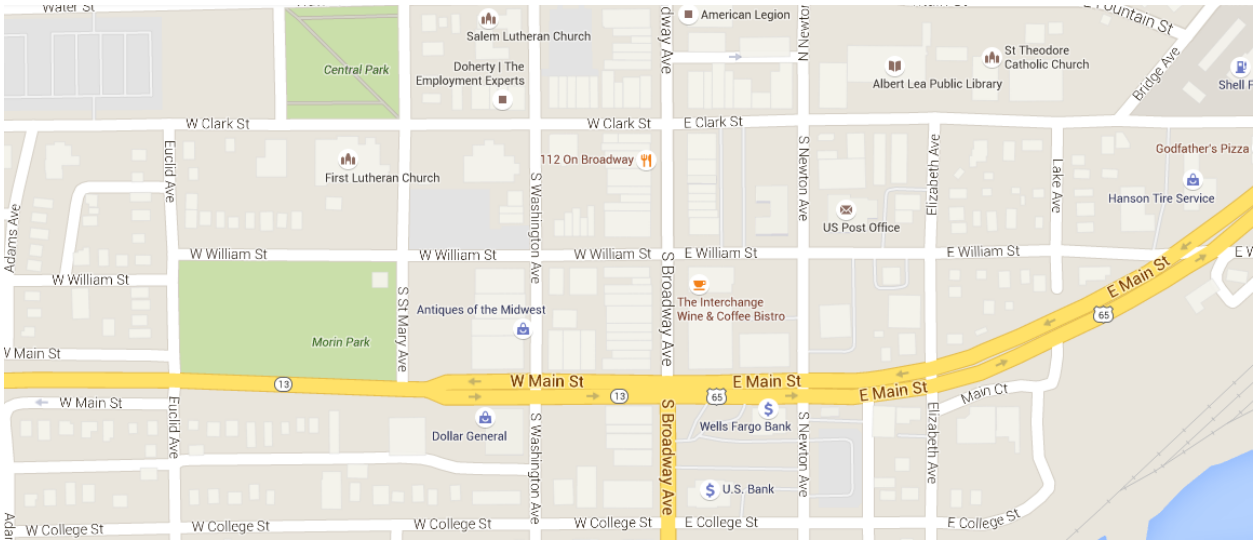


Figure 30: The urban form of Albert Lea is formalist with an urban street grid network Source: Google Maps.

Finally, after the social environment and the built environment, the change made its way to the individuals themselves. There was a kick-off meeting in which about 4,000 people, 25 percent of the community, pledged to get involved with the Blue Zones project on an individual level. Households began to see restocked refrigerators and pantries with healthier foods (Buettner, 2015).

It didn't take long for the city leaders to realize that Main Street is a place not just for cars, but also for humans. Mayors, city managers, chamber of commerce presidents, superintendents of schools, members of local media all became invested in the project along with community residents. What is important to remember is that the Blue Zones Project started out as an experiment similar to the "Miracle Up North." By taking little steps and making small adjustments to eating, physical activity and social circles, the team was able to reverse environments that caused so many of the non-communicable, chronic diseases outlined in the American Nightmare.

Ultimately, the Blue Zones project brought together community organizations, leadership and residents to give back, share and have a purpose. It was truly a public, private and community partnership. The results of the Albert Lea Blue Zone pilot project were stunning with a total of 12,000 pounds shed and decreased healthcare costs by nearly 40 percent (Buettner, 2015). More than half of all employers were acting on pledges to make workplaces healthier environments along with two-

thirds of the locally owned restaurants. All school age children were being reached through at least one of the Blue Zones school programs. At least 800 people had joined a walking moais and more than 80 children went to school as part of the walking school bus. Community gardens increased from 70 to 116. This project, which took only 6-9 months, was very successful and the team learned that Blue Zoning a community is in fact very scalable. The beach cities of California were next on the list, as well as the whole state of Iowa.

California Beach Cities: Manhattan, Hermosa and Redondo Beach

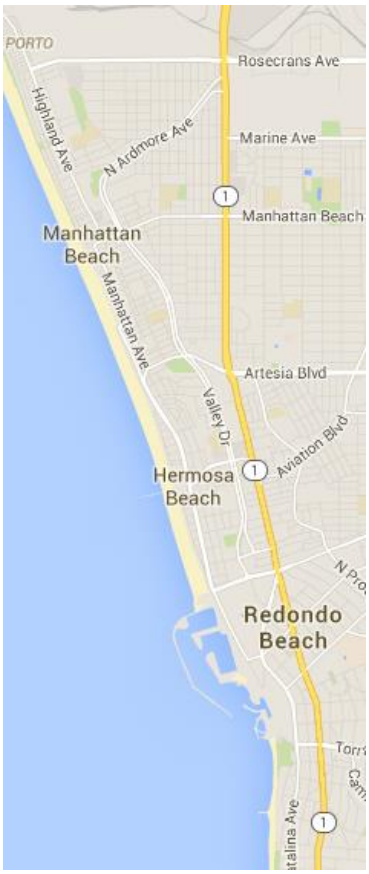


Figure 32: Source: Google Maps

The geography of the beach cities creates a "congested pressure cooker of stress" as Buettner calls it in the Blue Zones Solution. Bordering the beach on one side and the freeways on the other, these towns are situation in prime real estate land in the Los Angeles area. Similar to Loma Linda, these communities were sandwiched right near all of the temptations of consumer America, yet surprisingly Loma Linda's Adventist culture never succumbed to the pressure.

Real estate is religion in the California beach cities. What were once simple cottages and surf shops became pricey houses and brokerage offices. All three beaches a similar in that they share the ocean and Pacific Coast Highway, but have their own identity. Manhattan Beach is ritzy and suited for the 36,000 overachievers that live there. Hermosa Beach is a party town and the smallest of the beach cities with 20,000 residents, which used to be a more eclectic bohemian place. Redondo Beach is the largest beach with 68,000 residents and is the most diverse with a large Hispanic and Asian population.

Although these cities seem to have a great location near ocean with a lot of people getting physical activity, Buettner notes that this was surprisingly not the case. For every one person out running and biking, there were a couple more sitting inside eating junk food and watching television. Even though the residents lived in an "ideal" location, they were not immune to the pressures, temptations and bad habits affecting the rest of the American population.

From 2010-2013 the Blue Zones team tackled the beach cities, using what they had learned from Albert Lea, and scaling it up to work for the beach cities in California.

The results of the transformation in the beach cities was once again very promising. The Redondo Beach City Council tripled the total length of biking infrastructure in the community from 14 to 38 miles. More than 40 restaurants created healthy menus for customers. Three-thousand students began walking to school every morning instead of taking a car. Finally, 1,600 residents formed 150 group moais that walked, shared potluck meals and attended purpose workshops together. After two years, the cities secured an additional $3.8 million in state/federal funding for future planning initiatives.

State of Iowa

Iowa Governor, Terry Branstad, launched the statewide Blue Zones initiative in 2011. Iowa was on a mission to become the healthiest state in the United States. The state of Iowa signed up to become a Blue Zones demonstration site, with 20 towns rising up to the challenge to create a healthy environment for its residents. Towns such as Waterloo, Cedar Falls, Mason City, and Spencer are just a few that have made the pledge.

Figure 33: Spencer, Iowa context map. Source: Google Maps

Spencer

Spencer, Iowa located in the northwestern region of the state is only 11 square miles in area and is home to about 11,233 residents (Wikipedia). It was Iowa's first state certified Blue Zone community and has been leading the way for the rest of the Iowa Blue Zone communities. The town's small size at times was challenging to deal with. The town didn't have certain leadership and workforce positions that Albert Lea and the beach cities had to help implement the project. The small size made it even more important to build close community relationships and because of this

closeness, the Blue Zones word spread fast. Within only one year, half of Spencer's residents were participating in the project in some way. In 2013, national names such as Wellmark Blue Cross and Blue Shield, Healthways and the Blue Zones named the town the first certified Blue Zones Community.

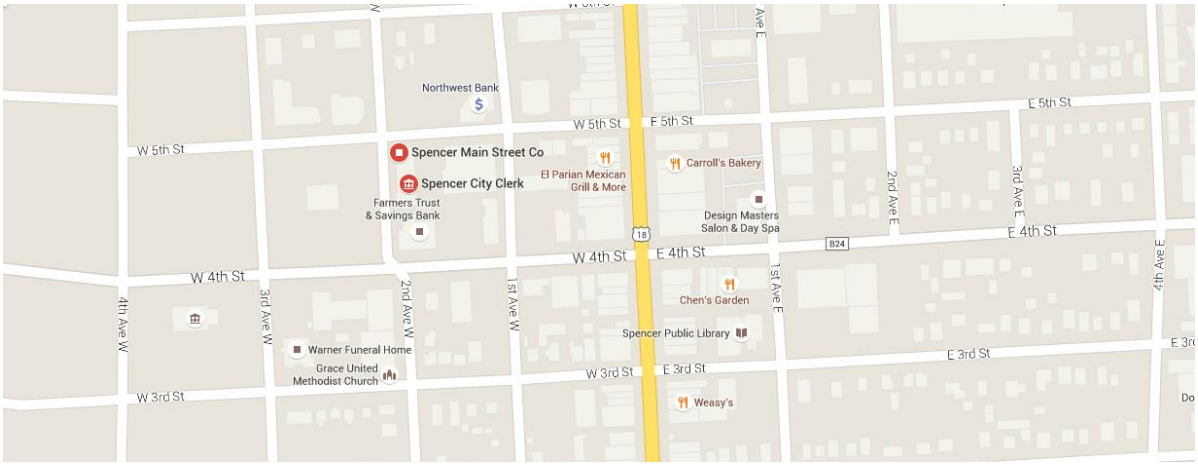


Figure 34: Spencer's formalist urban form. Source: Google Maps

From a planning perspective, it is really exciting to see what can be done at a small scale to create big changes. The city planners of Spencer were able to block off one of the entrances to a convenience store between the Junior High and High School that was typically a stopping ground for students. Blocking the entrance made what was once a convenience in route much more inconvenient.

Community gardens have sprung up across the town increasing from one location to three with 36 total plots. These community gardens allow residents access to local fresh fruits and vegetables. Community gardens are great assets to the community for creating an ecology of health that encourage the 5 habits and practices of the Power 9 most linked to the environment: move naturally, plant slant, right tribe, community, and loved ones first.

Similar to all the other Blue Zones Communities, Spencer formed walking moais that spread happiness and healthy behaviors throughout the social environment.

Cedar Falls

Cedar Falls, Iowa is located in the northeast region of the state and is 29 sq. miles with a population of 39,260 residents (Wikipedia). Unlike Spencer, Cedar Falls is a college town for the University of Northern Iowa and is home to many students. Policymakers, business-owners, residents, university staff and students all embraced the core principles of the Blue Zones and rallied behind the project. Hy-Vee, the main grocery store partnered with Blue Zones to make the healthy

options the easier options. Similar to Albert Lea, they created Blue Zones checkout lanes stocked with healthy snack food. The university's cafeteria decreased the diameter of their cafeteria plates and eliminated the trays completely to encourage students to not overindulge and to stop when their stomachs felt 80 percent full, similar to the Okinawans.

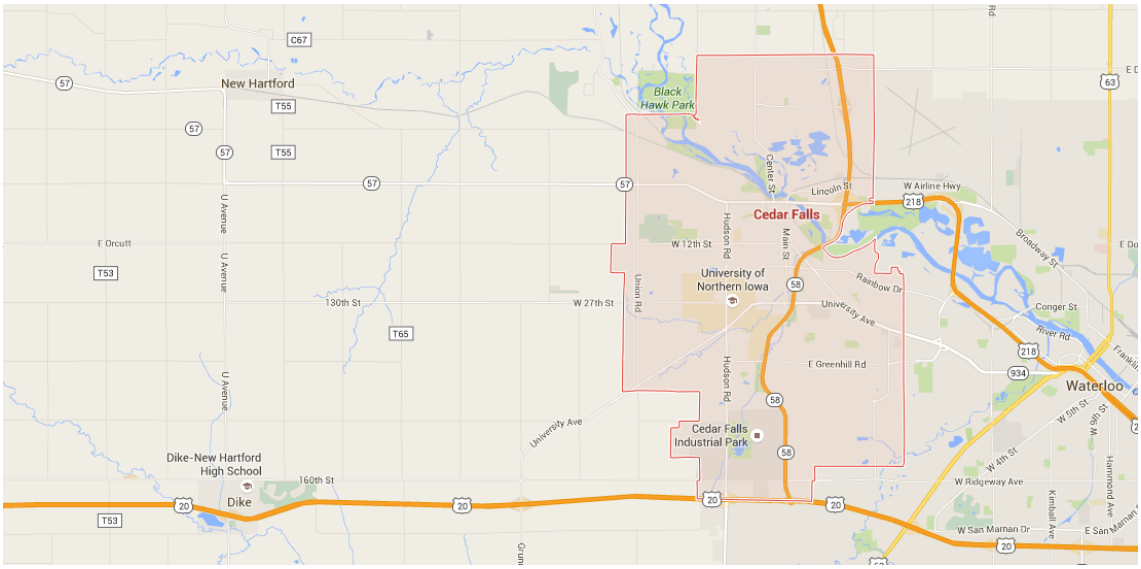


Figure 35: Cedar Falls, Iowa context map. Source: Google Maps

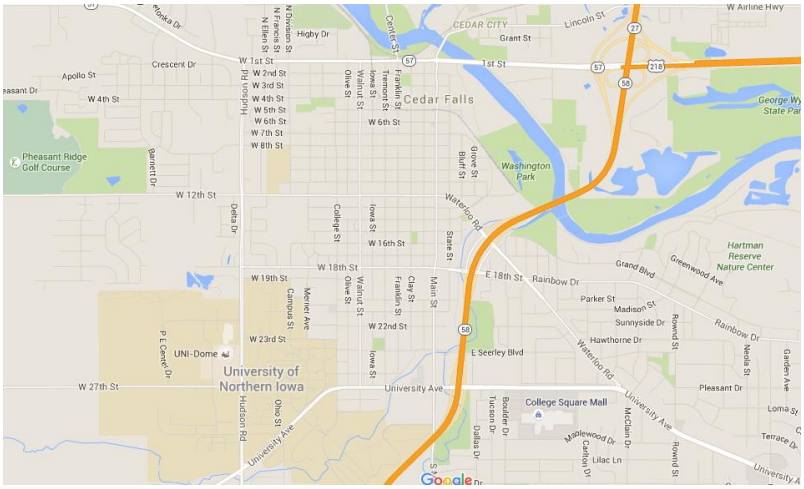


Figure 36: Cedar Falls' formalist and modernist urban form.

University of Northern Iowa added a campus garden that created a public space for students to cultivate social networks as well as healthy fruits and vegetables. The local elementary schools also established a school garden program that educated young children on healthy eating as well as a healthy relationship with the environment. From a planning perspective, it is exciting to hear that in 2013, the National Complete Streets Coalition named Cedar Falls as one of the 15 best Complete Streets policies in the nation.

V. Policies and Programs Impacting the Ecology of Health

Socio-ecological models and determinants of health could be further studied in order to understand how implementation should happen on multiple scales. Socio-ecological models of health behavior studied in the fields of public health, psychology, sociology, environmental planning, etc. provide a good framework for how we should go about planning in the future. They emphasize the environmental and policy contexts of behavior, while incorporating social and psychological influences. Ecological models lead to the explicit consideration of multiple levels of influence, guiding the development of more comprehensive interventions (Sallis, 2008). As was shown in the Blue Zones research, interventions should happen on multiple levels in order to make the strongest impact.

The core concept of an ecological model is that behavior has multiple levels of influences, often including intrapersonal (biological, psychological), interpersonal (social, cultural), organizational, community, physical environmental, and policy. Ecological models are believed to provide comprehensive frameworks for understanding the multiple and interacting determinants of health behaviors. Ecological models can also be used to develop comprehensive intervention approaches that systematically target mechanisms of change at each level of influence. Four core principles of ecological models of health behavior are proposed (Sallis, 2008):

1. There are multiple influences on specific health behaviors, including factors at the intrapersonal, interpersonal, organizational, community, and public policy levels.
2. Influences on behaviors interact across these different levels.
3. Ecological models should be behavior-specific, identifying the most relevant potential influences at each level.
4. Multi-level interventions should be most effective in changing behavior.

The focus of the paper has primarily been on the efforts of the Blue Zones team and the projects that they have implemented in the United State as a result of Dan Buettner's research. It is worth noting policy decisions in Atlanta and across the United States that are not connected to the Blue Zones research that still address the built environment and health in exciting and innovative ways. The 5 habits and practices that I have identified out of the "Power 9" that are most influenced by our environment are: move naturally, plant slant, right tribe, community and loved ones first. The

reality today is that most of the public has not even heard of Blue Zones, yet they understand the consequences of poor planning and design on health. If we are able to understand how somewhat typical policies and programs in the United States relate to these Blue Zone's habits and practices, we are on our way to understanding what needs to be changed with or without the initiative of the Blue Zones projects.

Move Naturally – Walkable Urban Development

In 2010, 28.7 percent of metro Atlantans were obese and ranked the 11th highest for pedestrian fatalities (Dunham-Jones, 2011). Atlantans also have a higher than MSA average rate of motor vehicle crash deaths. There is no doubt that Atlantans need a more pedestrian friendly environment to encourage physical activity, combat obesity, and decrease VMT.

Christopher Leinberger and Mason Alexander's The WalkUP Wake-Up Call: Atlanta discusses the growing demand of walkable urban development since the 1990s in Atlanta, the "poster child of sprawl." The growth in demand has mushroomed as a portion of real estate in the 1990s to now a majority of the real estate cycle (Leinberger, 2013). Buettner's concept of move naturally is taken to heart in walkable urban development by using walkability performance metrics to measure and increase walkability in neighborhoods across the United States.

The importance of understanding how walkable urbanism works and what policies and real estate strategies will be needed in the future to meet the growing demands. I also think it is important to note that drivable suburban development is a form that can be found in the city and walkable urban development can be found in the suburbs (location seems to not be as correlated as we thought). WalkUPs are regionally significant walkable urban places in Atlanta and can be a downtown, downtown adjacent, urban commercial, urban university, suburban town center, driveable suburban commercial redevelopment or greenfield/brownfield. A WalkUP can be ranked on their economic and social equity performance copper, silver, gold or platinum. There is a lot of potential for Atlanta with potential and emerging WalkUPs to add to the already good supply of established WalkUPs. Walkable urban places are a great form of development that is addressing "move naturally."

Plant Slant - Urban Agriculture

Studies have shown that urban agriculture contributes to healthy communities by engaging individuals in work and recreation that improves both individual and public well-being (Bellows,

2003). One health outcome measurement that could be analyzed further is how the physical activity of working on urban farms affects the overall health of gardeners. While the wellness aspect is often discussed, gardening is a physical activity that ranges from working fine motor skills to heavy aerobic exercise (Brown, 2000). Additionally, some of the stress relief gardening is responsible for can result in better physical health such as lower blood pressure and muscle tension (Brown, 2000). Obesity and associated health risks are linked with low physical activity (Lopez and Hynes, 2006). Incorporating agriculture into a city would be an outlet for physical activity. The Center for Disease Control has laid out steps to measure the effects of physical activity. Researchers could first document frequency of physical activity before working on a farm and note the baseline percentages of employees of the farm with physical health conditions. They could then periodically reassess frequency of activity from farming and monitoring how physical health changes over time to determine the physical benefits of urban agriculture (Center for Disease Control, 2014). While the benefits of eating more produce from urban agriculture is heavily studied, the physical impacts on the farmers themselves is less studied and could highlight additional benefits of urban agriculture or "plant slant."

In addition to physical activity, urban agriculture may have a significant impact on access to healthy foods. Researchers could measure access to healthy food based on the USDA's definition of a food desert. According to the USDA, a food desert is an area in which at least 33 percent of the census tract's population resides more than one mile from a supermarket or large grocery store (USDA, 2013). In many low-income communities, the only places to buy food are fast-food and convenience stores that sell fatty, sugary, processed foods. This lack of access to healthy foods makes it difficult for families to eat nutritiously. Studies have consistently shown that fewer supermarkets and other retail outlets selling affordable, nutritious foods are located in low-income communities than in wealthier ones, and in predominantly African American and Latino neighborhoods than in predominantly white neighborhoods (Walker 2010). Community environments affect people's eating and exercise habits. Scientists and medical professionals agree that lack of easy access to healthy foods and safe outdoor areas for physical activity are key contributors to obesity (USDHHS, 2001).

Right Tribe and Community

Surrounding yourself with close friends, family and coworkers that support healthy behaviors is key to long life and well as having some sort of faith-based routine or service to attend. The Vita Health and Wellness District located in Stamford, Connecticut serves as an interesting case

study for a transformative, healthy town that follows the determinants of health. Similar to the Blue Zones, they were able to redevelop and rezone Main Street as well as provide new public housing mixed with market housing and expand their hospital.

Besides making changes at a community level, changes can be made on a smaller social network level within church groups or work environments. It would be interesting to research what programs can be put in place in work offices to encourage healthy lifestyle choices.

Loved Ones First – Accessory Dwelling Units and Granny Pods

"Happy, healthy centenarians in the Blue Zones areas put their families first. This can take shape in many ways, from keeping your aging parents and grandparents in or near your home to being in a positive, committed relationship, which can add up to 6 years of life expectancy (Blue Zones Project, 2016)." Whenever I read about "loved ones first," I would instantly think of zoning regulations that prohibit accessory dwelling units and neighborhoods. These accessory dwelling units have the potential to serve as "granny pods," keeping aging parents and grandparents near their families and grandchildren.

The MEDCottage — "is a prefabricated 12-by-24-foot bedroom-bathroom-kitchenette unit that can be set up as a free-standing structure in their backyard. It's more than a miniature house — it's decked out with high-tech monitoring and safety features that rival those of many nursing homes (Seliger, 2012)." Typical zoning regulations can create barriers for placing these units on property. State laws can sometimes be passed that permit temporary medical dwellings on resident's property as long as a physician verifies that the patient needs assistance with daily functions (Seliger, 2012). It would be great to see accessory dwelling units permitted not only when elderly individuals are sick, but when they are healthy as well so that they can enjoy spending time with their loved ones.

VI. Next Steps

Conclusion and Recommendations

There is no denying that the United States is dealing with a public health crisis primarily due how we design our built environment and our lifestyle decisions. The Blue Zones message might be new to our ears, but its underlying principles have been understood to be important now for generations. The poor health outcomes have been reiterated over and over again and it is time to take action.

The key behind the longevity in the Blue Zones is that their environments make healthy lifestyle choices effortless. In this paper I have identified five habits out of Buettner's "Power 9" that are most important to focus on when planning healthy community design: move naturally, plant slant, right tribe, community and loved ones first.

Due to the United States resource rich, consumer culture, an individual is often tempted by unhealthy lifestyle choices more than the typical Blue Zone resident ever is, so at first it was hard to compare the two. Typically, the traditional answer to health behavior change is always directed towards an individual's responsibility for their health, which often requires long-term discipline and routine. Research shows that humans, especially Americans, have a hard time with self-discipline when they are constantly tempted by their built environment to make bad decisions. Most people stick with diets for less than 7 months, but if the built environment were to be strategically designed to encourage healthy eating habits, there would be less of a need for extreme caloric restrictions (Buettner, 2015).

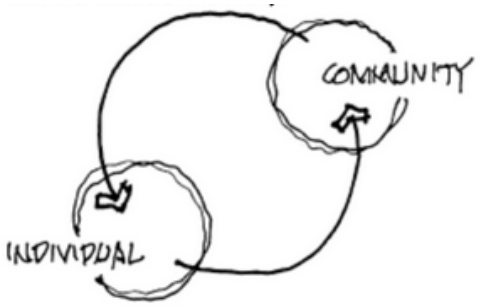


Figure 37: Community and the individual components of the interactivity theory (Dobbins, 2009)

The most successful health projects researched have made changes to the built environment. Instead of focusing on the individual, it is more important to think bigger and more collectively at the whole community and the design of the built environment that nudges these lifestyle choices each and every day. From a planning perspective, it is important to consider the depth of which health and environment policies can impact work, schools, restaurants, grocery store, and home; typical places that most people spend the majority of their time.

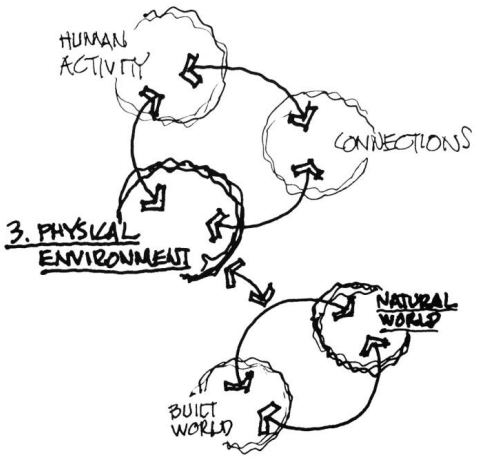


Figure 40: The physical environment (Dobbins, 2009).

Similar to the differences between health and healthcare mentioned in the beginning of the paper, it is so important to act proactively instead of reactively when dealing with healthy community design and health behavior. The next generation of urban designers, planners and public health advocates need to work collaboratively and innovatively to combat the current American system.

More and more governments around the world are listening and responding with policies that put well-being first. Countries with strong social and institutional capital not only support greater well-being, but are more resilient to social and economic crises. A key national challenge is to ensure that policies are designed and delivered in ways that enrich the social fabric for current and future generations. Under the pressures of putting right what is obviously wrong, there is often too little attention paid to building the vital social fabric.

People are more likely to make healthier choices when it's easier to do so. Lasting health is the result of our surroundings rather than our conscious choices. Simple fixes to urban design and the built environment. There is a hidden power behind simple, low-tech and low-cost interventions and they can make a big difference in someone's life.

Research Limitations and Questions

There were multiple research limitations that arose from this study. The health data was very difficult to find and I had to rely on the information that Buettner provided primarily. Buettner mentions that their team had limitations in some of these countries accessing the birth/death certificates was difficult and in many places, the oldest individuals don't know their ages or might be lying about them. Also, the Global Burden of Disease study only had health information by country

and I was not able to find health data about the specific Blue Zones regions due to their isolated and small populations.

A question I had about the Blue Zones research is whether picking the few outliers of longevity and studying them may not be the best strategy. We should expect variations from the expected mean in any subgroup. Can some of these variations in life expectancy be explained only by chance?

Most of the research questions in this paper were addressed, but there were some research findings that were not anticipated to begin with. Throughout the research, trends about the urban form became very clear. All of the Blue Zones studied follow the organic urban form due to the naturally hilly topography and limited technology available to build. The cities in America that were chosen as Blue Zones projects all had an underlying grid framework to work off of. In my opinion, this made their work much easier. In Brenda Case Scheer's *The Anatomy of Sprawl*, she came to the conclusion that American sprawl is composed of three suburban tissues (elastic, inelastic and campus) and some forms are easier to work with than others (Scheer, 2001). In the case of the Blue Zones projects, they started with areas that already had good bones to begin with. It would be interesting to research how these Blue Zones techniques, especially the 5 found to be most related to the environment, could be applied to more dendritic, unconnected suburban forms such as golf course communities. It is easy to work with communities that already have the framework once simple fixes are made and social groups are formed, but it seems quite harder to work with an area that has no connection. The Blue Zones organic form works for them, but does not work for America primarily because of lifestyle, technology and societal differences.

The Blue Zones have been isolated physically and socially for hundreds of years. Buettner mentions that 80 percent of our longevity is due to lifestyle choices, while 20 percent is due to our genetic makeup (Buettner, 2015). It isn't unreasonable to wonder whether these communities have actually been inbreeding for hundreds or even thousands of years. Is it possible that these communities have avoided some of the recessive genetic diseases due to their physical isolation? Are "longevity" genes more prevalent in an isolated gene pool? It would be interesting to research genetic diversity in static and elastic environments. When environmental changes take place, are these communities with genetic sameness in greater danger of dying off?

Finally the last question that I had was whether diversity is in fact not as important to longevity as we thought. The Blue Zones identified seem to lack diversity, yet in the American Nightmare, I outlined how suburban sprawl causes homogenous societies, which can cause feelings

of isolation and depression. This is not the case in the Blue Zones, so it would be interesting to research diversity and self-reported subjective well-being outcomes further.

Further Research

- Examining the remaining variables in Buettner's "Power 9" that were not selected and how planning policies impact them.
- Adding new variables to the conceptual framework.
- How these Blue Zones techniques, especially the 5 found to be most related to the environment, could be applied to more dendritic, unconnected suburban forms such as golf course neighborhoods, strip malls, etc.
- Genetic diversity in static and elastic environments
- Diversity and self-reported subjective well-being outcomes
- Topics of re-greening suburbia for urban agriculture (plant slant) and better uses
- In Ellen Dunham-Jones and June Williamson's *Retrofitting Suburbia*, they note great potential in retrofitting the American suburbs through 1st, 2nd and 3rd generation retrofits. The 1st generation has been primarily completed by the private sector, the 2nd by the public sector and finally the 3rd by public-private partnerships (Dunham-Jones, 2011). What will 4th generation retrofits of American suburbia look like? Will non-profits have a bigger role? Rising millennial planners have exciting work in their futures.
- Policies to dis-incentivize sprawl and how they impact health
- Public, private and non-profit partnerships
- Research the socio-ecological models of health behavior and the determinants of health
- Further literature review of World Happiness Report, Healthy People 2020, etc.

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