

MEASURING THE RIGHT TO FOOD: A U.S. POLICY PERSPECTIVE

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December 7, 2016

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ABSTRACT

The right to food is recognized by international law as a fundamental human right of all people. Three conditions must be met for the right to food to be realized; food must be available, accessible, and adequate. While food policy research in the United States has focused on specific elements of these conditions, the right to food has not been measured in a substantive and comprehensive way. This paper discusses the normative implications of the right to food in the United States and proposes a framework for operationalizing and measuring it domestically. I argue that right to food standards should apply in the United States, and that a substantive and comprehensive right to food assessment should be undertaken. Incorporating right to food principles into the development of U.S. food policy, particularly at the state and local levels, may address both structural and direct determinants of food insecurity and the prevalence of overweight and obesity. The goal of right to food policies in the U.S. should be to facilitate conditions such that people are able to provide a healthy diet for themselves. This paper takes the first step in a substantive right to food assessment of U.S. food policy by introducing an evaluation framework for use in future policy research and analysis.

ACKNOWLEDGEMENT

I would like to thank my advisors, Dr. Pamela Jagger and Dr. Ben Meier, for their guidance and support in writing this thesis. I also want to thank UNC Field Hockey and UNC Athletics for their continuous support of my goals in the classroom and on the field over the last four years.

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CHAPTER ONE: INTRODUCTION

The right to food is recognized by international law as a fundamental human right of all people. Multinational agreements recognizing the right to food can provide the foundation for national policies that seek to address determinants of this right. The right to food, as part of a collective human rights framework, may also be used to evaluate a nation's policies and resulting population-level outcomes. This thesis examines the right to food in a national context, focusing on how this right can be interpreted and applied in the United States. The study is motivated by three research questions:

1. Should the human right to food be applied as a standard in the United States?
2. How should this standard be applied and measured in the United States?
3. Which elements of the right to food have the greatest potential for impact in the United States?

In order to answer these questions, I first argue that right to food standards should apply in the United States. I provide a substantive review of normative right to food principles and obligations of states in meeting certain standards. To answer the second and third questions, I operationalize the conditions required by the right to food and provide a framework for measurement of this right in the U.S.

First, the paper provides a normative analysis of the right to food, including various international agreements that either guarantee or protect this right. This section discusses the conditions that must be met in order for the right to food to be realized, as identified and codified by U.N. agreements, in addition to specific obligations of states. This portion also discusses the right to food and its integration in national policy, focusing on how specific elements of the right to food have been addressed and quantified in domestic policy research. This represents the first step in translating the normative concepts associated with the right to food into tools for U.S.

policy evaluation and analysis. I answer the second research question by developing a framework of indicators that can be used to measure the right to food in the United States, in accordance with guidelines from the United Nations Food and Agriculture Organization (FAO). I then use secondary data analysis to address the third research question. Regression analysis is used to determine how selected indicators impact outcome measures chosen to represent each condition. Results from both the normative and quantitative analysis are discussed and evaluated. Finally, I make recommendations for future research and policy consideration based on my findings.

Although the United States has not ratified existing international agreements associated with the right to food, I argue that it should still work towards realization of right to food principles and standards for its own citizens. While hunger and malnutrition may appear in different ways in the U.S. (when compared to less developed nations), the level of resources available make realization of the right to food an achievable and reasonable goal. This thesis is founded in the notion that those worst off in the United States should not face limitations associated with hunger while living in a nation of such prosperity. A comprehensive assessment of the right to food in the United States is the first step in recognizing areas of strength and identifying any potential areas for improvement. Drawing on both normative implications and specific requirements of the right to food, this paper explores what the right to food *should* look like and attempts to establish a framework for determining quantitatively what it *does* look like. The ability to conduct such an assessment in the United States is an important element of effective evaluation and government accountability.

This thesis makes a unique contribution in two ways. First, it applies international human rights standards to the United States. Second, it operationalizes these standards for quantitative analysis within a U.S. context. I compile a wide range of right to food measures applicable in the

U.S. and synthesize them within a right to food framework. The thesis builds on discussion of normative right to food principles and how they can be applied in the U.S. (Messer and Cohen, 2007; Chilton and Rose, 2009; Carney, 2012; Raponi, 2016) and on efforts to operationalize the right to food into tangible indicators for measurement at the national level (OHCHR, 2012). The major contribution of this thesis is the development of an evaluation framework for measurement of the right to food in the United States. Furthermore, bringing together existing measures of the U.S. food system has the potential to identify relationships and inform future research with the goal of developing more effective policy. The goal of this thesis is to quantify the normative concepts implied by the right to food and to provide a mechanism for future policy evaluation and development.

CHAPTER 2: REVIEW OF THE EVOLUTION AND NORMATIVE CONTENT OF THE RIGHT TO FOOD

The right to food is an appropriate evaluation standard at the national and international levels due to its expansive nature and its protection under international law. Protection under international legal frameworks has specific advantages. First, international human rights law comes with a normative significance that lends importance to the issue of food security at the international and national levels; accepting the human right to food thus has a normative weight that can be empowering by providing agency to those who are protected by it (Raponi, 2016). Second, the fact that human rights are protected by international law implies that they are universal, and thus applicable to all state parties (Niada, 2006). The right to food as a legal concept provides a standard that can be applied across nations. This international standard is an essential element of using a human rights framework to evaluate the fulfillment of rights in

developed countries that may otherwise be exempt from scrutiny. The following section provides a thorough review of right to food standards and principles.

The Right to Food Under International Law

The right to food was first introduced in international human rights discourse in the 1948 Universal Declaration of Human Rights. Tracing the evolution of this right over time and its presence in international agreements allows for an understanding of the context and significance of the right to food today. Figure 2.1 provides a timeline of relevant right to food agreements, each of which is discussed in greater depth. Although the 1948 Declaration established an understanding of the right to food, the legal definition and specific requirements needed to be clarified. The following section provides a summary of key international accords that include provisions related to the right to food, and focuses specifically on two major documents: the 1966 International Covenant on Economic, Social, and Cultural Rights (ICESCR) and General Comment No. 12 in 1999. These two documents in tandem provide the strongest language guaranteeing the right to food as a human right.

Figure 2.1: The Right to Food in International Agreements and Law



International Covenant on Economic, Social and Cultural Rights

The right to food was first proclaimed by the United Nations (U.N.) in Article 25 of the Universal Declaration of Human Rights (UDHR): “Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food” (U.N.

General Assembly, 1948). The UDHR represented a global commitment to human rights in the wake of World War II (PWESCR, 2015). The next major document to address the right to food is the International Covenant on Economic, Social and Cultural Rights (ICESCR). Adopted in 1966 and effective in 1976, the ICESCR built upon post World War commitments and was adopted in response to Cold War tensions between countries that supported economic, social, and cultural rights and those that focused solely on civil and political rights (PWESCR, 2015). The ICESCR represents “the most important binding guarantee of the right to food” in international human rights discourse (Sollner, 2007: 393). Article 11 codifies the right to food in two respects (U.N. General Assembly, 1966).

1. “The States Parties to the present Covenant recognize the right of everyone to an adequate standard of living for himself and his family, including adequate food”
2. “The States Parties to the present Covenant, recognizing the fundamental right of everyone to be free from hunger...”

The ICESCR therefore guarantees the right to food in two different respects; Article 11 reaffirms the right to adequate food as distinct from the right to be free from hunger. This implies that adequacy cannot be interpreted as the basic fulfillment of caloric need, a notion later expanded upon in 1999 by the Committee on Economic, Social and Cultural Rights (CESCR) in General Comment No. 12.

In adopting the ICESCR, states commit themselves under Article 2 to “take steps...to achieving progressively the full realization of the rights recognized in the present Covenant” (U.N. General Assembly, 1966). The notion of progressive realization requires states to take actionable steps toward realizing certain rights while recognizing that the full realization of

rights is resource-dependent (Sollner, 2007). The two provisions guaranteed by the ICESCR thus provide the normative foundation for the right to food.

World Food Assemblies

The ICESCR resolutions were followed by two major assemblies of the international community. In response to a burgeoning global food crisis, world leaders convened in 1974 for the World Food Conference. The early 1970s were marked by a period of global famine and skyrocketing grain prices, resulting in widespread hunger and malnutrition (Gerlach, 2015). In passing the Universal Declaration on the Eradication of Hunger and Malnutrition, member states furthered their commitments to combating hunger by invoking human rights. The 1974 Declaration reaffirmed the “inalienable right to be free from hunger,” echoing the fundamental nature of the right to food first acknowledged in the ICESCR (U.N. General Assembly, 1974). Furthermore, this Declaration deemed addressing food security and problems of food distribution a “fundamental responsibility of Governments,” placing further obligations on states to take actionable steps to implement the right to food through national policy (U.N. General Assembly, 1974).

World leaders met again in 1996 for the World Food Summit, prompted by a global increase in cereal prices and diminishing reserves (Fresco, 1997). The World Food Summit furthered commitments of national governments to solving the problem of global food insecurity, as evidenced by the Rome Declaration, adopted at the outset of the Summit (Fresco, 1997). Although the conference focused largely on agricultural production and policy, the commitments made in the Rome Declaration and corresponding World Food Summit Plan of Action uphold both the right to adequate food and the right to be free from hunger (FAO, 1996). In Articles 12 and 13, the Plan reaffirms the obligation of states to implement national policies that uphold and

contribute to the full realization of human rights, emphasizing the importance of progressive realization of the right to food in order to achieve food security (FAO, 1996). The Plan also lays the groundwork for future clarification of the right to food and how it should be implemented. Article 61 affirms the commitment to expand on Article 11 of the ICESCR by promoting the provisions outlined and providing guidance for states to achieve full realization of the right to food and eradicate food insecurity (FAO, 1996). Finally, the Rome Declaration established the goal of reducing the number of undernourished people in the world by half by the year 2015. This goal was echoed four years later in Article 19 of the 2000 Millennium Declaration; while the Millennium Declaration did not specifically mention the right to food, it upheld the obligation of states to respect and promote the realization of all human rights (U.N. General Assembly, 2000). Similarly, the Sustainable Development Goals (SDGs), adopted in 2015 and coming into effect in 2016, prioritize global food security and nutrition. The second goal of “zero hunger” makes the commitment to “end hunger, achieve food security and improved nutrition and promote sustainable agriculture” by setting various targets to be achieved by 2030 (U.N., 2016). Though the SDGs do not specifically promote the right to food, the goal to end global hunger represents an international effort to implement certain right to food principles.

Voluntary Guidelines

One instrument used to clarify the right to food per the commitment made at the World Food Summit was the 2004 release of Voluntary Guidelines for states to follow in implementing the right to food in national policy. This comprehensive set of nineteen points span structural and process level policies that promote the right to food at the national and international levels. The Voluntary Guidelines are intended to assist states in pursuing a right to food agenda within the context of national food security. Sollner (2007) points out, however, that the guidelines can be

considered a form of “soft law”—although they discuss legally binding and non-binding information, they do not carry any formal legal authority and therefore cannot compel additional obligations onto states. This non-binding characteristic may play into critiques regarding the potential ineffectiveness of agreements that simply recognize human rights goals but do not provide formal obligations. However, the Voluntary Guidelines are an important component of right to food discourse for two reasons: one practical and one symbolic. First, the Guidelines provide a “blueprint” for policy implementation at the national level, including concrete steps that can be taken by states to advance the realization of the right to food (Sollner, 2007). Acceptance of the Voluntary Guidelines implies the political will of nations to combat hunger by adhering to a prescribed list of practices and policies, while states that deviate from the Guidelines must justify actions that oppose or do little to facilitate the realization of the right to food (Sollner, 2007).

General Comment No. 12

In accordance with the pledge made at the World Food Summit in 1996 to clarify the right to food, the U.N. Committee on Economic, Social and Cultural Rights (CESCR) in 1999 issued General Comment No. 12. This document provides the most substantive and strongest language regarding the specifics of the right to food, including an in-depth definition of necessary conditions, an explanation of state obligations, and notes on benchmark and monitoring procedures. Most importantly, General Comment No. 12 establishes a standard by which states can be evaluated and compared in their progress towards meeting the full realization of the right to food. General Comment No. 12 focuses not only on the right to be free from hunger, but more specifically on the notion of adequacy. Paragraph 6 provides the most expansive definition, stating:

“The right to adequate food is realized when every man, woman, and child, alone or in community with others, have physical and economic access at all times to adequate food or means for its procurement” (CESCR, 1999).

This definition captures multiple related dimensions of the right to food, specifically on what constitutes adequate food. Paragraph 8 expands on the definition of adequacy to include two components: availability and accessibility (CESCR, 1999). These three components (adequacy, availability, and accessibility) make up the fundamental conditions necessary of the right to food. Uniting these principles is an underlying concern for individual empowerment; the Comment states, “the right to adequate food is indivisibly linked to the inherent dignity of the human person” (CESCR, 1999). These themes support the concrete material discussed in the Comment and can be translated into substantive policies that support the right to food.

Most recently, in 2008 the CESCR issued a Statement on the World Food Crisis in response to rising global food prices. The Statement points to the crisis as a failure of nation states to meet the obligations required by the right to food (CESCR, 2008). More importantly, the Statement can be understood as a call to action for states to address not only the immediate effects of the food crisis, but also the structural issues contributing to an inequitable distribution of food and the widespread deprivation of the right to food (CESCR, 2008). The Statement thus has particular significance because it invokes the right to food to justify policy action at the national level, furthering the notion that national human rights policies can be used as a means to address the global problem of food security.

Defining the Three Conditions

As mentioned previously, the right to food encompasses three distinct conditions that must be met in order for the right to be fulfilled: food must be **available, accessible, and**

adequate. General Comment No. 12 clarifies these conditions and provides guidance for how each should be understood.

Availability is discussed primarily in paragraph 12 of the Comment. Food is available when individuals can feed themselves from “productive land” or via “well functioning distribution, processing and market systems that can move food from the site of production to where it is needed in accordance with demand” (CESCR, 1999). Availability refers to structural conditions that allow people to procure food, either by growing it themselves or by purchasing it. This condition can also refer to the sufficiency of the food supply to ensure that food is available “in a quantity...sufficient to satisfy the dietary needs of individuals” as per paragraph 8 of the Comment (CESCR, 1999). Availability is understood as a well functioning food system in which the production and distribution of food is such that there is sufficient food for everyone.

Accessibility includes both physical and economic access to food. Paragraph 13 of the Comment discusses both aspects. Economic access is related primarily to the cost of food, which must be “such that the attainment and satisfaction of other basic needs are not threatened or compromised” (CESCR, 1999). Economic access applies to any avenue by which people procure food, representing “a measure of the extent to which it is satisfactory” (CESCR, 1999). In what the CESCR would come to call “affordability,” this standard applies not only to actual food prices but also to structural level factors and economic conditions related to the means necessary for acquiring food (Sollner, 2007). In short, people must have the means to purchase food in order for this condition to be met (OHCHR, 2010). On the other hand, physical access refers to people’s actual ability to acquire food. Paragraph 13 states that “food must be accessible to everyone,” including certain classes of vulnerable groups who may face physical barriers to procuring food (CESCR, 1999). These barriers can include people who live in rural areas, or

those who face physical disabilities and may not be able to procure food on their own. Sollner (2007) notes that physical access is not a conditional standard; people are either able to procure food, or they are not. The two elements of accessibility thus span systems level and individual factors that may represent barriers to adequate food; these barriers must be addressed in order for the right to food to be fulfilled.

Adequacy is not limited to a sufficient amount of food, as Paragraph 6 notes, “the right to adequate food shall therefore not be interpreted in a narrow or restrictive sense which equates it with a minimum package of calories” (CESCR, 1999). In what the CESCR would come to call “quality,” adequacy thus embodies the expansive nature of the right to food that goes beyond simply eliminating hunger. Conditional factors must be taken into a consideration of adequacy; these conditions are impacted by “prevailing social, economic, cultural” norms (CESCR, 1999). This variability implies that what may be considered adequate in one state or under one set of circumstances may not meet the same standard in another. Three such conditions are highlighted specifically in General Comment No. 12. First, dietary needs must be met, according to Paragraph 9 of the Comment. Needs refer to the nutritional makeup of the available diet that go beyond calories necessary for life; rather, there must be a diversity of nutrients in the diet such that “physical and mental growth, development and maintenance, and physical activity” are possible (CESCR, 1999). The nutritional makeup of the diet is thus an important factor in determining adequacy; food must therefore be sufficient in quality in addition to quantity. Second, according to Paragraph 10, food must also be “free from adverse substances” (CESCR, 1999). This condition sets standards for food safety and requires some level of prevention directed towards the contamination of food. Third, the available diet must be consistent with cultural norms; it must be acceptable within the given society. Paragraph 11 requires that “non

nutrient-based values attached to food” must be considered when evaluating adequacy (CESCR, 1999). This bolsters justification for addressing structural factors in addition to the immediate problems related to food insecurity, focusing not just on eliminating hunger by meeting minimum caloric needs, but also on the factors that create conditions necessary for people to provide for themselves an adequate diet that meets their needs.

These three conditions must be met in order for the right to food to be considered fulfilled. States are faced with specific kinds of obligations that promote the right to food. Though interpretation and discussion of the extent of state responsibility is outside the scope of this thesis, the specific obligations as detailed in General Comment No. 12 are discussed in the following section.

Obligations of States to Promote the Right to Food

According with Paragraph 15 of General Comment No. 12, states have three obligations related to meeting the conditions specified by the right to food: to respect, protect, and fulfill. These obligations inform how we should understand the role of governments in realizing the right to food (CESCR, 1999).

States are required first to **respect** the right to food, meaning the government should not take actions that would prevent the right to adequate food from being realized (CESCR, 1999). To **protect** means that the state is obligated to prevent individuals, organizations, or third parties from denying the right to adequate food for any other class of individuals or group. This can include state actions taken to ensure that food is regulated in such a way that guarantees its safety and/or quality (OHCHR, 2010). The obligation to **fulfill** has two components: to facilitate and to provide (CESCR, 1999). Facilitate means that the state must “pro-actively engage in activities intended to strengthen peoples access to and utilization of resources” (CESCR, 1999). States

must therefore take actionable steps toward realization of the right to food. States are required to directly provide food only when people do not have the resources to do so for reasons outside of their control (CESCR, 1999). This obligation—to provide—is emblematic of the objection relating to a right to be fed. It is important to note that the Comment requires this action of states only when people are unable to provide for themselves “for reasons beyond their control” (CESCR, 1999). This obligation does not therefore imply that states should provide or hand out food to anyone who does not have it. When taken together, the three levels of obligation provide a framework that can be applied to states and interpreted relative to the conditions within those states.

Having defined the right to food in international discourse and clarified its key components, an understanding of what the right to food is *not* may be helpful. It is important to understand how the right to food is distinct from other concepts in both its legal status and scope. Potential misconceptions are clarified in next section.

The Right to Food vs. Food Security

One potential misconception is that the right to food is as simple as meeting a minimum caloric count to ensure food security. While the two concepts capture similar measures, food security is understood as a condition that must be met in order for the right to food to be fulfilled (OHCHR, 2010). There are two important distinctions between food security and the right to food. First, food security as a concept does not carry legal weight (OHCHR, 2010). As a result, it cannot be used to hold states and parties accountable because it is not legally binding. Second, food security is more limited than the right to food. Food security is a condition that must be met, while the right to food refers to a human-rights approach that imposes obligations on states and includes food security among other conditions; the right to food is therefore a more

comprehensive framework for use in international discourse about governmental obligations, accountability, and policy.

The Right to Food vs. Food Sovereignty

Food sovereignty builds on the concept of food security and is often viewed as an alternative, particularly in its rejection of neo-liberal attitudes towards the global food system (Wittman, 2011). Food sovereignty refers to “the right of communities, peoples and states to independently determine their own food and agricultural policies” (Beuchelt and Virchow, 2012: 259). In short, this concept implies that individual states and peoples should have democratic control over their own food systems. Food sovereignty goes further than food security in its emphasis on individual determination of access to the food system. Some proponents argue that food sovereignty can only be achieved by recognizing food as a human right (Carney, 2012). Still, rights-based approaches are preferable to both food security and food sovereignty because they are legally binding in international law, and thus provide a global context in which we are to understand the right to food and the ways in which this right can be fulfilled at the national level (Carney, 2012). Though food sovereignty has not been applied as consistently in the United States as food security, as Carney (2012) notes, an understanding of this concept as distinct from the right to food is essential when considering how the right to food should be translated within the U.S.

The Right to Food vs. The Right to be Fed

Another potential misconception about the right to food is that it implies that food should be provided for anyone who does not have it. This is not the case. In cases such as natural disasters that preclude people from providing for themselves, the state should provide food (OHCHR, 2010). However, consistent with general rights based approaches, the right to food is

understood as the right of the individual to provide for oneself. Direct food assistance under certain conditions is only one element of the right to food, which is “primarily a right to feed oneself and to have access to food” (Raponi, 2016: 4). The right to food is therefore more comprehensive and focused on addressing structural aspects of food insecurity, rather than simply providing justification for immediate and temporary solutions. The right to food as a fundamental human right emphasizes dignity and agency, with individuals expected to meet their own needs under conditions that allow them to do so (OHCHR, 2010). Accepting the right to food does not “impos[e] an obligation on someone else to produce the food, or to hand over food to anyone who might be inclined to assert the claim” (Byron, 1988: 322). Rather than ensuring that food will be provided to all people, the right to food protects the right to engage in the responsibilities associated with feeding and providing for oneself with dignity (Byron, 1988). Some find in the United States an aversion to accepting a fundamental “right” to food, viewing efforts to address domestic food insecurity as charitable (Raponi, 2016). This misconception must be addressed for any substantive efforts to be made in advancing the right to food in the United States, particularly by distinguishing the right to feed oneself—the guarantee of conditions that allow individuals to do so—from the right to be fed via charitable causes or governmental assistance.

Over-Nutrition

Though applications of right-to-food principles are largely relevant to achieving food security and mitigating under-nutrition, the growing epidemic of over-nutrition in the 21st century cannot be ignored. Global institutions, including the U.N. and the World Health Organization, have increased scrutiny and policy attention paid to non-communicable diseases (NCDs), including the endemic health concern posed by widespread obesity. From the 2011

U.N. High Level Meeting on NCDs to the WHO's Global Action Plan in 2013, awareness that an integrated strategy is needed to combat global obesity rates has increased. A major theme is the need for accountability systems at the national and international level to advance a public-health oriented strategy, as opposed to focusing solely on the responsibility of individual behaviors (Chopra, et.al., 2002; Swinburn, et.al., 2015). Swinburn, et.al. (2015) note that widespread agreement exists on the role that national governments can play to facilitate policies that improve the healthfulness of food environments, allowing for specific focus on disadvantaged populations where applicable. This approach is consistent with right-to-food principles of access and adequacy, particularly in a U.S. context. Access to food can refer to healthy foods; for example, by ensuring that grocery stores, farmers markets, and other outlets selling fruits and vegetables and other healthy foods are physically accessible in the population. Furthermore, the price of a healthy diet should be affordable and therefore economically accessible to the population. The concepts of access to healthy food and a healthy food environment contribute to a more nuanced understanding of adequacy; the readily available diet should not only be calorically sufficient, but should provide individuals with the nutrients they need. This is another example of how adequacy encompasses both quality and quantity of the diet.

The relationship between obesity and dietary adequacy brings to light a double burden of under and over nutrition. It is possible to face food insecurity and over-nourishment simultaneously. Hough and Sosa (2015) discuss this “paradoxical” relationship that is largely driven by poverty, through low-income individuals meeting their caloric needs with a low-quality diet that fails to meet nutritional standards and can have negative health consequences. In the United States, this is a pressing concern given persistent rates of both food insecurity and obesity; the population experiencing both of these outcomes may not exist in two distinct groups.

An emphasis on improving access and adequacy to healthy food specifically may be even more important in the U.S. as individuals may be afflicted by this double burden, driven largely by the food environment in which people live.

Attempts to measure food environments and national food policies are an important element of the global strategy to combat NCDs. Two current efforts on this front are worth mentioning. The International Network for Food and Obesity/NCDs Research, Monitoring and Action Support (INFORMAS) is a global network of public interest and civil society groups working to collect and provide data in an effort to measure public and private policies related to healthy food environments (Swinburn, et al., 2013). INFORMAS serves as a complement to the WHO's NCD monitoring process by providing a system of monitoring and evaluation that allows for standardized comparisons between nations. (Swinburn, et al., 2013). In addition to measuring determinants of the food environment, INFORMAS also seeks to measure the actions of public and private actors and their effects on obesity and NCDs. A second accountability mechanism exists through independent monitoring systems. Issued since 2013, the Access to Nutrition Index evaluates global leaders in the food industry based on the strength of their commitments to alleviating both under and over nutrition (Swinburn, et al., 2015). Complementary to the ANI is the Hunger and Nutrition Commitment Index, focused on evaluating national governments on the basis of their policies aimed at addressing poor nutrition (Swinburn, et al., 2015). Though this index applies to low and middle-income countries and does not measure U.S. policy impact, both of these measurement frameworks provide examples of systematic evaluation mechanisms that could be applied in the United States. When taken together, these systems address actions of the public and private actors that become the determinants of under-nutrition and, of increasing concern, over-nutrition in the form of obesity.

The right to food has been the subject of international discourse and protection for some time. Though the concept has developed, the conditions of availability, access, and adequacy continue to set the standard for realization of this right. In short, food must be sufficient in both quantity and quality. However, acknowledgement of the right to food in global accords is not enough. The next step is to translate and implement right to food principles into national policy. Building on the normative content of the right to food, an understanding of how these principles can be applied in the United States is essential. In the following section, I first discuss ways in which states can implement right to food principles, and then focus on how the right to food can be translated in the context of the United States and discuss existing efforts to address availability, access, and adequacy in the U.S.

CHAPTER 3: THE RIGHT TO FOOD AT THE NATIONAL LEVEL

Beyond recognition of the human right to food in international law and discourse, the right must be operationalized domestically. It is the responsibility of states to enact policies that will ultimately determine the conditions directly linked to the right to food and the outcomes observable at the individual and population levels. Simply acknowledging the right to food in international agreements is ineffective if commitments are not followed by actions seeking to implement the principles of the right to food through national policy. McDermott (2012) notes that this is in fact one weakness of the internationally recognized right to food; it cannot effectively stand alone without enforceability at the national level. General Comment No. 12 highlights the responsibility of states to develop a national strategy for implementing the principles associated with the right to food, “based on a systematic identification of policy measures and activities relevant to the situation and context” (CESCR, 1999). In other words, states must seek to identify areas, including structural factors, in which policy action is necessary

for realization of the right to food. States must also establish the necessary mechanisms to track progress towards realizing the right to food in the most expeditious manner possible. This section marks a transition from an analysis of the normative implications and specific conditions of the right to food, towards a practical discussion of how these principles are to be applied at the national level, focusing on a U.S. context. Potential strategies for policy implementation are first summarized. I then focus specifically on the United States, examining the position historically taken by the U.S. on the right to food and ways in which the U.S. can make advancements in incorporating rights-based principles in its domestic food policies.

Options for State Implementation of Right to Food Policies

Formal guidance is available for states to adopt a rights-based approach to national food policy. In taking a rights-based approach to food security, the Food and Agriculture Organization notes that human rights principles must be fundamental elements of policy (FAO, 2006). FAO suggests a national right to food approach with policies spanning five categories: advocacy and training, information and assessment, legislation and accountability, strategy and coordination, and benchmarks and monitoring (FAO, 2006). Policy efforts across these areas collectively can lead to an effective implementation of rights based food policies that target vulnerable groups and make advancements in realizing the right to food for all of a state's citizens.

States also have the option to formally recognize the right to food in the state constitution. Protecting the right to food in this way provides a legal basis for enforcement of violations and a general extension of the right to all those protected under a constitutional document. The approach recommended by the CESCR is development of a framework law (CESCR, 1999). Framework legislation would include an explanation of the law's context while setting specific targets and establishing a timeframe in which to make sufficient progress towards

the goals defined by the law (CESCR, 1999). This approach has advantages because it requires the state to ground a national policy within a right to food context and based on right to food principles, while still emphasizing state accountability by establishing concrete goals and defining the mechanisms necessary to achieve them.

In addition to the two potential options outlined above, states can still advance right to food policies in more targeted ways. Addressing specific elements of the right to food may contribute to valuable progress towards outcome goals, but a comprehensive strategy developed within a right to food framework may prove most effective in addressing structural determinants of the right to food and its realization. Any strategy adopted should be based on a definitive effort to identify areas of weakness and potentially vulnerable populations, in accordance with Paragraph 22 of General Comment No. 12 and FAO guidance. The next section discusses the positions taken by the United States concerning the right to food and its components in international discourse and in domestic policy, before assessing ways in which the U.S. could begin to move towards or implement a more rights-based approach to national food policy.

The Right to Food in the United States

The United States has typically taken a reserved approach in its positions concerning the right to food. Although the U.S. does have some degree of national food policy, it is not within the context of a right to food framework (Messer and Cohen, 2007). This section first summarizes the position taken by the U.S. on right to food legislation before discussing steps the U.S. *has* taken and potential advancements for policy going forward.

Messer and Cohen (2007) note that though the United States accepts the human rights principles set forth in the U.N. Declaration of Human Rights, it has categorically rejected any legally binding right to food agreements. This is a principled objection founded in rejecting the

notion that states have specific *obligations* as part of the right to food (Raponi, 2016). The U.S. is therefore not a party to the International Covenant on Economic, Social and Cultural Rights, having signed the agreement but not ratified it. Failing to ratify the ICESCR signifies that the U.S. is unwilling to assume the responsibilities they would be legally obliged to, although signing the agreement indicates an acceptance of the values implicit (Chilton and Rose, 2009). Tension between the U.S. stance on right to food agreements and acceptance of right to food principles is not a recent phenomenon. Messer and Cohen (2007) highlight fluctuating levels of support for the right to food during the 1970s and 1980s. Though advocacy groups, such as Food First and the Food Research and Action Center, worked to emphasize the importance of the right to food, U.S. policy did not reflect these grassroots attempts; such groups did not present a cohesive policy agenda to advocate for, and thus failed to have an influence on foreign policy stances, which remained resistant to commitments that would require action from the U.S. government (Messer and Cohen, 2007). Messer and Cohen (2007) also point out that federal food assistance programs fluctuated in their scope during this period; though “welfare” remained on the policy agenda, support was inconsistent, and the impacts of these national programs were not evaluated within any rights based frameworks. Meanwhile, the Right to Food Resolution garnered support from some U.S. legislators in 1976. This resolution was an attempt by Congress urging the United States to consider humanitarian values in its foreign and domestic food policies; however, this resolution was non-binding and did not ultimately lead to any decisive actions towards embracing the right to food, despite the signing (though not ratifying) of the ICESCR in 1977 (Messer and Cohen, 2007).

In 1993, the United States formally withdrew from international commitments to further define the right to food. The U.S. stance was largely motivated by suspicions that welfare reform

policies taking effect in the U.S. would not hold up against international legal standards (Messer and Cohen, 2007). The U.S. has continued to support a neoliberal approach in the global sphere, favoring economic growth as the mechanism by which to push for achievement of the Millennium Development Goals and continuing to vote against the U.N. Right to Food Resolution (Messer and Cohen, 2007). Despite efforts to combat food insecurity and garner support for rights-based food policies, the U.S. has clearly rejected international recognition of the right to food and its obligations on principle, instead pursuing its own food policy agenda at the national level in the absence of a rights-oriented framework.

One rationale for opposing right to food legislation or right to food policies is an objection to the obligation of the government to provide food (Raponi, 2016). This view is driven by misconceptions about what the right to food entails and how it is to be implemented. The distinction between the right to food and the right to be fed has been clarified previously, but it is worth reinforcing that the right to food does not imply that the role of government should be to provide food for anyone who needs it. Rather, the right to food is simply “the right to expect reasonable opportunities to provide food and good nutrition for oneself” and that “the government’s role is to facilitate these opportunities” (Chilton and Rose, 2009: 1207). In short, the government can support food policies to ensure that the economic and social conditions are such that people can provide for themselves. Adopting a rights-based approach could allow for structural changes as opposed to focusing solely on a needs-based approach, which has been favored by the U.S. in addressing domestic food concerns.

Food Security and a Needs Based Approach

As discussed in previous sections, the right to food is a multidimensional right that encompasses not only outcome measures, but also structural factors related to how and what

people eat. The United States has focused largely on outcome measures, specifically on food security. Beginning with the Reagan administration, a conceptual basis for measuring food security and hunger in the United States was developed and implemented in the form of a national survey called the Food Security Supplement (Carney, 2016). Today, the United States Department of Agriculture (USDA) monitors food security at the national and state levels. The USDA defines food security as “access by all people at all times to enough food for an active, healthy lifestyle” (USDA, 2016c). This measurement is the primary indicator of need in the United States. Measuring food insecurity addresses the immediate problem: that people often do not have enough to eat. In fact, 71% of the USDA’s 2017 budget is allocated toward providing direct nutrition assistance, with \$82 billion allocated to the Supplemental Nutrition Assistance Program (SNAP), formerly known as Food Stamps (USDA, 2016a). While measuring food insecurity provides valuable information about which populations need assistance and can inform policies aimed at providing it, this approach is limited in that it does not address structural factors that contribute to the problem. Former U.N. Special Rapporteur on the Right to Food, Olivier de Schutter, cites a lack of “political will” in addressing such underlying causes of hunger, largely due to inefficient national policy strategies (de Schutter, 2009: 2). Conceptually, such needs-based strategies “assume that people who lack access to food are passive recipients” (Chilton and Rose, 2009: 1207). Though needs-based strategies in the U.S. may be essential solutions to targeting the most immediate problems of hunger and food insecurity, there is potential for improvement with policies that address underlying factors and conditions. A rights-based approach and national food policy strategy would provide a platform for addressing both while emphasizing the significance of providing for oneself as opposed to receiving direct assistance.

Quantitative Approaches to Measuring Right to Food Principles in the U.S.

Extensive research has been conducted in the United States relating to certain elements of the right to food. While not specifically understood within a right to food framework, aspects of food availability, access, and adequacy are covered in existing food policy research. A summary of current findings is found below.

Efforts to document the U.S. food supply explore trends in availability and subsequent consumption. The USDA has extensively documented the availability of food and specific nutrients at the national level, focusing on availability of specific food items, food groups, and macronutrients (USDA, 2016d). This documentation also accounts for food loss. In addition to objective measures of U.S. availability, the food supply can be evaluated in a global context. A white paper report from the group Sustainable America evaluates the U.S. food supply in relation of the global food supply; the report finds that although crop yields have continuously increased in the U.S., the global food supply currently operates above capacity, increasing the potential for future price increases and shortages (Sustainable America, 2012). The report finds that food waste must be decreased at all levels of the U.S. food system from a current estimated range of 27 to 50 percent in order to avoid negative environmental effects and potential shortages in the future (Sustainable America, 2012). In addition to documenting the depth of the food supply, efforts to evaluate its actual composition are also found in existing research. Krebs-Smith, Reedy, and Bosire (2010) measure the dietary quality of the U.S. food supply from 1970 to 2007, developing the Healthy Eating Index (HEI) to evaluate the food supply and its consistency with dietary recommendations from the USDA's Dietary Guidelines. A major finding from this research is that "deliberate efforts on the part of policy makers, the agriculture sector, and the food industry" will be needed to ensure that the food supply can provide a nutritionally adequate

diet that is available to everyone (Krebs-Smith, Reedy, and Bosire, 2010:1). This finding, that coordinated policy efforts are needed to ensure an adequate diet for all people, is consistent with right-to-food principles and should be taken into consideration. Finally, national-level analysis of the U.S. food supply has also examined the prevalence of overconsumption. Blair and Sobal focus on the concept of “luxus consumption,” defined as the prevalence of “food waste and overconsumption leading to...health problems, and excess resource utilization” (Blair and Sobal, 2006: 63). The authors focus on the prevalence of luxus consumption between 1983 and 2000, finding that obesity rates increased consistently with increases in per capita food availability during the selected time period (Blair and Sobal, 2006). The simultaneous presence of overconsumption and food waste can have detrimental effects on both the environment and population health. Sources indicate little concern with food shortages in the United States; distribution and composition of the U.S. food supply appear to be greater threats.

Access to food is a major theme in domestic food policy research. Quantitative approaches have largely been applied in examining physical access to food, particularly in low-income areas and across demographic dimensions. As a general trend, studies find more limited access to chain supermarkets and healthy options in low-income and minority neighborhoods (Powell, et al., 2007; Zenk, et al., 2014; Bower, et al., 2013). Food store availability and type is important, as research suggests that the local food environment, including the type of food stores available, can impact the diets of residents (Walker, et al., 2010). Neighborhood access to supermarkets has been linked to healthier dietary consumption patterns and reduced prevalence of obesity; low-income neighborhoods tend to have fewer supermarkets and more unhealthy food outlets, particularly fast food restaurants (Larson, et al., 2009). In a systematic review of empirical studies on food deserts, Walker, et al. (2010) highlight trends in the research pertaining

to the number and type of food outlets in different neighborhood as well as the price of food, bolstering findings that low-income and minority residents not only experience relatively lower access to chain supermarkets, but also face higher food prices (Walker, et al., 2010). A particularly important finding from this review is the identification of a need for research on the impact policy may have on food access. Research suggests that there is some level of consensus that access to food—both physical and economic—is a problem for particularly disadvantaged populations in the United States, and that there may be opportunities for policy to mitigate these disadvantages.

An important subset of research on food access concerns the availability and impact of farmers markets as a healthier outlet in the food environment. More research is needed on the potential for farmers markets as a strategy to improve dietary quality and access to healthy food, as shopping at farmers markets has been associated in preliminary research with increased consumption of produce (Jilcott-Pitts, et al., 2014). A preliminary study on farmers market availability and disparities conducted at the county level found results consistent with existing food access literature, particularly in that minority and below-poverty populations were less likely to have a farmers market present in the food environment (Singleton, et al., 2015). In response to potential associations between shopping at farmers markets and increased intake of fruits and vegetables in low-income communities, Savoie-Roskos et al. (2016) examine the potential impact of financial incentives provided via the Supplemental Nutrition Assistance Program (SNAP); results from the pilot program indicate that participation in the incentive program, in which participants received \$10 per week to spend at a farmers market, was associated with decreases in food-insecure behaviors and a statistically significant increase in vegetable intake (Savoie-Roskos, et al., 2016). The potential for partnership programs between

SNAP and farmers markets via incentive structures and matching programs, in which farmers markets match each dollar spent via SNAP benefits, warrants further research, particularly in determining any potential causal link between farmers market prevalence and improved dietary outcomes (Savoie-Roskos, et al., 2016). Similar to farmers markets, food hubs are an emerging phenomenon on which more research is needed. A regional food hub is “a business or organization that actively manages the aggregation, distribution, and marketing of source-identified food products primarily from local and regional producers to strengthen their ability to satisfy wholesale, retail, and institutional demand” (Barham, et al., 2012: 4). Though research notes that this definition is in many ways intentional vague to allow for development of such a recent phenomenon, common characteristics of food hubs include working with local food producers, employing pricing strategies that are fair to producers and consumers, and a mission for social, economic, and environmental impact in addition to financial profit (Fischer, et al., 2015; Barham, et al., 2012). The emphasis on economic and social impact is of particular relevance given the potential for food hubs to increase food access for vulnerable populations, though the non-financial characteristics of food hubs are seemingly consistent with right-to-food principles (Fischer, et al., 2015). Food hubs represent an innovative option for local food outlets, but there is a need for measurement and quantification about food hubs and their impact on the respective communities in which they exist (Matson and Thayer, 2013). More research is needed on the potential impact of food hubs in order to develop a model of effectiveness and potentially incorporate food hubs as a non-traditional food outlet into a comprehensive strategy to improve access.

Finally, research regarding food insecurity in the U.S. has explored the relationship between dietary quality, food access, and measurement. In a systematic review of 170

associations in the literature regarding food insecurity and dietary quality, Hanson and Connor find differences in the relationship for adults and children. The review found consistently adverse associations between dietary quality and food insecurity in adults, finding that food-insecure adults were less likely to consume adequate amounts of fruits, vegetables, and dairy, as well as certain micronutrients (Hanson and Connor, 2014). However, the same relationship was not always found for children, bolstering the notion that parents may be likely to shield children from the effects of food insecurity. Finally, a salient finding from this comprehensive review is the suggestion that public policy may be used as a strategy to “support access to adequate, healthful food” for food insecure households (Hanson and Connor, 2014: 691). In addition to the relationship between dietary quality and food insecurity, access to food is also thought to be a factor contributing to food security, or lack thereof. Bonnano and Li analyze the relationship between food outlet density (an indicator of access) and food insecurity, finding that access to large and small grocery stores (including supermarkets and convenience stores) can “mitigate the likelihood of adults experiencing food insecurity” in U.S. metropolitan areas; the study also includes measures of SNAP participation, finding that nutrition assistance in conjunction with increased access can mitigate food insecurity in adults (Bonnano and Li, 2014: 199). The study identifies areas for future research, including a further assessment of local access to food and its impact on food insecurity, as well as the effects of non-traditional food outlets, such as farmers markets. These notes for future research are consistent with the ideas in this paper.

Several aspects of the right to food have been evaluated within the United States. In many cases, research has focused on the relationships between factors such as access and adequacy. However, these conditions have not been evaluated within a right to food framework or understood within the context of right-to-food principles. The following section presents the

argument for building on existing research and incorporating a right to food assessment into U.S. food policy.

The Need for a Right to Food Assessment

Up to this point, I have provided a summary of the human right to food, including its history in international law, core principles, and distinct nature. I have emphasized the importance of states in developing national strategies to implement the right to food in public policy, in accordance with recommendations made by international governing bodies. The most salient point concerning the right to food is the notion that this right serves to empower the individual by facilitating conditions under which people can provide food for themselves. The United States has accepted tenets of the right to food but has yet to recognize this right as a worthwhile goal, much less as a framework by which national food policy can be structured. I argue that a logical next step is for the United States to take right to food principles into account and conduct a comprehensive assessment of the three necessary conditions: availability, accessibility, and adequacy. General Comment No. 12 emphasizes the need for states to conduct a “systematic identification of policy measures and activity relevant to the situation and context” (CESCR, 1999). The U.S. has already made steps in this area through its documentation of food insecurity. A rights-based approach would go further, analyzing the underlying factors that may have the most significant impact on the population. Persistent food insecurity in the United States, given the size of the economy and the prosperity that has come to represent the American identity, is a profound issue that must be examined further in order to address its root causes. A rights-based approach would allow the U.S. to do so while promoting values of individual potential and the goal of self-sufficiency consistent with American ideals. Conducting an assessment of these factors and recognizing the right to food domestically is both a feasible and

imperative step in identifying areas that can be addressed through national policy and coordination. In the following section, I make first steps to synthesize existing measures within a right to food framework and to operationalize the normative conditions associated with the right to food within a U.S. context. I first explain the methods used before providing a discussion of my results.

CHAPTER 4: METHODS AND EVALUATION FRAMEWORK

The multidimensional right to food and its core principles must be translated into concrete measures. This step is essential for conducting an initial right to food assessment as well as for setting benchmarks and monitoring progress in the future. In response to the second research question, this paper seeks to operationalize some of the core elements of the right to food and identify areas that have the most potential for impact in the U.S.

Many factors related to the realization of the right to food are at the sub-state level (Messer and Cohen, 2007). In the U.S., state and local policies may be particularly impactful. To assess the current status of availability, access, and adequacy, I begin by looking at national level factors before narrowing the focus to the state level unit of analysis. I use secondary data to evaluate the specific factors that may be of greatest significance or have potential to inform policy solutions. The variables chosen for this analysis are indicators of the constructs outlined by right to food standards; they represent a translation of right to food principles into a U.S. context, consistent with the recommendation in General Comment No. 12 for a “systematic identification of...activities relevant to the situation and context” (CESCR, 1999).

FAO provides guidance for states to operationalize the right to food by selecting specific indicators along structural, process, and outcome dimensions. Table 4.1 summarizes the FAO recommended indicators for measurement of the right to food. These recommendations can be

applied within the context of the United States and existing food policies and programs. In this section, I take a first step in identifying potential interpretations or applications of the FAO right to food indicators in terms of U.S. policy. For each of the three right-to-food conditions—available, accessible, and adequate—I will discuss how I chose to operationalize the implicit concepts, the specific variables chosen and related information, and an explanation of why the selected variables are good indicators of the construct. I will then highlight the most pertinent indicators and discuss the statistical method used to analyze each condition, as well as any drawbacks or potential advantages to the data and methods chosen. Finally, I present this paper’s major contribution: an evaluation framework based on FAO recommendations as applied in the United States. This framework includes the set of indicators collected for this paper as well as additional suggested measures. The goal of presenting a right to food evaluation framework for use in the United States is to structure future research in this area and provide the foundation for a right to food assessment in the U.S.

Table 4.1: Illustrative Indicators on the Right to Adequate Food

	Nutrition	Food safety and consumer protection	Food availability	Food accessibility
Structural	<ul style="list-style-type: none"> International human rights treaties relevant to the right to adequate food ratified by the State Date of entry into force and coverage of the right to adequate food in the constitution or other forms of superior law Date of entry into force and coverage of domestic laws for implementing the right to adequate food Number of registered and/or active NGOs (per 100,000 persons) involved in the promotion and protection of the right to adequate food 	<ul style="list-style-type: none"> Time frame and coverage of national policy on food safety and consumer protection Number of registered and/or active civil society organizations working on food safety and consumer protection 	<ul style="list-style-type: none"> Time frame and coverage of national policy on agricultural production and food availability Time frame and coverage of national policy on drought, crop failure and disaster management 	
	<ul style="list-style-type: none"> Time frame and coverage of national policy on nutrition and nutrition adequacy norms 	<ul style="list-style-type: none"> Proportion of received complaints on the right to adequate food investigated and adjudicated by the national human rights institution, human rights ombudsperson or other mechanisms and the proportion of these responded to effectively by the Government Net official development assistance for food security received or provided as a proportion of public expenditure on food security or gross national income 	<ul style="list-style-type: none"> Proportion of female-headed households or targeted population with legal title to agricultural land Arable irrigated land per person Proportion of farmers using extension services Share of public budget spent on strengthening domestic agricultural production (e.g., agricultural extension, irrigation, credit, marketing) Proportion of per capita availability of major food items sourced through domestic production, import and food aid Cereal import dependency ratio in the reporting period 	<ul style="list-style-type: none"> Share of household consumption of major food items for targeted population groups met through publicly assisted programmes Unemployment rate or average wage rate of targeted segments of labour force Proportion of targeted population that was brought above the poverty line in the reporting period Work participation rates, by sex and target group Estimated access of women and girls to adequate food within household Coverage of programmes to secure access to productive resources for target groups
Process	<ul style="list-style-type: none"> Proportion of targeted population that was brought above the minimum level of dietary energy consumption* in the reporting period Proportion of targeted population covered under public nutrition supplement programmes Coverage of targeted population under public programmes on nutrition education and awareness Proportion of targeted population that was extended access to an improved drinking water source* in the reporting period 	<ul style="list-style-type: none"> Disposal rate or average time to adjudicate a case registered in a consumer court Share of public social sector budget spent on food safety and consumer protection advocacy, education, research and implementation of laws and regulations relevant to the right to adequate food Proportion of food producing and distributing establishments inspected for food quality standards and frequency of inspections Proportion of cases adjudicated under food safety and consumer protection law in the reporting period 		<ul style="list-style-type: none"> Proportion of population below minimum level of dietary energy consumption* / proportion of undernourished population Average household expenditure on food for the bottom three deciles of population or targeted population
Outcome	<ul style="list-style-type: none"> Prevalence of underweight and stunted children under five years of age* Proportion of adults with body mass index [BMI] < 18.5 	<ul style="list-style-type: none"> Number of recorded deaths and incidence of food poisoning related to adulterated food 	<ul style="list-style-type: none"> Per capita availability of major food items for local consumption 	<ul style="list-style-type: none"> Proportion of population below minimum level of dietary energy consumption* / proportion of undernourished population Average household expenditure on food for the bottom three deciles of population or targeted population
<ul style="list-style-type: none"> Death rates, including infant and under-five mortality rates, associated with malnutrition and prevalence of malnutrition [including under, overnutrition and inadequate intake of nutrients] 				
<i>All indicators should be disaggregated by prohibited grounds of discrimination, as applicable and reflected in metadata sheets</i>				

Source: OHCHR, 2012

Availability

To analyze availability, I began looking at the food supply of the United States.

Availability refers to conditions under which the food supply is sufficient to feed the population.

I used data from the United Nations Food and Agriculture Organization (FAO) Statistics

Division. FAO provides data from various sectors related to agricultural production and trade,

climate, food prices, and other relevant topics. I used the Suite of Food Security Indicators

Database for this analysis (FAO, 2016a). FAO categorizes food security indicators along similar

dimensions as the right to food, with one category specifically dedicated to variables related to

food availability. I used cross-sectional, national-level data from 45 countries categorized as

“developed” by FAO, using the average of the most recently available years, 2009-2011 (see

Appendix A). The variables used are summarized below in 4.2. All definitions come from the

dataset, cited above.

Table 4.2 Indicators of Food Availability

Variable Name	Definition	N	Mean	Std. Dev.	Indicator
Average Dietary Energy Supply Adequacy (%)	The Dietary Energy Supply (DES) represents the per capita calories available in the food supply; the Average Dietary Energy Requirement (ADER) represents the amount of energy (in per capita calories available) that would be necessary to eliminate hunger. This variable expresses the DES as a percentage of the ADER.	45	130.5111	11.30692	Values greater than 100 represent a surplus of dietary energy in the food supply; this variable represents the adequacy of the food supply in meeting caloric needs of the population.
Average Value of Food Production (\$/capita)	Food net production value (in international 2004-2006 dollars)	45	491.422	340.5127	Indicates the economic value and size of a country's food production sector
Percent of DES Coming From Cereals, Roots, and Tubers (%)	Percentage of the total DES accounted for by cereals, roots, and tubers.	45	33.77778	6.324156	Provides information on quality of the diet

Average Protein Supply (g/capita/day)	National average value of available protein in grams/capita/day	45	99.8	12.79666	Provides information on quality of the diet; higher values indicate increased diet sufficiency.
Cereal Import Dependency Ratio (%)	Ratio indicating how much of a country's food supply from cereals is imported relative to how much is produced domestically	45	1.442	56.607	Lower cereal import dependency indicates increased food security. Negative values indicate that the country is a net exporter.
Percent of Arable Land Equipped for Irrigation (%)	Ratio between arable land equipped for irrigation and total arable land. Arable land refers to land under temporary agricultural crops. Land equipped for irrigation refers to land equipped to provide water to crops.	43	19.88837	24.72	Indicates a country's dependence on irrigation for agricultural production and vulnerability to water stress, which can impact agricultural production and potentially food security.
Value of Food Imports in Total Merchandise Exports (%)	Ratio between the value of food imports over total merchandise exports	45	11.31111	206.6283	Indicates a country's vulnerability in providing food based on the adequacy of exchange reserves to pay for food imports when necessary
Prevalence of Food Over-Acquisition (%)	Percentage of individuals who tend to acquire food in quantities that exceed their daily needs	45	38.52222	14.88845	Indicates the potential skew in distribution of food and likelihood of overconsumption due to food excess
Average Fat Supply (g/capita/day)	National average of available fat in grams/capita/day	45	126.0667	25.30487	Indicates quality of the diet; higher values indicate a better quality food supply
Food Supply Total* (kcal/capita/day)	Total available energy in the food supply in kcal/capita/day from all food sources	45	3281.578	280.5915	Indicates food availability by providing a measure of the calories available for each individual.

Source: FAO Food Security Indicator Metadata, 2016a

*The Food Supply Total variable comes from FAO Food Supply Crops Primary Equivalent Database and is a measure of the energy from all foods in a country's food supply. This variable represents cross-sectional data from 2011 (FAO, 2016b).

The purpose of this analysis is to determine the degree of food availability in the United States. I compare the U.S. food supply to other developed nations to determine if the U.S. is on par with its global counterparts. To achieve this comparison, I ran a one-sample t-test of mean difference for each variable, comparing the average value of developed countries in the dataset (excluding the U.S.) to the U.S. value for that variable. This approach allowed me to determine if the U.S. values were statistically significantly higher or significantly lower than the standard of

other developed countries, in turn allowing for an analysis of the U.S. food supply's sufficiency relative to other developed countries.

The next two conditions, accessibility and adequacy, are evaluated at the state level. The state level unit of analysis is justified given the opportunity for comparison of units within the United States. I used various sources in compiling cross-sectional, state-level data.

Two limitations of this approach must first be discussed. First, I did not use fixed effects at the state level in this analysis, primarily due to the availability of data, which resulted in a small sample size. Many variables were not available in a time series, limiting the potential sample size. Though some constructs, such as food security, are measured annually, regular data collection and reporting for some of the chosen factors is a recent phenomenon, as awareness of issues such as obesity and food insecurity has increased in the U.S. Some variables, such as those collected by the USDA, represent constructs that have received fairly recent attention and have therefore been measured at only one or two points in time. For these variables, I chose to use the most recent year available. Other variables come from comprehensive surveys that were part of specific USDA studies rather than annual measures; unlike food security measures, which have been included as a supplement in annual population surveys since the 1990s, many of these constructs have not yet garnered the same level of attention or resources to be measured annually. However, the data from the USDA are in many respects the best (and only) available measures of these constructs. It should be noted that all variables are measured between 2009 and 2016. A second limitation or concern with the data is the impact of the 2008 economic recession in the United States. Some variables, such as SNAP enrollments, may be overrepresented due to a general increase in need during the years that followed the recession and into the period of recovery. The window during which the chosen variables were measured is

narrow, but can introduce variability in the degree of impact the recession has on those data. Data collected in later years may show less impact from the economic pressures and increased need than those taken in the years immediately following. I attempt to mitigate this concern with the control variables chosen; I use data corresponding to five-year averages from 2010-2014, encompassing part of this time period from recession to recovery.

Data Sources

Data used for analysis of accessibility and adequacy come primarily from various United States Department of Agriculture (USDA) divisions and databases. A summary of USDA data sources and descriptions can be found below in Table 4.3.

Table 4.3 United States Department of Agriculture (USDA) Data Sources

Dataset	USDA Division	Description
Food Access Research Atlas	Economic Research Service	The USDA recognizes that there are barriers to many Americans eating a healthy diet. The Food Access Research Atlas is a census-tract level database of indicators measuring different dimensions of access, including vehicle availability, distance to food outlets, and population characteristics.
Food Environment Atlas	Economic Research Service	The food environment consists of program, population, and economic factors, among others, that play a role in diet quality. The USDA identifies the need for more research in this area to inform policy; the Food Environment Atlas database is one contribution. The database includes county-level indicators measuring grocery outlet availability, food prices, local food systems, and other factors that collectively make up the food environment.
U.S. Food Insecurity	Economic Research Service	The USDA measures food insecurity rates via the annual Food Security Supplement. State level data is reported in 3-year averages, with the most recent publication being the 2013-2015 value.
SNAP Participation and Benefits	Food and Nutrition Service	The USDA FNS publishes SNAP participation data at the state and national level. This dataset provides monthly data on participation, benefits, and costs.
Cost of Food Plans	Center for Nutrition Policy and Promotion	The USDA assembles monthly food plans at varying costs. Data on the cost of each plan is published monthly. More

		information about the plans can be found in Appendix B.
National Farmers Market Directory	Agricultural Marketing Service	The USDA keeps a running directory of local farmers markets in each state. This database includes information on the number of farmers markets as well as detailed information about products available, payment accepted, etc.

A second agency providing data sources for this analysis is the Centers for Disease Control and Prevention (CDC). A summary of CDC databases used is provided below in Table 4.4.

Table 4.4 Centers for Disease Control and Prevention (CDC) Data Sources

Dataset	CDC Division	Description
Weight Classification by Body Mass Index	Behavioral Risk Factor Surveillance System	The BRFSS is an annual survey conducted by the CDC regarding health behaviors. This dataset provides state level information about weight and BMI status, including underweight, overweight, and obesity prevalence.
State Food Policy Council	Fruit and Vegetable Indicator	The fruit and vegetable indicator summary provides data on behavioral, environmental, and policy factors that can influence fruit and vegetable consumption.

Two other agencies provide data sources used in this analysis. The U.S. Census Bureau publishes large amounts of data at the state level. I use data from the American Community Survey (ACS) for population and demographic information. Second, the organization Feeding America conducts various studies at the state and local level regarding food insecurity and underlying causes of hunger in the United States. I use data from the 2016 “Map the Meal Gap” report, a comprehensive analysis of county level food prices and food insecurity.

The following section summarizes the indicators and methods used to analyze the conditions of access and adequacy. In order to comprehensively measure the fulfillment of each condition, a wide range of constructs must be captured and operationalized, per the FAO recommended indicators framework. With this paper, I make a first attempt at compiling a set of indicators that spans the specific elements of each condition. The variables chosen represent a

potential representation of right-to-food measures given current data. A full list of indicators I identified is found in Appendix B. However, given the relatively small sample size (N=50 states) used in this analysis, I chose to select the most pertinent indicators out of the set I identified and include the selected variables in a statistical analysis of each condition. The following sections detail the selected variables, explain the rationale behind their selection, and discuss the statistical methods used.

Access

Accessibility to food includes both physical and economic access. For this analysis, I chose variables aimed at measuring both of these constructs. I operationalized physical access by examining the number of food outlets available to the population. To analyze economic access, I chose variables related to the cost of food as well as programs and efforts designed to make food affordable.

For the outcome of interest, I examine the population designated as both low-income and having low access to food. This disadvantage is quantified in two ways: the number of census tracts in a state designated as low-income and low-access (number of food deserts), and the share of the population living in designated low-income and low-access areas. These measures and standards for classification of low-income and low-access are determined in the USDA Food Environment Atlas (see Appendix B for variable details). These outcome measures are most appropriate for analysis because they capture a sector of the population that is vulnerable in two respects: low-access, meaning they lack physical access to food outlets, and low-income, meaning they lack economic access to food.

I use multivariate regression to analyze physical and economic access to food. Model 1 corresponds to physical access. I use both outcomes of interest—the number of food deserts, and

the percent of population designated as low-income and low-access—as outcome variables in separate regressions. The covariates used to measure physical access are summarized in the

Table 4.5.

Table 4.5 Indicators of Physical Access to Food

Variable Name	Definition	Unit	N	Year	Data Source	Mean	Std. Dev.	Indicator
Food Hubs	Number of designated food hubs in the state	#	50	2016	USDA Agricultural Marketing Service	3.38	3.122597	Food hubs are community-oriented systems of food production, distribution, and supply. This variable indicates community efforts to increase access in areas that may be otherwise lacking.
Grocery Stores	County average; Number of grocery stores per 1,000 residents	#	50	2012	USDA Food Environment Atlas	.2681183	.1101296	This is an indicator of physical access based on the number of food outlets available.
SNAP Authorized Retailers	County average; Number of SNAP-authorized retailers per 1,000 residents	#	50	2012	USDA Food Environment Atlas	.8531559	.2069504	This is an indicator of physical access based on the number of food outlets available, and of economic access based on how many of those outlets service low-income customers.
Farmers Markets	Number of farmers markets per 1,000 residents	#	50	2016	USDA Agricultural Marketing Service	.0392885	.0252442	This is an indicator of physical access based on the number of food outlets available.
Low-Income and Low-	Percentage of population designated as low income and low	%	50	2010	USDA Food Environment Atlas	.0626632	.0225649	Outcome variable; indicates the number of people affected

Access Population	access at 1 and 10 miles							by barriers associated with physical and economic access to food
Low-Income and Low-Access Census Tracts (Food Deserts)	Number of census tracts designated as low income and low access at 1 and 10 miles	#	50	2010	USDA Food Access Research Atlas	179	183.0769	Outcome variable; indicates the number of neighborhoods or communities affected by barriers associated with physical and economic access to food

I chose measures of food outlet density as the best indicators of physical access. Research has discussed the relationship between grocery stores and access to food for low-income and other vulnerable populations (Powell, et al., 2007; Zenk, et al., 2014; Bower, et.al., 2013). Similarly, farmers markets are promising contributors to access, justifying more research in this area. I chose these indicators to compare the impact of different types of food outlets. Grocery stores are the most typical avenue for providing food, but including measures of SNAP authorized stores (which include convenience stores and other approved outlets) captures a type of store available to the low-income population. Food hubs and farmers markets are included as measures of alternative local food options.

Model 2 represents economic access, focusing on the cost of food and programs intended to make food more affordable. I use the same two outcome variables in separate regressions. Table 4.6 summarizes the covariates used as indicators of economic access. Additional information about how certain variables were calculated and detailed information can be found in Appendix B.

Table 4.6 Indicators of Economic Access to Food

Variable Name	Definition	Unit	N	Year	Data Source	Mean	Std. Dev.	Indicator
SNAP Farmers Markets	Percentage of farmers markets that report accepting SNAP benefits	%	50	2016	USDA Agricultural Marketing Service	.2974741	.1189436	This is an indicator of physical access based on the number of food outlets available, and of economic access based on how many of those outlets service low-income customers.
Thrifty Food Plan Ratio	Average monthly SNAP benefit for four people relative to the average monthly cost of the Thrifty Food Plan for a family of four	%	50	2015	USDA Food and Nutrition Service; USDA Center for Nutrition Policy and Promotion	.8242553	.1154716	Indicates the affordability and economic accessibility of food by illustrating how much of the <i>minimum</i> monthly market basket that can be purchased by low-income individuals using only the monthly SNAP benefit.
Average Cost Per Meal	Calculated average cost for one meal (average weekly cost of food/21 meals per week)	\$	50	2014	Feeding America	2.878	.182779	Indicates the affordability and economic accessibility of food by illustrating the variation in food prices across the U.S.
Low-Income and Low-Access Population	Percentage of population designated as low income and low access at 1 and 10 miles	%	50	2010	USDA Food Environment Atlas	.0626632	.0225649	Outcome variable; indicates the number of people affected by barriers associated with economic and physical access to food
Low-Income and Low-Access Census	Number of census tracts designated as low	#	50	2010	USDA Food Access Research Atlas	179	183.0769	Outcome variable; indicates the number of neighborhoods

Tracts (Food Deserts)	income and low access at 1 and 10 miles							or communities affected by barriers associated with physical and economic access to food
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The cost of food can vary between states, and may be a barrier to an adequate diet. I chose these indicators as measures of food costs. The percent of farmers markets accepting SNAP benefits indicates the scope of options available to the low-income population as well as economic access to a healthy diet; this variable represents the likelihood that low-income shoppers will be able to afford fresh produce from local vendors. Second, the Thrifty Food Plan Ratio measures the share of the most basic and minimal USDA food plan that is covered by the average monthly SNAP benefit for a family of four. This variable represents the likelihood that a family relying solely on SNAP benefits to meet their food needs is economically able to do so. Finally, the average cost per meal is a measure of food costs as they vary between states. This is a measure of how much people pay, on average, for food depending on where they live. These indicators, when taken together, represent a general measure of economic accessibility to food.

In each regression, I control for population characteristics. Table 4.7 summarizes the control variables used.

Table 4.7 Control Variables

Variable Name	Definition	Unit	N	Year	Data Source	Mean	Std. Dev.
Poverty Rate	Percent of the population living below poverty level in the last twelve months	%	50	2014 5-year estimate	American Community Survey (ACS)	14.896	3.155362
State Population	Total estimated population of the state	#	50	2014 5-year estimate	American Community Survey (ACS)	6,269,467	7,007,003
	Percent of the population	%	50	2010	U.S. Census Bureau	26.4182	14.56456

Rural Population Percentage	living in a designated rural area						
Median Income	Median income in the last twelve months	\$ (2014 inflation adjusted)	50	2014 5-year estimate	American Community Survey (ACS)	53829.12	8831.854
Unemployment Rate	Percent of the population in the labor force unemployed	%	50	2014 5-year estimate	American Community Survey (ACS)	8.382	1.900557

Adequacy

Adequacy is the most difficult condition to translate into concrete measures; the concept of adequacy captures multiple constructs, and in many ways this condition is situation specific. Comprehensive measures are needed to capture all aspects of an adequate diet. At a minimum, people's basic caloric needs should be met. Given the persistence of food insecurity in the U.S., federal food assistance programs are designed to help people in doing so. The diet must also be nutritionally adequate. In the United States, obesity is a major health concern. Measures of dietary consumption patterns and structural factors that facilitate and shape food choices can be used as indicators of nutritional adequacy. Food insecurity and the prevalence of overweight and obesity are chosen as outcome measures because they represent two ends of a spectrum: under-nutrition and over-nutrition. The prevalence of both in the United States indicates a problem of distribution, warranting research on the factors that may contribute to one or both of these outcomes. Since food must also be safe in order to be adequate, measures of food contamination and foodborne disease outbreaks also capture a dimension of adequacy. Finally, adequate food must be culturally acceptable. This construct is not currently captured by any widespread and/or substantive measure. Though qualitative methods may contribute to an understanding of cultural acceptability of the American diet, this analysis focuses on the tangible factors contributing to adequacy that can be measured quantitatively.

I use two outcome measures in this analysis, both at the state level. The food insecurity rate is a simple measure of inadequacy because it captures households who report struggling to meet their food needs. This measure corresponds to the caloric needs and under-nutrition dimensions of adequacy. On the other hand, I use the combined prevalence of overweight and obesity in adults as the second outcome of interest. This is a measure of over-nutrition. Obesity is a complex issue; exploring both its direct causes, in the form of dietary consumption, as well as structural factors that influence consumption is essential to understanding how policies can be designed to mitigate this problem. I chose to focus on these outcomes due to the availability of data and measures and the increasing attention paid to the health risks of obesity and awareness of food insecurity as a domestic issue.

In this analysis, I use multivariate regression to analyze both outcomes. As in the analysis of access to food, I chose to focus on the most pertinent indicators due to the sample size available. In assessing adequacy, I chose to include measures primarily related to structural factors that contribute to dietary adequacy, such as the food environment and existing policy efforts. This approach is consistent with right-to-food principles suggesting that people should be empowered to provide for themselves in a way that meets standards for dietary adequacy; in other words, the chosen indicators represent the conditions under which people make dietary choices. A full list of indicators can be found in Appendix B. I focus here on the selected indicators used in the regression analysis.

Model 3 uses corresponds to under-nutrition, using food insecurity as the outcome of interest, while Model 4 uses the prevalence of overweight and obesity in adults as the outcome measure of over-nutrition. Table 4.8 summarizes the covariates used in both models.

Table 4.8 Indicators of Food Adequacy

Variable Name	Definition	Unit	N	Year	Data Source	Mean	Std. Dev.	Indicator
Overweight and Obese Adults	Percent of adults who are classified as overweight or obese (BMI > 24.9)	%	50	2014	CDC BRFSS	64.73	3.118231	Outcome variable; this variable represents the nutritional adequacy of food and dietary quality by measuring the population living at an unhealthy weight.
Food Insecurity	Percent of households who are classified as having low or very low food security	%	50	2015	USDA Economic Research Service	13.564	2.65528	Outcome variable; Provides a general measure of adequacy based on whether or not household's caloric needs are regularly met and the severity of household food shortage.
National School Breakfast Program	Average daily percent of population participating in the USDA National School Breakfast Program	%	50	2014	USDA Food Environment Atlas	4.02033	1.389998	Focuses on the caloric needs of a specific vulnerable (and protected) population—children—and on the commitment of the state to assist in meeting children's needs through federally funded programs.
SNAP Enrollment Rate	Estimated percentage of the population enrolled in SNAP	%	50	2010	USDA Food Environment Atlas	14.35556	3.7268	Measures the scope of federally funded food assistance programs, indicating the coverage rate of the program and how much of the population requires assistance in meeting their food needs
SNAP-Ed Participation Rate	Estimated percentage of SNAP-Ed participants who are also	%	49	2015	USDA Food and Nutrition Service	68.03224	15.67071	Measures the effectiveness of federally funded nutrition education programs, indicating the coverage success

	enrolled in SNAP							rate of enrolling the targeted population: low-income individuals also enrolled in SNAP.
Fast Food Restaurants	Number of fast food restaurants per 1,000 residents	#	50	2012	USDA Food Environment Atlas	.7052513	.0658149	Indicates the quality of the diet readily available to the population; indicates structural or environmental factors that contribute to dietary consumption patterns
State Food Policy Council	Existence of a state-level food policy council	(0,1)	50	2012	CDC; Community Food Security Coalition	.54	.5034574	Measures efforts taken at the state level to create avenues for policy development and implementation; indicates structural factors that may contribute to the shaping of the readily available diet and individual food choices
Farmers Markets	Number of farmers markets per 1,000 residents	#	50	2016	USDA Agricultural Marketing Service	.0392885	.0252442	This is an indicator of physical access based on the number of food outlets available.
SNAP Farmers Markets	Percentage of farmers markets that report accepting SNAP benefits	%	50	2016	USDA Agricultural Marketing Service	.2974741	.1189436	This is an indicator of physical access based on the number of food outlets available, and of economic access based on how many of those outlets service low-income customers.

In addition to the two outcome measures of adequacy, I chose indicators corresponding to the food environment and existing policy efforts in order to assess structural factors and their impact on the adequacy of the readily available diet. I chose two specific measures of the food environment for this analysis. The concentration of fast food restaurants indicates the likelihood

or ease of consumption of an unhealthy diet. On the other hand, the concentration of farmers markets indicates the likelihood of consumption or increased ease of acquisition and consumption of fruits and vegetables. Similarly, the share of farmers markets accepting SNAP benefits (in addition to being used as an indicator of economic access) is included in the analysis of adequacy to represent the likelihood that the low-income population will consume fresh produce as part of an adequate diet. Measures of the food environment are not limited to these indicators; for this analysis, fast food restaurants and farmers markets represent two ends of a spectrum related to the healthfulness of the readily available diet.

Policies and programs related to dietary needs are structural factors that can impact adequacy of the diet. Some federal programs are designed to assist people in meeting their food needs, while others relate to food choices. I use the percent of the population enrolled in SNAP as an indicator of the scope of nutrition assistance; this is a measure of how many people are in need of assistance in acquiring an adequate diet. Similarly, the percent of the population enrolled in the National School Breakfast Program, which provides low-income children with a breakfast at school, is another indicator of need. SNAP-Ed is a program complimentary to SNAP that provides education programs in nutrition and food budgeting. The percent of SNAP-Ed participants who are also enrolled in the SNAP program measures the share of the low-income population receiving assistance also receiving education about healthy eating. This measure is important to include in a measure of adequacy because it indicates the potential for low-income people to purchase and consume an adequate diet, in terms of both caloric and nutritional needs. Including measures of participation in SNAP and SNAP-Ed are consistent with FAO recommendations to measure participation in nutrition assistance and education programs. Finally, the existence of a state-level food policy council is an important indicator because it

represents state efforts to address food-related issues specific to the population of that state. I chose this indicator to measure the scope of policy efforts at the sub-national level. I chose the selected measures as indicators of structural factors—including the food environment and current food policies—that may influence dietary adequacy and its manifestation in population level outcomes of food insecurity and obesity.

A Right to Food Evaluation Framework

Operationalizing the three components of the right to food—availability, access, and adequacy—is the first step in evaluating the extent to which right to food principles are fulfilled in the United States. These conditions must be measured in a comprehensive way within the context of an overall right to food approach. The framework detailed in Table 4.9 represents the major contribution of this paper: a comprehensive set of potential indicators for use in measurement and evaluation. The framework is organized along the dimensions of the three conditions of the right to food—availability, access, and adequacy—and by three levels of policy and behavioral determinants: structural, process, and outcome indicators. Because constructs related to availability are largely relevant to the overall food system, these indicators can likely be measured at the national level. However, measurement of constructs related to access and adequacy should be taken at the state or local (census tract or county) unit of analysis in order to identify local trends, make comparisons between and within states, and provide a comprehensive picture of the extent of fulfillment of each condition. The framework provides a set of indicators for use in future research, drawing primarily from FAO recommendations as applied in the United States. Many constructs are left intentionally unspecified in order to provide states with flexibility in designing specific policies and programs. However, if a right to food framework is

adopted, national standards for data collection and evaluation must be prioritized in order to ensure reliable measures.

Table 4.9 A Right to Food Evaluation Framework for Use in the United States

General (National)	<ul style="list-style-type: none"> • Legislative efforts related to national food policies • Number of states with food policy councils • Number of non-profit organizations involved in promotion of food policy awareness and advocacy 		
Availability (National)	<ul style="list-style-type: none"> • Scope of national agricultural policy • Share of domestic food supply coming from industrial farming sector • Prevalence of local farms and small-scale output • Cereal Import Dependency Ratio • Per capita calories and micronutrients available • Share of major food products produced domestically • Prevalence of food over-acquisition 		
	Structural	Process	Outcome
Accessibility (State/Local)	<ul style="list-style-type: none"> • Share of population unemployed • Share of population living below poverty level • Number of state policies and incentive programs designed to increase physical and economic access to food 	<ul style="list-style-type: none"> • Number of supermarkets, grocery stores, farmers markets, specialty food stores, convenience stores, and other food outlets • Sufficiency of monthly SNAP benefit • Percent of population lacking access to vehicle or other form of transportation 	<ul style="list-style-type: none"> • Number of food deserts • Share of household income spent on food • Share of population compromising basic needs to purchase food
Adequacy (State/Local)	<ul style="list-style-type: none"> • Number of states with nutrition education programs and standards implemented in schools • Sufficiency of national nutrition standards and dietary guidelines • Scope of national policies regulating food industry • Number of incentive programs designed 	<ul style="list-style-type: none"> • Scope and effectiveness of federal nutrition education programs • Percent of eligible persons and households enrolled in SNAP and federal nutrition assistance programs • Share of population enrolled in 	<ul style="list-style-type: none"> • Prevalence of underweight, healthy weight, overweight, and obesity in youth, adolescent, and adult age categories • Prevalence of food insecurity • Number of reported illnesses, deaths attributed to food contamination

	to improve dietary quality	various federal nutrition assistance programs, including SNAP <ul style="list-style-type: none"> • Dietary consumption patterns, focusing on intake of fruits and vegetables • Enforcement of food safety standards, including inspection 	
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Potential options for implementation and use of this framework will be discussed in greater depth in the following chapters. This is the first concerted attempt at developing a comprehensive framework for understanding and measuring the right to food in the United States, drawing from FAO recommendations and from currently available data sources in the U.S. Furthermore, it should be noted that the framework is flexible and can be adapted in the future to reflect research and policy priorities.

CHAPTER 5: RESULTS AND DISCUSSION

The following points summarize major findings from analysis of the three conditions and provide specific figures. Potential steps for future research that result from these findings are also discussed.

Finding 1: The U.S. Food Supply is Sufficient

Based on the analysis of availability, there is enough food in the United States to meet the needs of citizens. Examining the U.S. food supply compared to the average of other developed countries along dimensions of food availability reveals that the U.S. food supply is significantly

more robust in almost every category. The comparison between the United States and other developed nations is summarized below in Table 5.1.

Table 5.1 Results from Analysis of U.S. Food Availability

Variable	United States (N=1)	Mean of Developed Nations	Std. Dev. Developed Nations	U.S. Comparison	Sufficiency Indicator
Average DES Adequacy	143	130.2273 (N=44)	11.30692	Higher*	Higher sufficiency
Average Value of Food Production	669	487.3864 (N=44)	340.5127	Higher*	Higher sufficiency
Percent DES From Cereals, Roots, and Tubers	25	33.97727 (N=44)	6.324156	Lower*	Higher sufficiency
Average Protein Supply	110	99.56818 (N=44)	12.79666	Higher*	Higher sufficiency
Cereal Import Dependency Ratio	-24	2.020455 (N=44)	56.607	Lower*	Higher sufficiency
Percent of Arable Land Equipped for Irrigation	17	19.95714 (N=42)	24.72	Lower	--
Value of Food Imports in Total Merchandise Exports	5	11.45455 (N=44)	206.6283	Lower*	Higher sufficiency
Prevalence of Food Over-Acquisition	57.8	38.08409 (N=44)	14.88845	Higher*	Higher sufficiency
Average Fat Supply	161	125.2727 (N=44)	25.30487	Higher*	Higher sufficiency
Food Supply Total	3639	3273.455 (N=44)	280.5915	Higher*	Higher sufficiency

Source: FAO Food Security Indicator Metadata (FAO, 2016a)

*Indicates statistically significant

These results indicate that the U.S. food supply is significantly more robust than that of its counterpart nations. One result in particular is important to note. The prevalence of food over-acquisition in the United States is 57.8 percent. This indicates that over half the U.S. population is acquiring food beyond their needs. While this does not provide any indication of dietary quality, the prevalence of people exceeding their food needs increases concern about overconsumption. The prevalence of over-acquisition in conjunction with persistent food insecurity in the U.S. suggests a problem of distribution, not availability. These results in total

suggest that the U.S. is not characterized by a lack of food availability. Agricultural production and dietary availability data indicate that the U.S. food supply is sufficient to meet population needs, both relative to other countries and in objective terms of per capita dietary needs and availability. Having established the sufficient availability of food in the US supply, we must further examine potential issues with distribution and dietary quality at a more localized level to determine areas in which the right to food may be unfulfilled for non-supply side reasons.

Finding 2: The Local Food Environment Can Significantly Impact Access

The findings from regression analysis of physical and economic access indicate specific areas that appear to impact the population with limited ability to acquire food. Results from both models are summarized in Table 5.2.

Table 5.2 Results from Analysis of Physical Access to Food

Covariate	Outcome: food deserts (#)	Outcome: percent of population low-income and low-access (%)
Number of Food Hubs (#)	-9.175353 (5.953757)	-0.0021492** (0.0008614)
Grocery Stores per 1,000 Residents; County Average (#)	-374.7303** (171.8684)	0.0250168 (0.0248652)
SNAP-Authorized Store per 1,000 Residents; County Average (#)	245.2091** (117.609)	0.0206461 (0.0170152)
Farmers Markets per 1,000 Residents (#)	-1104.611 (885.5186)	-0.1375803 (0.1281131)
Poverty Rate (%)	-0.6236217 (13.09363)	0.0075997*** (0.0018943)
State Population (#)	0.0000238*** (3.06e-6)	-3.27e-10 (4.43e-10)
Percent Rural Population (%)	-1.484346 (2.207312)	-0.0002709 (0.0003193)
Median Income (\$)	-0.0038553 (0.0043781)	5.93e-7 (6.33e-7)
Unemployment (%)	-28.81692** (11.94275)	-0.0081864*** (0.0017278)
Constant	493.1087 (398.5421)	-0.0162852 (0.0576594)
	R squared= 0.7883	R squared= 0.7083
	N=50	N=50

*Statistically significant at the p=.1 level

** Statistically significant at the p=.05 level

***Statistically significant at the p=.01 level

These results indicate that physical access to food can be influenced by the types of stores available to the population. In particular, the number of grocery stores and SNAP authorized stores per 1,000 residents in the average county demonstrates a respective decrease and increase in the number of food deserts. These results suggest that grocery stores can increase physical access to food by decreasing the number of census tracts that are designated as low-income and low-access. Conversely, the prevalence of SNAP authorized stores appears to increase the number of food deserts within a state; these stores may be more likely to operate in low-income areas, or may be the only option for people living in low-access tracts. Given the results from this analysis, one potential option for increasing physical access may be to counteract the impact of SNAP authorized stores by incentivizing grocery stores to open in low-income and low-access areas.

Using the low-income and low-access population as the outcome of interest, the number of food outlets in each category does not appear to have the same statistically significant impact on access. However, the local food environment can still affect accessibility. The prevalence of food hubs appears to decrease share of population designated as low-income and low-access. Food hubs are community-centered efforts to coordinate food production and distribution at the local level. In both models, structural factors also appear to have a significant impact on access. The state population increases the number of food deserts in each state; this result makes intuitive sense because states with more people have increased potential for isolation of the low-income population from access to food. The results also indicate that an increase in the state poverty rate also increases the population designated as low-income and low-access, However, an increase in the state unemployment rate in both models appears to *decrease* the number of food deserts and the share of low-income and low-access population when controlling for other

factors, a surprising result. Based on this analysis, local efforts to increase physical access to food may be one potential strategy to consider supporting at the state level. A second model examined economic access, still using the low-income and low-access population as the outcome of interest. Results from the second analysis are summarized in Table 5.3.

Table 5.3 Results from Analysis of Economic Access to Food

Covariate	Outcome: food deserts (#)	Outcome: percent of population low-income and low-access (%)
Percent of Farmers Markets Accepting SNAP (%)	-181.4454 (132.9043)	-0.056053*** (0.0191003)
Thrifty Food Plan Ratio (%)	-10.87903 (144.7248)	0.0161149 (0.020799)
Average Cost per Meal (\$)	-164.5823 (115.1827)	0.0165632 (0.0165534)
Poverty Rate (%)	17.43334 (13.18008)	0.0096453*** (0.0018942)
State Population (#)	0.0000201*** (2.45e-6)	-1.12e-9*** (3.53e-10)
Percent Rural Population (%)	0.4376013 (1.645327)	-0.0002636 (0.0002365)
Median Income (\$)	0.0026588 (0.004809)	9.33e-7 (6.91e-7)
Unemployment (%)	-6.585848 (11.85622)	-0.0072984*** (0.0017039)
Constant	230.2629 (434.0468)	-0.1003348 (0.0623788)
	R squared= 0.7614	R squared=0.6756
	N=50	N=50

*Statistically significant at the p=.1 level

** Statistically significant at the p=.05 level

***Statistically significant at the p=.01 level

Results from the analysis of economic accessibility are less conclusive. None of the selected indicators appear to have a statistically significant impact on the number of food deserts in a state, although the state population does appear to significantly increase the number of food deserts (consistent with Model 1 examining physical access). However, when using the percent of population designated as low-income and low-access as the outcome of interest, results indicate that the share of farmers markets accepting SNAP benefits may positively impact people's economic access to food by decreasing the low-income and low-access population percentage. Farmers markets represent a localized option for people to purchase food within their

communities; accepting SNAP benefits make products sold at the market, often including fresh produce, more accessible to the low-income population. Increasing the prevalence of SNAP farmers markets is another option that can be facilitated through policies that would incentivize farmers to sell within vulnerable communities. Another option, based on the combined results from analysis of physical and economic access, may be to work with local farmers and communities to increase the prevalence of food hubs in conjunction with farmers markets that service the low-income population. Such local efforts would require coordination between local governments, food producers, and consumers, but may have potential to increase both physical and economic access to food, particularly for low-income populations living in food deserts. More research on the impact and feasibility of expanding local food hubs is therefore warranted as a potential outcome or goal of local food policies.

Finding 3: Farmers Markets May be an Important Factor of Dietary Adequacy

As discussed throughout this paper, the concept of adequacy captures a range of constructs that are in many ways situation specific. This analysis in particular focuses on food insecurity and the prevalence of overweight and obesity, examining the role structural or environmental factors that can influence dietary adequacy. Given the results identified in the first finding of this paper—that the U.S. food supply is sufficient to meet everyone’s needs—the prevalence of both food insecurity and overweight and obesity bolsters the notion that the problem in the United States is one of *distribution* of food. Results from the analysis of food insecurity and overweight and obesity prevalence are summarized in Table 5.4.

Table 5.4 Results from Analysis of Food Adequacy

Covariate	Outcome: Food Insecurity (%)	Outcome: Prevalence of Adult Overweight and Obesity (%)
Fast food restaurants per 1,000 residents (#)	--	-3.810258 (4.624448)
Farmers Markets per 1,000 residents (#)	--	-57.02066*** (19.2604)
Percent of SNAP-Ed participants receiving SNAP benefits (%)	-0.0071329 (0.0155289)	0.0123418 (0.0189106)
Existence of state food policy council	-0.9324278* (0.5224175)	-0.3979771 (0.6337312)
Percent of farmers markets accepting SNAP benefits (%)	-3.651772* (2.075163)	-6.8279** (2.755644)
Percent of population participating in the National School Breakfast Program (%)	-0.2199682 (0.3262424)	--
Poverty rate (%)	0.8133772*** (0.2904003)	0.2904898 (0.2591057)
State population (#)	-3.65e-8 (3.86e-8)	-5.99e-8 (4.69e-8)
Percent Rural Population (%)	0.0664482** (0.0248467)	0.1072464*** (0.0339097)
Median Income (\$)	0.000088 (0.0000772)	7.21e-6 (0.0000847)
Unemployment (%)	0.4457017** (0.1919094)	-0.2643033 (0.238148)
Constant	-5.610826 (7.19454)	66.22196 (8.362333)
	R squared=0.7324	R squared=0.6894
	N=49	N=49

*Statistically significant at the p=.1 level

** Statistically significant at the p=.05 level

***Statistically significant at the p=.01 level

The results indicate that structural factors, including policy efforts and programs, can impact population level outcomes of both food insecurity and overweight and obesity in adults. First, the existence of a state food policy council appears to significantly decrease the rate of food insecurity. This result bolsters the notion that state and local policy may be the most effective strategy for implementation of right-to-food policies. A food policy council may allow states to identify vulnerable populations or areas specific to the population of that state and develop targeted strategies or policies to combat them. Given the relationship indicated here between a food policy council and decreased food insecurity rate, this option may be particularly

attractive to states with higher or more persistent rates of food insecurity. More research on states with food policy councils may be helpful in determining standards for effective operation and guidance for other states in establishing a food policy council.

The results also indicate that farmers markets in particular can influence both food insecurity and overweight and obesity. The number of farmers markets per 1,000 residents appears to significantly reduce the share of the adult population classified as overweight and obese. As discussed previously, the causal link between farmers markets and weight outcomes may relate to dietary consumption, particularly of fruits and vegetables; more research on this relationship is warranted. Similarly, the percent of farmers markets accepting SNAP benefits appears to have a negative effect on rates of food insecurity and overweight and obesity. Consistent with results in Finding 2 of this analysis, increasing access to farmers markets (including economic access—making their products affordable) appears to be a potentially impactful policy goal.

Similar to findings from the analysis of access, structural factors related to local economic conditions also appear to impact outcomes related to adequacy. In particular, the state poverty rate appears to significantly increase the food insecurity rate; this is a logical relationship between the low-income population and the number of households struggling to meet food needs. A similar relationship is found between the state unemployment rate and the prevalence of food insecurity. The percent of the state population designated as rural also appears to significantly increase both food insecurity and the prevalence of overweight and obesity in adults; this finding indicates that special attention may need to be paid to these issues in states with larger rural populations.

This analysis merely scratches the surface of the specified conditions, identifying key elements of each and operationalizing them with basic indicators or measures. Though some promising trends have been identified in the analysis, more in-depth and comprehensive examination is needed of the structural factors that may drive the relationships identified in this paper. A more localized unit of analysis (census tract or county level as opposed to state) may be a logical next step in analyzing access and adequacy. However, this paper seeks to present the feasibility of a quantitative right to food assessment, provide a starting point for operationalizing and analyzing right to food conditions, and emphasize the importance of examining structural factors rather than focusing solely on outcome measures.

Discussion of Evaluation Framework

In Chapter 4, I described a set of available data and selected measures from the evaluation framework presented. The framework provides a summary of ideal measures that should be collected for use in right to food assessments. However, a general finding from this paper is the need for more comprehensive and robust data collection along these dimensions. The goal of developing an evaluation framework is to assist in structuring future research by identifying areas requiring the most attention and provide recommendations for future data collection. One limitation of the analysis conducted in this paper was attributed to the types of data available, particularly due to incongruities in the time frame and unit of analysis. Some of the most important data we have relating to food access and the local food environment are available at the census tract and county level, allowing for an in-depth analysis of specific factors in research beyond the scope of this paper. However, many of these data were collected at only one or two points in time, limiting their usefulness in 2016. Although comprehensive data collection requires dedication of time and resources, current indicators should be measured on a

more frequent basis and made available for use in order to monitor progress. For example, USDA Research Atlases would provide better data if they were updated on an annual or biennial basis, allowing for the identification of local and regional trends over time as well as future benchmark monitoring of policy effects, particularly if state and local policies are implemented. A strength of agencies such as the USDA conducting research on food system policies and outcomes is a commitment to publishing data that are accessible for use by the public.

This analysis allowed for identification of areas in which data collection is either needed or could be improved. Table 5.5 highlights indicators (in blue) for which data are readily available; others may be the subject of literature and research, but may not have comprehensive or standardized measures currently available. However, even indicators with available data can be improved and synthesized in accordance with the recommendations discussed above, such as increased frequency and a narrowed unit of analysis.

Table 5.5 Right to Food Indicators with Available Data

General (National)	<ul style="list-style-type: none"> Legislative efforts related to national food policies Number of states with food policy councils Number of non-profit organizations involved in promotion of food policy awareness and advocacy 		
Availability (National)	<ul style="list-style-type: none"> Scope of national agricultural policy Share of domestic food supply coming from industrial farming sector Prevalence of local farms and small-scale output Cereal Import Dependency Ratio Per capita calories and micronutrients available Share of major food products produced domestically Prevalence of food over-acquisition 		
	Structural	Process	Outcome
Accessibility (State/Local)	<ul style="list-style-type: none"> Share of population unemployed Share of population living below poverty level Number of state policies and incentive programs designed to increase physical and economic access to food 	<ul style="list-style-type: none"> Number of supermarkets, grocery stores, farmers markets, specialty food stores, convenience stores, and other food outlets Sufficiency of monthly SNAP benefit Percent of population lacking access to vehicle or other form of transportation 	<ul style="list-style-type: none"> Number of food deserts Share of household income spent on food Share of population compromising basic needs to purchase food

Adequacy (State/Local)	<ul style="list-style-type: none"> • Scope of nutrition education programs and standards implemented in schools • Sufficiency of national nutrition standards and dietary guidelines • Scope of national policies regulating food industry • Number of incentive programs designed to improve dietary quality 	<ul style="list-style-type: none"> • Scope and effectiveness of federal nutrition education programs • Percent of eligible persons and households enrolled in SNAP and federal nutrition assistance programs • Share of population enrolled in various federal nutrition assistance programs, including SNAP • Dietary consumption patterns, focusing on intake of fruits and vegetables • Enforcement of food safety standards, including inspection 	<ul style="list-style-type: none"> • Prevalence of underweight, healthy weight, overweight, and obesity in youth, adolescent, and adult age categories • Prevalence of food insecurity • Number of reported illnesses, deaths attributed to food contamination
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While the framework above represents an ideal set of indicators to be collected, it is likely not feasible for such a comprehensive set of measures to be taken immediately. Further research is warranted regarding many of the selected constructs and indicators, particularly relating to food access and adequacy in the United States. In the interim, I recommend that a general measure of access and adequacy be included in current measurement tools. The rate of food insecurity is measured annually based on responses to a survey supplement included in the Current Population Survey (USDA Food Insecurity, cite). The survey includes 10 to 18 questions (depending on household composition) used to assess the food security of the household. I recommend that a short set of questions be added to the survey in order to measure household access and dietary adequacy. While not in-depth measures, these questions could relate to a household's ability to access an adequate diet. Sample questions include:

- Did you face difficulty reaching a grocery store or other place to buy food?
(measures physical access)
- Were you able to eat a balanced diet on a regular basis, including fruits and vegetables? (measures nutritional adequacy)

Including a set of 3-5 total questions intended to measure household food access and adequacy in addition to household food security would provide a general measure of these conditions in a nationally representative survey conducted annually. This step is feasible given the simplicity of questions required and due to the fact that the survey is already administered; including a small number of additional questions is unlikely to alter participation in the survey or its administration.

In the future however, the purpose of developing an evaluation framework is to guide future research and data collection with the ultimate goal of conducting a comprehensive and systematic right to food assessment at the sub-state level. There are multiple options for achieving this goal and for next steps moving forward. Development of a toolkit and guidance for states or outside groups to conduct their own assessments may be a helpful resource. Data can be collected by existing government agencies such as the USDA and compiled into a framework database or annual report. An alternative option is to provide grants and other research opportunities to non-profit agencies or think-tanks dedicated to food policy research to assume the responsibility of independent data collection and/or an assessment and report of right to food conditions. The involvement of civil society groups may be the most viable option for advancing right-to-food policies and conducting this kind of research moving forward. Federal and state agencies may be unable to dedicate the time and resources necessary and may also be subject to political influence, particularly in the face of an impending shift in the United States away from global integration to a neoconservative and protectionist attitude following the 2016 presidential election. An integrated and coordinated effort by non-profit and research groups would allow for a comprehensive and independent assessment. While in the process of research and evaluation, these groups could continue to develop and pursue a right-to-food policy agenda,

including specific policies related to aspects of availability, access, and adequacy, as an effort to counteract a political climate potentially adverse to these goals.

CHAPTER 6: CONCLUSIONS

This paper has provided a substantive review of right-to-food principles, including the history and development of the right to food in international policy, and a framework which with to understand the right to food in the United States. This is the first paper to my knowledge seeking to operationalize the conditions associated with the right to food in the context of the United States and within a comprehensive right-to-food framework. Having identified potential measurements currently available for use as right-to-food indicators and conducted a statistical analysis of specified indicators and their impact on selected outcome measures, the following section presents a discussion of my conclusions and potential next steps for research and policy. This paper has addressed the initial research question first by arguing for the adoption of right-to-food principles in the United States, and then by presenting a potential framework for measurement and evaluation. General conclusions from my findings are summarized below.

1. Right to food policies can begin locally in the United States

While the normative value of right-to-food principles relies on national governments, specific policies that facilitate the fulfillment of the right to food can be implemented at the sub-national level. In the United States, state and local policy makers may have the most impact on the potential realization of right to food principles. Consistent with existing research, the results of this analysis indicate that some of the most significant factors contributing to access and adequacy relate to local policies and programs, such as the local food environment and nutrition assistance programs. Because conditions of access and adequacy are context specific, state and

local policy may be the best tool available, allowing policy makers to identify problems specific to a community and design targeted policy solutions.

2. Non-traditional food outlets

Access to food and dietary quality are two related areas that present the greatest challenges in the United States. Results from this analysis are consistent with existing research indicating that farmers markets may be an effective strategy in mitigating the effects of food insecurity and the prevalence of overweight and obesity. More research is needed on the potential impact of farmers markets, particularly in servicing the low-income and low-access community. Non-traditional food outlets such as food hubs may also be an effective element of the local food environment that can positively impact vulnerable populations by increasing access and facilitating improved quality of dietary consumption.

3. An independent right to food assessment of U.S. food policy is a viable goal

This assessment should be a systematic and data-driven analysis consistent with the requirements of states outlined in General Comment No. 12. This paper has explored currently available data and presented a sample of potential indicators as well as an evaluation framework to guide future research. Coordination between federal agencies such as the USDA and independent research organizations may be the best option for augmenting data collection and ultimately conducting an assessment of U.S. food policies at the local, state, and national levels within a right-to-food context.

Though it is unlikely that the United States will formally adopt a right to food policy strategy, particularly in the next presidential administration, acknowledging the importance of right to food principles domestically would be an important step. Each element of the right to food framework is a worthwhile goal in its own right; the framework synthesizes these goals and

allows for a comprehensive understanding of how each element would impact the population and empower individuals. Conducting an assessment consistent with right to food principles would allow the United States to evaluate and measure structural factors that contribute to food availability, access, and adequacy in an effort to mitigate outcomes of food insecurity and obesity. Policy efforts in each of these areas can contribute to the empowerment of individuals to provide food for themselves in a way that is consistent with principles outlined by the human right to food and those engrained in American values and ideals.

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Appendix A: List of Developed Countries

Albania	Lithuania
Australia	Luxembourg
Austria	Malta
Belarus	Montenegro
Belgium	Netherlands
Bosnia and Herzegovina	New Zealand
Bulgaria	Norway
Canada	Poland
Croatia	Portugal
Cyprus	Republic of Moldova
Czech Republic	Romania
Denmark	Russian Federation
Estonia	Serbia
Finland	Slovakia
France	Slovenia
Germany	Spain
Greece	Sweden
Hungary	Switzerland
Ireland	The former Yugoslav Republic of
Israel	Macedonia
Italy	Ukraine
Japan	United Kingdom
Latvia	United States

Source: FAO Food Security Indicator Metadata

Appendix B: Variable List and Details

Average Cost Per Meal

Definition: The average cost of one meal in each state (cost per meal)

Source: Feeding America's "Map the Meal Gap" Annual Report

Year: 2014

Unit: \$

To obtain the average cost of a meal, the reported amount spent on food each week by food-secure individuals was divided by 21 and then weighted using a local cost of food index. This variable is an indicator of the price of food security and how economically accessible a healthy diet is.

Average Dietary Energy Supply Adequacy

Definition: Expresses the Dietary Energy Supply (DES) as a percentage of the Average Dietary Energy Requirement (ADER).

Source: FAO Food Security Indicator Metadata

Year: 2009-2011 Average

Unit: %

Average Fat

Definition: Average per capita fat supply

Source: FAO Food Security Indicator Metadata

Year: 2009-2011 Average

Unit: grams/capita/day

Average Protein

Definition: Average per capita protein supply (g/capita/day)

Source: FAO Food Security Indicator Metadata

Year: 2009-2011 Average

Unit: grams/capita/day

Average Value of Food Production

Definition: The food net production value (in constant 2004-06 international dollars) per capita

Source: FAO Food Security Indicator Metadata

Year: 2009-2011 Average

Unit: \$/capita

Cereal Import Dependency Ratio

Definition: The cereal imports dependency ratio tells how much of the available domestic food supply of cereals has been imported and how much comes from the country's own production.

Source: FAO Food Security Indicator Metadata

Year: 2009-2011 Average

Unit: %

The ratio is computed as:

$$(\text{cereal imports} - \text{cereal exports}) / (\text{cereal production} + \text{cereal imports} - \text{cereal exports}) * 100$$
 (FAO, 2016a)

Fast Food Restaurants

Definition: The number of fast food restaurants per 1,000 residents in each state

Source: USDA Food Environment Atlas

Year: 2012

Unit: #

Farmers Markets

Definition: The number of farmers markets per 1,000 residents in each state

Source: USDA Agricultural Marketing Service

Year: 2015, 2016

Unit: #

Numerator: Number of farmers markets in the state

Denominator: State population estimate

I used the most recently updated data from the AMS Farmers Market Directory and 2015 ACS Population estimates to calculate the number of farmers markets per 1,000 residents in each state.

Food Deserts

Definition: The number of census tracts in each state designated as low income and low access

Source: USDA Food Access Atlas

Year: 2010

Unit: #

The USDA characterizes food deserts as census tracts designated as low-income and low-access according to defined standards or criteria. The standards for low-income tracts are determined by the Department of Treasury's New Markets Tax Credit program. A low-income tract can be characterized by any of the following: the poverty rate is over 20%, the median income is less than 80% of the state's median income, and/or the median income is less than 80% of the median income for the metropolitan area. Criteria for low access relate to how far the tract is from a grocery store or supermarket. Although varying degrees of distance are used in different measures of access, this analysis uses the original standard of 1 mile for urban tracts and 10 miles for rural tracts. Food deserts are considered to be those census tracts that are classified as both low-income and low-access.

Food Hubs

Definition: Number of designated food hubs in each state

Source: USDA Agricultural Marketing Service

Year: 2016

Unit: #

A food hub is “a business or organization that actively manages the aggregation, distribution, and marketing of source-identified food products primarily from local and regional producers to strengthen their ability to satisfy wholesale, retail, and institutional demand” (Barham, et al., 2012: 4). Food hubs can contribute to increasing access of locally sourced foods, particularly in areas that may otherwise lack sufficient access to typical food outlets. There are multiple models of food hubs that can vary by region, but all are community oriented. An ongoing list of food hubs in each state is made available by the USDA Agricultural Marketing Service.

Food Insecurity

Definition: Percent of households that experience food insecurity or very low food security

Source: USDA Economic Research Service

Year: 2013-2015 Average

Unit: %

The USDA defines food insecurity as households that “were uncertain of having, or unable to acquire, enough food to meet the needs of all their members because they had insufficient money or other resources for food” (USDA, 2016c). Food insecure households can be further classified as having low food security, meaning eating patterns are not substantially disrupted, or very low food security, characterized by disrupted dietary patterns and reduced food intake. The USDA reports 2015 data using 3-year averages; data are obtained using the Food Security Supplement.

Food Over-Acquisition

Definition: Estimated percent of the population that acquires more food than they need

Source: FAO Food Security Indicator Metadata

Year: 2009-2011 Average

Unit: %

Food Supply Total

Definition: The total number of per capita calories available in the food supply from various food sources.

Source: FAO Food Supply Crops Primary Equivalent Data

Year: 2011

Units: kcal/capita/day

State Food Policy Council

Definition: A state has named a point of contact for a state food policy council, which are recognized by the Community Food Security Coalition.

Source: CDC Fruits and Vegetables Indicator Summary

Year: 2012

Unit: Binary

Grocery Stores

Definition: County average, number of grocery stores per 1,000 residents

Source: USDA Food Environment Atlas

Year: 2012

Unit: #

Grocery stores include food retailers such as supermarkets and other smaller stores selling fresh food items, but do not include convenience stores.

Median Income

Definition: The median income in each state in 2014 inflation-adjusted dollars

Source: American Community Survey; U.S. Census Bureau

Year: 2010-2014 5-year estimates

Unit: \$

Prevalence of Overweight and Obesity

Definition: Percent of adults (over 18) with a BMI >24.9

Source: CDC Behavior Risk Factor Surveillance System

Year: 2014

Units: %

Database includes share of U.S. adults belonging to each weight classification based on Body Mass Index (BMI).

Arable Land Equipped for Irrigation

Definition: Ratio between arable land equipped for irrigation and total arable land.

Source: FAO Food Security Indicator Metadata

Year: 2009-2011 Average

Unit: %

“Arable land is defined as the land under temporary agricultural crops (multiple-cropped areas are counted only once), temporary meadows for mowing or pasture, land under market and kitchen gardens and land temporarily fallow (less than five years).

This indicator provides a measure of the dependence of a country’s or region’s agriculture on irrigation. It shows the vulnerability of agriculture to water stress and climatic shocks (such as droughts), which has implications for national food security depending on production and trade patterns” (FAO, 2016a).

Dietary Energy Supply from Cereals, Root, and Tubers

Definition: Available energy (in kcal/capita/day) from cereals, roots, and tubers over the total Dietary Energy Supply (DES) (in kcal/capita/day)

Source: FAO Food Security Indicator Metadata

Year: 2009-2011 Average

Unit: %

SNAP Farmers Markets

Definition: Percent of farmers markets that report accepting SNAP benefits

Source: USDA Agricultural Marketing Service

Year: 2016

Numerator: Number of farmers markets that report accepting SNAP benefits

Denominator: Total number of farmers markets in the state

I used the most updated data from the AMS Farmers Market directory to calculate the share of farmers markets in each state that report accepting SNAP benefits.

Low Income and Low Access Population

Definition: Percent of the state population designated as low income and low access

Source: USDA Food Access Atlas

Year: 2010

Unit: %

See description for “food deserts.” This variable represents the percent of the population living in census tracts that are classified as both low-income and low-access, using the standard of 1 mile for urban tracts and 10 miles for rural.

National School Breakfast Program

Definition: Average daily percent of population participating in the USDA National School Breakfast Program

Source: USDA Food Environment Atlas

Year: 2014

Unit: %

Participation counts come from the USDA FNS and population data from the U.S. Census. Participation reported in 9-month averages, not including summer months, and weighted by attendance factor.

Rural Population

Definition: Percent of the population of each state designated as living in rural areas

Source: U.S. Census Bureau

Year: 2010

Unit: %

SNAP Population

Definition: Percent of the population of each state enrolled in the Supplemental Nutrition Assistance Program (SNAP)

Source: USDA Food Environment Atlas

Year: 2014

Unit: %

SNAP-Ed and SNAP Participation

Definition: Estimated percentage of SNAP-Ed participants who are also enrolled in SNAP

Source: USDA FNS

Year: 2015

Unit: %

SNAP-Ed is a program complimentary to SNAP that seeks to educate low-income individuals about healthy eating, dietary habits, and physical activity (USDA, 2016b). While programs are targeted towards SNAP recipients, community organizations may offer courses that are more widely available. This variable (data provided directly from FNS) reports the estimated share of SNAP-Ed enrollees who are also SNAP recipients. This measurement captures the extent to which a vulnerable population—low-income individuals, particularly those receiving SNAP—is benefiting from state-level nutrition education programs in conjunction with food assistance.

Poverty Rate

Definition: Percent of the population of each state experiencing poverty within the last twelve months

Source: American Community Survey; U.S. Census Bureau

Year: 2010-2014 5-year estimate

Unit: %

SNAP Retailers

Definition: County average, number of SNAP authorized retailers per 1,000 residents

Source: USDA Food Environment Atlas

Year: 2012

Unit: #

Data regarding SNAP retailers come from the USDA Food and Nutrition Service and are published in the Food Environment Atlas. SNAP authorized retailers include typical grocery outlets and supermarkets, as well as convenience store and warehouse clubs, but not other meal providers.

State Population

Definition: Total population of each state

Source: American Community Survey; U.S. Census Bureau

Year: 2010-2014 5-year estimate

Unit: #

Thrifty Food Plan Sufficiency Ratio

Definition: Percentage of the average monthly cost of the Thrifty Food Plan for a family of four that is covered by the average monthly SNAP benefit for four people

Source: USDA Center for Nutrition Policy and Promotion; USDA Food and Nutrition Service
Year: 2015

Numerator: Average monthly SNAP benefit for 4 individuals for each state in 2015
Denominator: Average monthly cost of the TFP for a family of 4 in 2015

The Thrifty Food Plan is the lowest cost food plan accounted for by the USDA and is used as the basis of calculation for SNAP benefit allotment (FRAC, 2012). The average monthly SNAP benefit varies by state SNAP program. This ratio indicates the affordability of the TFP by illustrating the share of the minimum monthly basket that can be purchased using only the monthly SNAP benefit.

Unemployment Rate

Definition: Percent of the population in each state designated as unemployed
Source: American Community Survey; U.S. Census Bureau
Year: 2010-2014 5-year estimates
Unit: %

Value of Food Imports to Total Merchandise Exports

Definition: The value of food imports over the value of total merchandise exports
Source: FAO Food Security Indicator Metadata
Year: 2009-2011 Average
Unit: %