

IDENTIFYING FACTORS INFLUENCING A HOSPITAL'S DECISION  
TO ADOPT A FARM-TO-HOSPITAL PROGRAM

A Thesis

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## ABSTRACT

Research on the adoption of Farm-to-Hospital programs is extremely limited in the agricultural and applied economics literature. Based on a survey conducted of Hospital Food and Nutrition Services Directors in the Northeast (New York, Connecticut, Massachusetts, New Hampshire, Maine, Pennsylvania, Rhode Island, and New Jersey) region of the United States and USDA's ERS Atlas of Rural and Small-Town America, this thesis estimates a logit model to determine the factors that influence hospital food service directors' decision to adopt a farm-to-hospital program. A Farm-to-Hospital program is the linkage of locally produced fresh foods between hospitals/healthcare facilities and farms that are incorporated in patient meals. This thesis also provides insight into the current perceptions, challenges and barriers of these directors in the procurement of local foods. Among the explanatory variables, it is found that the Healthy Food in the Healthcare Pledge, the amount of meals prepared daily at a hospital, the percent of farms participating in Community Supported Agriculture, and a hospital's county classification have the greatest impact on influencing a hospital's decision to adopt a farm-to-hospital program. Most FTH programs are in hospitals located in counties in or near metropolitan areas.

## BIOGRAPHICAL SKETCH

Bobby J. Smith, II was born on September 26, 1988 in Fort Hood, Texas, and raised in Fort Worth, Texas. He graduated *summa cum laude* from Prairie View A&M University of Texas in May 2011, with a Bachelor of Science degree in Agriculture, studying Agricultural Economics. During his undergraduate career at Prairie View, Bobby was the 2010-2011 Student Government Association (SGA) President, and also president of the Prairie View chapter of the Minorities in Agriculture, Natural Resources and Related Sciences (MANRRS) from 2008-2010.

His academic journey into the field of Agriculture began during the summers of his sophomore (2005) and junior (2006) years in high school when he was accepted into the Research Apprentice Program for Agricultural Sciences at Prairie View. In the summers of 2009 and 2010 respectively, he researched market trends related to the production of corn, cotton, and soybean crops as an intern with the Monsanto Company in Arkansas. Likewise, his second internship experience at Fielder's Choice Direct in Monticello, Indiana involved examining the non-traditional approaches to marketing corn and soybean seed in the southwest regions of the United States. The aforementioned experiences served as his motivation to pursue graduate studies at Cornell University in Agricultural Economics and making his contribution to the agricultural and applied economics literature.

“Now all glory to God, who is able, through his mighty power at work within us, to accomplish infinitely more than we might ask or think.” Ephesians 3: 20. First, I give all glory to God for everything he has done and is going to do in my life, without him I am nothing.

To my family, friends, and all those who have helped me up to this point in my life, this thesis is respectfully dedicated.

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## **CHAPTER ONE**

### **INTRODUCTION**

The evolution of the agricultural and food sector of the United States has evolved from being highly localized to more regional and national in scope. Tremendous improvements in transportation and distribution technology, which have made it possible to move foods at substantially greater distances and lower costs, has been the major reason behind this transformation. However, in recent years, there has been an increase in demand for a return to more localized agriculture. The term “local” agriculture has no universal definition, but a reasonable definition is food that is produced in the same state or less than 400 miles from the location in which the food is being consumed (Martinez, et al. 2010). While the local agriculture movement is still small relative to the entire food industry in the United States, its share has grown substantially in recent years. For example, in 2008, the Agricultural Resource Management Survey (ARMS), conducted by the USDA, estimated the gross sales of locally marketed foods at \$4.8 billion, four times larger than in the previous census, and is expected to climb to \$7 billion in 2011 (Low and Vogel, 2011).

There are numerous examples of local food systems. For instance, farm-to-institution partnerships involve such organizations as elementary and secondary schools, universities, colleges and hospitals to purchase some or all of their food locally. The Farm-to-school program concept is the most developed form of farm-to-institution programs. The “Buy Local” and “Know Your Farmer, Know Your Food” campaigns, farmers markets, community supported agriculture (CSA) organizations, along with local food guide publications promote local, regional, and sustainable food systems. Due to the various campaigns, more attention is being paid to the location where food is produced. The localization of food systems support rural

sustainability initiatives and cultivate relationships between farmers and consumers. There have been many studies and popular press articles aimed at improving our understanding of local food production and direct marketing of local foods (see Hinrichs, 2000; Thilmany, 2004; Thilmany & Watson, 2004; Allen & Hinrichs, 2007; Hardesty, 2008). These studies address a variety of topics, including food safety, health (nutrition - organic), environmental sustainability, farmer benefits, and food production.

However, currently there is little known about the contribution of hospitals to support local food systems, and there has been little empirical research conducted in the area of Farm-To-Hospital<sup>1</sup> (FTH) programs. This alternative food distribution channel could benefit not only local producers, but also the hospital participants. Hospitals have the ability to impact their respective communities through active engagement, involvement and community education on health and well-being.

FTH programs are being implemented through pilot program initiatives across the United States. The Urban Environmental and Policy Institute's Center for Food Justice (UEPI-CFJ) at Occidental College and the western North Carolina-based Appalachian Sustainable Agricultural Project (ASAP) have conducted analyses and case studies to raise awareness and highlight the benefits of FTH programs. UEPI-CFJ has focused on such programming in California, Iowa, Maine, Montana, and North Carolina (Beery and Vallianatos 2004). The establishment of on-site farmers markets has occurred at hospitals in North Carolina, Maryland, Virginia, Iowa, and California. In addition to the case studies and pilot programs, over 350 hospitals nationwide are taking steps to improve the health of their patients, communities and the environment through

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<sup>1</sup> A farm-to-hospital program is defined as the supply chain relationship of locally produced fresh foods between hospitals or healthcare facilities and farms that are incorporated in patient meals. Also, the terms "healthcare facility" and "hospital" are used interchangeably.

the Healthy Food in Healthcare Pledge. The Healthy Food in Healthcare Pledge is structured to guide members of the healthcare industry to improve the health of patients through support for the community and sustainability initiatives (Health Care Without Harm 2006).

To fully understand the nature of these new programs, region specific research must be conducted. Morrison, Nelson, and Ostry (2011) explain the importance of the rise in local food interest and its relationship with policy, which requires regional agricultural data to influence policymakers. Regions in the U.S. differ in size, land, soil characteristics, production practices, and a host of other economic differences. Utilizing econometric modeling and analysis, this thesis presents findings on the key factors impacting the decision to adopt FTH programs in healthcare facilities in the Northeast (NE) region (New York, Connecticut, Massachusetts, New Hampshire, Maine, Pennsylvania, Rhode Island, and New Jersey) of the U.S. The thesis also presents findings on the challenges, barriers, and opportunities for FTH programs.

The primary goal of the thesis reported here is to identify the factors that influence a hospital's decision to adopt a FTH program. A regional survey for hospital foodservice directors in the Northeast (NE) region of the U.S. is used to assess their interest in FTH programs. These data are, in turn, employed to develop an econometric model identifying these determinants. This investigation is unique from other research endeavors, which have solely focused on the presence of an on-site farmer's market at hospitals or the generalization of farm-to-institutions programs. Through the identification of the factors that influence a hospital's decision to adopt a FTH program, this research can be used to facilitate a discussion between hospitals and local farming communities. Engaging in such discussion may increase participation in this program, thereby promoting viable local food systems in the NE and broadening the role of food and agriculture in society.

## CHAPTER TWO

### LITERATURE REVIEW

In the agricultural and applied economics literature, there are no peer-reviewed studies specifically on FTH programs. However, there are a number of institutional reports, conference proceedings, mass media articles, and case studies examining the potential benefits, challenges, and barriers to adopting farm-to-institution programs. Many of these papers are case-studies discussing potential opportunities for hospitals that do not participate in such programs. Among the studies that analyze hospital food service director's interest in FTH programs, Kirby (2006) surveyed 15 hospital foodservice directors in western North Carolina to examine whether hospitals were willing to purchase local foods and support the local food systems. The results indicated that 87% (13 out of 15) of the directors expressed high interest in buying locally-grown foods, and the majority of the directors ranked current contractual agreements along with company policies as the major barriers to procuring local foods.

Beery and Valliantos (2004) examined the hospital food environment and conducted a series of case studies in hospitals that developed relationships with their respective local farming communities. The authors concluded that hospitals have the ability to procure local foods institutionally if they incorporate their interest in local foods within their yearly goals and initiatives. Beery and Valliantos also suggested, based on evidence from the Kaiser Permanente hospitals in California, whom have established farmer's markets at ten of their hospitals, that there is need for a company-wide food policy to bring fresh food to patients, visitors and surrounding communities.

Hardesty (2008) used data from 66 institutions in Iowa, and suggested that due to the potential limitations of farmers markets, alternative food markets for locally grown products

should be considered. In the article, an ordered logit model was estimated to assess the impact of transactional costs, institutional characteristics and a price proxy on the status of an institution's locally grown produce buying program. Hardesty (2008) found that teaching hospitals were less likely to consider year-round availability of key items stable product prices to be important and more likely to have vendor approval requirements and more produce suppliers. Hardesty (2008) presented a useful model for better understanding institutions such as schools, universities, colleges and hospitals and their relationships with local food systems.

Martinez et al. (2010) cited capacity limitations of local growers, limited farmer expertise and training, and limited research as some barriers to market entry by local growers in local food market development in the U.S. Martinez et al. (2010) also suggested that most farmers will have to combine their products to make processing and shipping more economical and increase participation in local food programs. They also found that production of locally marketed foods is more likely to occur on small farms located in or near metropolitan areas. Through a series of case studies across the United States, King et al. (2010) argued that local foods are being incorporated in programs designed to reduce food insecurity, support small farmers, and encourage more healthful eating habits through fostering relationships between farmers and consumers.

Environmental sustainability is a common theme associated with farm-to-institution programs, and recently the linkages between farms and hospitals. The National Research Council (2010) suggests that FTH programs can improve environmental, economic, and social sustainability by decreasing the distance of food delivery, creating a new market opportunity for farmers, and providing populations access to fresh food. Beery and Markley (2007) state that if a hospital supports a localized food system, the hospital will help reduce the ecological impact of

the agricultural sector (through the decreasing of food travel miles), lower patient and staff exposure to harmful substances in meat products (e.g., pesticides, herbicides, hormones, etc.), and boost local economies by assisting in overcoming the challenges of small sustainable farmers.

The aforementioned studies are related to FTH programs, local food systems, and obstacles of local growers to participating in local food markets and generalize many of the topics related to farm-to-institutions. It is clear that hospital foodservice directors' interest in FTH programs have not been thoroughly investigated. Although the Kirby (2006) and Beery and Valliantos (2004) publications discuss FTH programs, the publications do not provide a quantitative approach to understanding the development of FTH programs.

The existing literature on local food systems and institutional relationship heavily focuses on farmers, direct marketing, and methods to increase farmer sales volume by identifying alternative markets for farmers. There is clearly a void in the literature regarding the interests of the institutions on the other end of the direct marketing chain. Here, we examine a specific program, the FTH program, and investigate the factors that influence a hospital's decision to adopt such program.

## **CHAPTER THREE**

### **DEVELOPING FARM-TO-HOSPITAL PROGRAMS:**

#### **EVIDENCE FROM NEW YORK STATE, CONNECTICUT, AND VERMONT**

Farm-To-Hospital (FTH) programs seek to establish a formal supply relationship between hospitals and farms, in which both parties benefit. Despite the rise of FTH pilot-programming, little is still known about the relationship between hospitals and farms in local food systems. The purpose of this chapter is to present findings related to improving the understanding of FTH programs. Hospitals benefit by upholding the common mission of many hospitals to promote healthy living, provide a model from which patients may learn and foster a healthy food environment. Farmers benefit since FTH programs create a consistent alternative marketing channel for their products. In order to assess better the role of hospitals in FTH programs, understanding more about the practice and process of procuring local foods is critical. Therefore, an in-depth investigation of three specific FTH programs is conducted.

The main components of this investigation are based on three interviews conducted with hospital foodservice directors at the hospitals. The interviews provided detailed information about the status of current FTH programs in the NE. These three programs were chosen based on their location and level of locally produced foods procured annually. The three specific programs studied, which differ in size and capacity, are the Cayuga Medical Center (Ithaca, New York), New Milford Hospital (New Milford, Connecticut), and Fletcher Allen Healthcare (Burlington, Vermont).

#### *Interview Process*

The interview process included one on-site visit to Cayuga Medical Center and two telephone conversations with key informants from New Milford and Fletcher Allen Healthcare.

The questionnaire [Appendix A] included a short background information section and ten open-ended questions. Additional information such as hospital bed size, and meals prepared per day was gathered from the regional survey. The interview questions sought to gain a more thorough understanding of:

1. Perceived barriers and advantages to procuring local foods at the hospital level, and criteria used to define ‘local foods’ contrary to the USDA national definition.
2. Motivation and interests that influenced procurement of local foods through the development of a Farm-to-Hospital program.
3. The nature and strength of the relationship between hospitals and their respective local farming communities.

*Cayuga Medical Center – Ithaca, New York* ([www.cayugamed.org](http://www.cayugamed.org))

The Cayuga Medical Center is a 204-bed healthcare facility located in the Finger Lakes region of New York State in the city of Ithaca. Located in Tompkins County, Ithaca has a population of approximately 30,000 plus another 30,000 students from Cornell University, Ithaca College, and a Tompkins-Cortland Community College, and is surrounded by local farmers and facilitates many local food initiatives such as buy local, the Tompkins County Buy Local Guide, and the Ithaca farmers market. Tompkins County has a population of approximately 101,273. Cayuga Medical Center prepares an average of 400 meals per day with an average patient daily census of 130. The Nutritional and Food Services Department within the facility is self-operated. Due to the isolated nature of the Ithaca community and community-wide support for the local economy, Cayuga Medical Center began its FTH program about 10 years ago as the “local-to-hospital” program through an informal relationship with farmers in the community.

The program is not mandated or prescribed by the hospital; it is a preference of

Nutritional and Food Services to procure local foods. Their annual food budget allocates 40% toward the procurement of local foods (dairy, produce, and baked prepared goods from the local Ithaca bakery), and the hospital defines 'local' to be within a 100-mile radius of Ithaca. They have no direct relationship or formal contracts with farmers; however, they have a consistent relationship with local purveyors such as Regional Access, Cortland Produce, and Sysco (main supplier), and securing quality foods is the number one priority of the FTH program. The medical center informs the distributors of the volume of local product needed, and the distributors develop/maintain a relationship with farmers; with this process, no issues with government regulations or compliance issues have occurred.

When asked about the greatest challenges faced by the FTH program, the Foodservice Director mentioned "the diversification of patient meals due to dietary guidelines of patients which is viewed as a "big stumbling block" to the advancement of the FTH program and the seasonality of farm products." The director also stated, "the support for the local community/economy, convenience and accessibility" are the most important advantages of procuring local foods through a FTH program. The director believes that local foods can improve patient health and foresees this type of program has the ability to grow regionally, especially in the Northeast due to the diversification of crops grown in the northeastern states. There is also an opportunity for hospitals and farms in other regions of the United States that produce a diverse group of crops to participate in this program.

*New Milford Hospital – New Milford, Connecticut (www.newmilfordhospital.org)*

New Milford Hospital, a member of the Western Connecticut health network, is an 88-bed healthcare facility located in Litchfield County, Connecticut, in the city of New Milford. New Milford has a population of approximately 28,000 surrounded by a small farming

community heavily influenced by agriculture. Litchfield County has a population of approximately 189,927. New Milford Hospital is a member of the “Healthy Food in Healthcare” pledge and prepares an average of 200 meals per day with an average patient daily census of 50. Dining services’ current food service is third party contracted through the Unidine® Corporation. New Milford has a unique approach to its FTH Program, which is Plow-to-Plate ([www.plowtoplate.org](http://www.plowtoplate.org)). According to the website, Plow-to-Plate is a “comprehensive initiative that combines hospital leadership and community base-based programs to promote the local foods and agriculture as critical means to well-being and disease prevention.” The hospital’s FTH program facilitates a farmer group through a direct partnership with seven farms within 100 miles of the hospital (operating based on the belief that ‘local’ means less than 100 miles from New Milford). The partnership allows the hospital to gain enough volume to supply patient meals. They dedicate 40% of their annual food budget toward the procurement of local foods.

The program began in 2006, initially addressing childhood obesity and then eventually expanded into the hospital’s senior care center and hospital in 2009. The program utilizes a “whole family” approach through education. The “whole family” approach allows the hospital to expose its patients to a healthy lifestyle through healthier food choices and continuing this healthy lifestyle outside of the hospital environment. Exposure to the local farming community is through farm-identifier advertising (signage that states “Today’s vegetables come from \_\_\_\_\_ farm”), and it encourages patients to support local growers and purchase local foods.

Farmers are selected with the assistance of a USDA grant and the Youth Agency of New Milford, and a part of the “Plow-to-Plate” Coalition started in 2008. The Dining Service Director met with each farm individually to reduce the hospital’s carbon footprint through the procurement of local foods. The hospital keeps record of documentation of each farm selected

and proof of purchase is required, and has incurred no governmental regulation or compliance issues. Through verbal relationships, each farm is set up as a hospital vendor through hospital regulations and working through Unidine®. The farms set prices (however, if a sudden spike in price occurs, a meeting to discuss the reasoning behind the spike is conducted), and the Dining Service Director has found it to be cheaper to procure locally than traditionally through large broad liner companies. All milk is procured locally along with fresh produce; meats are procured through broad liner companies due to the volume of meat needed and the lack of supply reliability locally.

According to the Dining Service Director, “initial resistance from senior hospital management, changing preparation techniques and the lack of education in regard to local foods” are the greatest challenges faced by the FTH program. When asked about the most important advantages to the program, the Dining Service Director mentioned “promoting health-wellness education, shorter time-food chain, and the opportunity to promote sustainability practices for farmers.” The Dining Service Director believes local foods improve patient health.

*Fletcher Allen Health Care – Burlington, Vermont (www.fletcherallen.org)*

Fletcher Allen Health Care (in alliance with The University of Vermont) is a 550-bed hospital located in the city of Burlington, Vermont, which is the largest city in Vermont. Burlington is located in Chittenden County and has a population of approximately 42,000. Chittenden County has a population of approximately 156,545. Fletcher Allen is a member of the healthy food in healthcare pledge and prepares an average of 1,100 meals per day through a self-operated foodservice, with an average patient daily census of 450. With over 70 local partners including farmers, producers, and distributors, Fletcher Allen has an extensive FTH program and defines local as within a one-day drive from the hospital round trip. Fifty percent of its entire

annual food budget is designated for procurement of foods categorized as “local, healthy, and sustainable.” Over 90% of its beef and all of its pork are from Vermont; all milk comes from Vermont or New England; a high percentage of vegetables and some chicken are local. All eggs are organic, and the majority of fish/seafood is from New England and salmon is procured from Alaska.

Beginning six years ago, the development of the FTH program was influenced heavily by the food services department’s decision to commit to supporting its local economic environment and the healthy food in healthcare pledge, in which Fletcher Allen was one of the first hospitals to sign the pledge. The department also wanted to mitigate climatic change and its carbon footprint. Fletcher Allen is self-operated, and has no formal contracts with the farmers. It utilizes three distributors (2 local, 1 national) and majority of the local foods are procured through the distributors. Procurement of bread, milk and ice cream are through direct relationships with farmers. The farmers are identified from community ties, and upon identification, Fletcher Allen asks its distributors to procure from those farms as well. Also, the hospital may even call farmers to purchase whatever the farmer has (whether on farm or through storage crops) if needed. Fletcher Allen meets with local farm partners in early winter to discuss the needs for the following year and develop possible plating plans and have ongoing meetings with distributors. They keep all the information on every local partner they have, and they have not incurred any governmental regulations or compliance issues.

Pricing for the procured local foods is not concrete and varies from year-to-year. Holistically procuring local foods is cheaper; however, the foodservice director stated, “There is a need to challenge the assumption that buying local is always more expensive, because that is not always the case.” When asked what are the greatest challenges faced by the FTH programs

from initiation to now, the foodservice director stated, “time required to research farms and build a consistent relationship with the farm and price of local foods versus national procurement, are the greatest challenges.”

Developing a relationship with the local farming community through community building, support for the local economic environment and protection in regard to food safety were mentioned as advantages to the program. For example, “protection” refers to if an issue was to occur with the recall of a certain food due to a possible foodborne illness or unsanitary production practices, the hospital is able to call upon local partners and have food to replace the recalled food quickly. The foodservice director believes that local foods improve patient health; however, the director stated, “it’s hard to prove due to the short time span in which patients are in the hospital.”

#### *Key Lessons*

Hospitals need food year-round and provide a consistent market for farmers to participate. Through careful examination of the key informants’ responses, this investigation provides a clear understanding of the differences and similarities among the FTH programs. The three farm-to-hospital programs described all are located near or in regional food systems and all exhibit different characteristics related to size and level of program. However, they also exhibit similarities related to the motivation and support of establishing relationships with the respective local farming communities directly or through a local supplier. Apparently, the hospitals are located in areas that are heavily influenced by agriculture.

Each hospital strongly believes in supporting the local economic environment and greatly benefits from the convenient nature of FTH programs. All of the hospitals dedicate at least 40% of their annual food budget toward the procurement of local foods. Although the presence of strong local farming communities and systems has facilitated the development of FTH programs,

one of the biggest challenges of the programs is supply reliability due to the seasonality of production and the development of consistent, ongoing farmer-hospital relationships.

It is also discovered through the key informant interviews that there does exist a consistent relationship between hospitals and local food systems. New Milford and Fletcher Allen Healthcare maintain regular relationships with farms and regional food distributors in their areas. These relationships are strengthened, not only by personal-community relationships but also the usage of regional food distributors who specialize in the procurement of locally produced foods. The Cayuga Medical Center uses a useful model in not only procuring locally produced foods, but also use local restaurants/bakeries that provide local prepared foods as well. However, the Ithaca-based hospital is seeking a more reliable relationship with farmers. One thing is certain, that the three programs provide a model for other hospitals in the NE who are interested in developing a FTH program, but do not know how to begin the process of building a relationship with local food systems.

## **CHAPTER FOUR**

### **DATA AND METHODOLOGY**

Primary data on hospitals and FTH programs were obtained by an online regional survey [Appendix B] sent to a random sample of 160 food and nutrition service directors of hospitals in the NE from April 2012 to November 2012. The final number of hospital food service directors that completed the survey was 101. The eight-question online survey was developed utilizing the Cornell University Qualtrics web survey software. A pilot test was conducted to ensure the survey design would capture the data necessary to assess hospital foodservice directors' interest in FTH programs. To maximize the response rate of the survey, a series of phone calls were conducted and emails sent to the sample of hospital food service directors in the region to individually discuss the purpose of the survey and increase successful completion.

The main objective of the survey was to assess hospital foodservice directors' views on developing a relationship with the local farming community through the FTH programs. Respondents were asked whether or not they had adopted a FTH program to determine how many hospitals have adopted the program. The survey also collected information regarding hospital characteristics that may influence FTH program adoption such as number of licensed beds, number of patient meals prepared daily, type of food service utilized, location, and the percentage of foods procured locally versus nationally. The response format of most of the questions required was closed-choice (check all that apply, yes/no, and fill-in) or to select from a list of potential answers that were on a 5-point Likert-type scale (unimportant to critical).

## Survey Findings

The overall response rate was 63%, with 101 hospital food service directors responding. 11% of the food service directors expressed interest in implementing a FTH program at their respective hospital. More than half of the hospitals reported that they had adopted a FTH program (58%), and the average amount of meals served per day among the respondents is 498 meals. Most respondents (87%) reported their hospitals being a medical center and 63% have self-operated foodservice. 36% of the hospitals signed the healthy food in health care pledge. Among the hospitals, 21% included in the survey are located in non-metro counties adjacent to metropolitan areas and 17% of the land is classified as farm land on average among the hospitals.

To understand how local food is involved in a hospital's budgetary allocations, the hospitals were asked to indicate the share of yearly purchases in the following categories: meat, fruit, vegetables, dairy and eggs. They were also asked the percentage of the purchases that are classified as local. Table 2 reports the averages among the respondents.

Categories	3. What is the share of purchases of the following categories as a percentage of total yearly purchases on patient food?	4. What percentage of these purchases is local?
Meat	<b>20%</b>	<b>9%</b>
Fruits	<b>12%</b>	<b>16%</b>
Vegetables	<b>14%</b>	<b>18%</b>
Dairy	<b>12%</b>	<b>30%</b>
Eggs	<b>8%</b>	<b>17%</b>

As seen in table 1, the highest average percentage of local purchases, among the respondents, are dairy products (30%). This finding can be attributed to the heavy influence of dairy

operations in the NE, therefore dairy products are accessible. The lowest average percentage of local purchases is meat (9%). This could be due to the amount of meat needed to procure and the lack of local producers producing meat in certain areas.

Hospitals were asked to rank, on a scale from 1 (unimportant) to 5 (Critical), the importance of issues that could challenge their facility from directly procuring local foods from local producers. The top four challenges are:

1. Supply reliability
2. Cost
3. Lack of access to local food systems
4. Seasonality of foods

The hospitals that reported having a FTH program were asked to rank, on a scale from 1 (unimportant) to 5 (critical), the benefits of the program. The top four benefits are:

1. Food safety
2. Support of local economic environment
3. Quality of food (freshness)
4. Environmental sustainability

After ranking the challenges and benefits of the FTH program, the hospitals were asked to provide their own definition of “local” foods. Fifty-three percent of the hospitals classified “local” as being within 100-200 miles from the hospital or within the same state.

The secondary data were obtained from the U.S. Department of Agriculture’s (USDA) Atlas of Rural and Small-Town America produced by the Economic Research Service (ERS)

(USDA 2007). The Atlas data are composed of four broad categories of socioeconomic factors—people, jobs, agriculture and county classifications. Data on agriculture and county classifications are used to identify agriculture and county characteristics of the areas in which the hospitals are located, and to determine whether any of these factors affect a hospital’s decision to adopt a FTH program. The dependent variable is defined as a hospital’s decision to adopt a FTH program. The explanatory variables that may influence the adoption of a FTH program are discussed below.

### *Hospital-Specific Characteristics*

The variable Healthy Food in Healthcare Pledge, labeled *HealthPledge*, indicates whether a hospital has signed the pledge or not. Food Service (*Foodservice*) type is classified as self-operated or third party contracted. Average Patient Meals served per day, *Meals/Day*, can also be referred to as patient-meals per patient-day, where patient-days are the number of hospital occupied beds in a month. Thus, the variable *Meals/Day* is calculated by dividing the total number of patient-meals by the total number of patient-days (Reed 2011).

Among the hospital-specific characteristics, it is expected that hospitals that have signed the Healthy Food in Healthcare Pledge are more likely to adopt a FTH program than the rest. An inverse relationship is expected between the dependent variable and the average patient meals served per day because over 50% of the survey respondents stated that “supply reliability” is a barrier to adoption, indicating that the more meals prepared per day at a hospital, the less likely a hospital will adopt a FTH program.

### *County and Agricultural Land Characteristics*

Non-metro areas adjacent to metropolitan areas (*NonmetroAdj*) are identified from the ERS rural-urban continuum codes, which are constructed based by a county's degree of urbanization and proximity to metropolitan areas with a population of fewer than 250,000. Percent of county farms that participate in community-supported agriculture (*FarmCSA*) captures the extent of utilization of direct market channels by farms located in the county. Percent of county land area in agriculture (*PctLandFarm*) captures the amount of county land used for farming operations.

Among the county and agricultural characteristics it is expected that the percentage of farms participating in CSAs in a county influences a hospital's decision to adopt a FTH program. Of the respondents that have adopted a FTH program, over 50% cited "supporting the local economic environment" as a benefit of having a FTH program. The percent of county land area in farms is also expected to influence a hospital's decision to adopt a FTH program because more food should be available locally.

To model a hospital's decision to adopt a FTH program we use the dichotomous dependent variable *FTHProgram*, which indicates whether a hospital has ( $Y=1$ ) or has not ( $Y=0$ ) adopted a FTH program. The explanatory variables: *HealthPledge*, *Meals/Day*, and *Foodservice* measure the hospital's ability to prepare food and the flexibility of procuring local foods through FTH programs. Explanatory variables *NonmetroAdj*, *FarmCSA*, and *PctLandFarms*, are associated with county and agricultural classifications of the areas in which the hospitals are located. Descriptive statistics and definitions of the variables included in the model are presented in Table 2.

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**Table 2. Descriptive Statistics of Variables**

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<b>Variable</b>	<b>Description</b>	<b>Mean</b>	<b>St. Dev.</b>
<b>Dependent Variable:</b>			
FTHProgram	= 1 If Hospital adopted a FTH Program, 0 otherwise	0.58	0.50
<b>Explanatory Variables:</b>			
HealthPledge	= 1 if signed Healthy Food in Healthcare Pledge, 0 otherwise	0.36	0.48
Meals/Day	Average number of meals prepared daily	498	575
FoodService	= 1 for self-operated food service, 0 otherwise	0.63	0.49
NonmetroAdj	= 1 if Nonmetro area adjacent to Metro area, 0 otherwise	0.21	0.41
FarmCSA	Percent of farms participating in CSA in a hospital's county	1.62	1.58
PctLandFarms	Percent of land area in farms in a hospital's county	17	16

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## CHAPTER FIVE

### EMPIRICAL MODEL AND RESULTS

A logit model is employed to identify the factors that influence a hospital’s decision to adopt a FTH program (Greene 2008). The logit model:

$$(1) \text{ Prob}(Y = 1|x) = \frac{e^{x'\beta}}{1+e^{x'\beta}} = \Lambda(x'\beta)$$

assumes a logistic cumulative distribution function,  $\Lambda(\cdot)$ , and  $(Y=1)$  indicates that a hospital has adopted a FTH program. The vector  $x$ , represents the explanatory variables expected to influence a hospital’s decision to adopt the FTH program; and  $\beta$  is a vector of the estimated parameters. The correlation matrix of the variables included in the empirical model is shown in Table 3 and indicates a low degree of correlation among the explanatory variables and therefore the model appears free of multicollinearity.

<b>Table 3. Correlation Matrix of Variables</b>							
<b>Variables</b>	FTH Program	Health Pledge	Meals/Day	Food Service	Nonmetro Adj	Farm CSA	PctLand Farms
FTH Program	1						
Health Pledge	0.31	1					
Meals/Day	-0.10	0.12	1				
Food Service	-0.07	0.04	-0.14	1			
Nonmetro Adj	-0.06	0.23	-0.26	0.14	1		
Farm CSA	0.33	0.22	-0.001	0.08	0.03	1	
PctLand Farms	-0.03	-0.05	-0.17	0.19	0.25	-0.18	1

Marginal effects of the continuous variables were calculated at the means of the data,

$$(2) \frac{\partial E[y|x]}{\partial x} = \Lambda(x'\beta)[1 - \Lambda(x'\beta)]\beta$$

and marginal effects for the dummy variables, indicated by the subscript  $d$ , were estimated as

$$(3) Prob[Y = 1|\bar{x}_d, d = 1] - Prob[y = 1|\bar{x}_d, d = 0],$$

where  $\bar{x}$ , refers to all other variables other than  $d$ , are held constant at their mean values.

### *Empirical Results*

Table 4 reports the parameter estimates and marginal effects for the logit model for factors that influence a hospital's decision to adopt a FTH Program. Overall, four of the estimated coefficients are statistically significant and their signs are as expected.

**Table 4. Parameter Estimates and Marginal Effects from the Logit Model Estimating the Factors that Influence a Hospital's Decision to Adopt a Farm-to-Hospital Program**

Explanatory Variable	Estimate (Standard Error)	Marginal Effect (Standard Error)
<i>Constant</i>	-0.0122 (0.5914)	
<i>HealthPledge</i>	1.6384** (0.5729)	0.3497** (0.1040)
<i>Meals/Day</i>	-0.0012* (0.0006)	-0.0003* (0.0001)
FoodService	-0.6033 (0.5034)	-0.1390 (0.1125)
NonmetroAdj	-1.23264 * (0.6707)	-0.3194* (0.1526)
FarmCSA	0.5820** (0.2118)	0.1376** (0.0489)
PctLandFarms	0.0106 (0.0158)	0.0025 (0.0038)
Observations	100	
Pseudo R-square	0.2065	
Log-Likelihood Value	-53.98	
% Correctly Predicted	62	

Note: \* and \*\*, indicate statistical significance at the 5% and 1% levels, respectively.

The estimated coefficient for the Healthy Food in Healthcare Pledge (*HealthPledge*) is positive and statistically significant at the one-percent level. The magnitude of the coefficient of the variable *HealthPledge*, interpreted by the marginal effect, indicates that having signed this pledge significantly increases the probability of a hospital adopting a FTH program. Holding all other factors constant, the results indicate that hospitals that signed the pledge have approximately a 35 percent higher probability of adopting the FTH program than hospitals not signing the pledge.

The average number of patient meals prepared per day (*Meals/Day*) has a negative coefficient and is statistically significant at the five-percent level. The marginal effect of this variable suggests that an increase in the number of meals prepared daily at a hospital will decrease the likelihood of a hospital adopting a FTH program, implying an inverse relationship. Specifically, if the number of patient meals prepared per day increases by one then the probability of FTH program adoption decreases by 0.03 percent. This result is expected due to the amount of food needed for a large number of patients and supply reliability was a common challenge among survey respondents who have adopted a FTH program. However, the magnitude of this variable's impact on the adoption decision is quite small.

The percentage of farms participating in community supported agriculture (*FarmCSA*) has a positive coefficient and statistically significant at the one percent level. That is, a one-percent increase in the amount of county farms participating in CSAs leads to 14 percent increase in the probability of adoption. This is not surprising because farms in areas that participate in CSA understand the importance of local food systems and value the opportunity to participate in the system. These farms provide their customers with a variety of fresh, nutritious foods, which many hospitals need to adhere to many dietary guidelines of patients.

The parameter of *NonmetroAdj* is negative and statistically significant at the five-percent level. The marginal effect suggests that hospitals located in non-metro areas adjacent to a metropolitan area have a probability of adopting a FTH program that is 32 percent lower than other hospitals located outside these areas. This result is consistent with the findings of Martinez et al. (2010) that most of these programs are located in or near metropolitan areas.

The results in Table 4 suggest that neither type of foodservice nor percent of county land allocated to farming significantly influences a hospital's decision to adopt a FTH program. The negative sign on the coefficient for *Foodservice* suggests that a hospital that does not have a self-operated foodservice is less likely to adopt a FTH program, displaying an inverse relationship. One relevant variable to take into account is the percent of county land in farms (*PctLandFarms*). It has been found that most counties that are heavily influenced by regional food systems require less acreage to produce high value crops. As a result, the model suggests that land area percentage in farms do not have a significant affect on a hospital's decision to adopt a FTH program.

## **CHAPTER SIX**

### **CONCLUSION**

Farm-to-Hospital programs can cultivate a consistent relationship between hospitals and local food systems. However the literature on factors influencing a hospital's decision to adopt these programs has not been fully explored. The principle goal of this thesis has been to identify the factors influencing a hospital's decision to adopt a FTH program and also better understand how FTH programs are developed (both conceptually and empirically) and potential barriers to the adoption of such programs. This was achieved through the following objectives:

1. Develop a regional survey for hospital foodservice directors in the NE region of the U.S. to assess their interest in FTH programs.
2. Utilize data from the regional survey to present an empirical model to discover the determinants that influence a hospital's decision to adopt a FTH program.
3. Identify and explain the potential barriers to the adoption of FTH programs through case-study analysis.

The survey data were employed to develop an econometric model identifying these determinants. In this thesis, a logit model was used to identify the factors that influence hospitals to adopt FTH programs. Identifying the factors that influence hospitals to adopt these programs may provide farmers with an alternative market to participate in, and also assist cooperative extension personnel who work directly with farms in local food systems in helping farmers find better ways to market their products through FTH programs.

Chapter three provided a case-study investigation of how FTH programs develop and operate in the NE. The three hospitals were chosen based on size and level of FTH program. The on-site visit to Cayuga Medical Center and the telephone interviews with the key informants paid

attention to the motivation behind the development of FTH programs. It is found that each hospital strongly believes in supporting the local economic environment and dedicate at least 40% of their annual food budget toward the procurement of local foods. Although the presence of strong local farming communities and systems has facilitated the development of FTH programs, one of the biggest challenges of the programs is supply reliability due to the seasonality of production and the development of consistent, ongoing farmer-hospital relationship.

Using primary data from an online regional survey and secondary data from the USDA's Economic Research Service, the logit model was estimated. The empirical results indicate that the Healthy Food in Healthcare Pledge, the average number of patient meals prepared daily, the percentage of farms participating in CSAs, and a hospital's county classification are the major factors that influence a hospital's decision to adopt a FTH program. Most FTH programs are in hospitals located in counties in or near metropolitan areas. Farmers located in areas that have a strong CSA presence and are looking for alternative markets to participate in should consider establishing a relationship with hospitals and vice-versa. This can be achieved through the usage of regional food distributors or a direct relationship with hospitals. The results indicate that both hospital specific characteristics and agricultural factors significantly influence a hospital's decision to adopt a FTH program.

The policy implication of the study is that FTH programs can offer market opportunities for local farmers and can contribute to more sustainable local food systems. These systems will improve the economy of these communities and preserve the environment. Many areas are moving toward the building sustainable food systems through regional networks and this study can be used to facilitate a discussion between policymakers, famers, and advocates for local food

systems. The ultimate goal of this thesis was to identify the factors that influence a hospital's decision to adopt a FTH program which have been identified.

The gap in the literature that served as a motivation for this research has been partially filled by identifying the factors, however, there is need for additional research on these programs to develop a network of hospitals and farms participating in FTH programs. With the saturation of consumers at farmers' markets, many farmers leave the markets with most of their product unsold and lose profit. As stated before, hospitals represent a consistent market for farmers, and could possibly ensure their product will be sold. Due to some hospital guidelines, the best way to facilitate this market is through the usage of regional distributors and suppliers. By using official distributors, hospitals can easily procure from these types of entities.

For further research endeavors, the concept of regional food hubs, especially in the NE, should be addressed when discussing FTH programs. 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). It has been found by Barham et al. (2012) that regional food hubs are mostly heavily concentrated in the NE (Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont) and north central (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin) regions of the U.S., and 25% of all food hubs are located in the NE. Therefore there is an opportunity for hospitals and farms in the NE to be forerunners in developing a network of FTH programs.

An underlying goal of this study is to serve as an avenue to explore this area of farm-to-institutional programming and build a body of knowledge that will promote additional studies to

help build and sustain new ideas related to working towards a healthier, more accessible local food system. Therefore, this thesis can be used as a basis to generate further studies in the area of FTH programs. More extensive research should be performed in order to understand the regional economic impact of FTH programs. In recent years there has been an increase in demand for a return to more localized agriculture in the US. This is a great opportunity for similar or replicated studies to be conducted in different areas in the US to assist policymakers in making decisions related to farmers who participate in local food systems, and begin to support these efforts on a national level.

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## APPENDIX A: KEY INFORMANT QUESTIONNAIRE

### Background Information:

- A. Hospital Name:
- B. Location (Zip Code):
- C. Cost Spent on Food Annually:
  - a. % Local:

### Open Ended Questions:

1. Describe your FTH Program and your definition of 'local.'
2. How long have you had an FTH Program? (or procured locally)
  - a. What made your hospital decide to procure locally through an FTH program?
3. What is the selection process for farms from which the hospital procures, and how many farms do you work with to supply the local food?
  - a. Do you work with Community Supported Agriculture (CSA) (or related organizations) or do you have separate formal contracts with farmers? Is there a distance limit?
4. How do governmental regulations affect your FTH program? Any compliance issues?
5. What are the greatest challenges faced by your FTH program in terms of the initiation to the current program?
6. What are the most important advantages of FTH?
7. What foods are procured locally? Percentage of budget?
8. How often do you place orders for local foods? How is pricing determined? How much more expensive is it than traditional food?
9. Do you foresee many more hospitals adopting FTH programs within the next five years?
10. Do you think local foods improve patient health?

## APPENDIX B: SURVEY INSTRUMENT

### Preliminary Definitions

Please utilize the definitions below to successfully complete this survey.

**Farm to Hospital Program** – the purchases of locally produced fresh foods by hospitals or healthcare facilities from farms for inclusion in patient meals.

**Local Food** – Food produced within 400 miles or within the same state in which the food is marketed or consumed. (United States Department of Agriculture, May 2010)

**Healthy Food in Healthcare Pledge** – the members pledge to develop a relationship with local farmers, community-based organizations and food suppliers to increase the availability of locally sourced food through the implementation of educational programs that support sustainable agriculture. (For more information visit [http://noharm.org/us\\_canada/issues/food/pledge.php](http://noharm.org/us_canada/issues/food/pledge.php))

### Background Information:

Your Name/Position: \_\_\_\_\_

Healthcare Facility: \_\_\_\_\_

Location (City/State): \_\_\_\_\_

Type of facility (Medical, cancer center, women's/children, veteran's, etc.):

Medical  Cancer Center  Women's  Children's  Veteran's

Other: \_\_\_\_\_

Is the facility apart of a Healthcare System?  Yes  No

If Yes, Name: \_\_\_\_\_

Is the Facility a Non-Profit?  Yes  No

A. How many licensed beds does your healthcare facility currently employ? \_\_\_\_\_

B. How many beds are included in the hospital's average daily census?  
\_\_\_\_\_

C. How many patient meals are prepared each day at your facility? \_\_\_\_\_

### C. Survey

1. Which category below describes your facility's Farm-to-Hospital program?

- Full Program (All patient foods are locally produced)
- Partial Program (Some patient food is locally produced)
- No program, interested in implementing a FTH program
- No program

2. Is your healthcare facility a part of the *Healthy food in healthcare pledge*?

Yes

No

Categories	3. What is the share of purchases of the following categories as a percentage of total yearly purchases on patient food?	4. What percentage of these purchases is local?
Meat	%	%
Fruits	%	%
Vegetables	%	%
Dairy	%	%
Eggs	%	%

5. Which category below describes your facility’s current food-service contract obligation?

Self – Operated

Third-Party

Other: \_\_\_\_\_

**For questions 6 and 7, please utilize the scale from 1 to 5 below.**

1 = Unimportant

2 = Slightly important

3 = Important

4 = Very important

5 = Critical

6. Please rank the importance of the following topics that could challenge your facility from directly procuring local foods from local producers.

	Unimportant	Slightly Important	Important	Very Important	Critical
Food Safety	1	2	3	4	5
Nutritional Program Guidelines	1	2	3	4	5
Current Food Contract Obligation	1	2	3	4	5
Supply Reliability	1	2	3	4	5
Cost	1	2	3	4	5
Seasonality of Foods	1	2	3	4	5
Lack of access to local foods systems	1	2	3	4	5
Lack of Facilities to prepare foods	1	2	3	4	5
Other: _____	1	2	3	4	5

7. If your facility has a full or partial farm-to-hospital program, please rank the following benefits of the program.

	Unimportant	Slightly Important	Important	Very Important	Critical
Food Safety	1	2	3	4	5
Support of local economic environment	1	2	3	4	5
Environmental Sustainability	1	2	3	4	5
Quality of Food (Freshness)	1	2	3	4	5
Healthier Foods	1	2	3	4	5
Belief that locally produced foods improve patient health	1	2	3	4	5
Other: _____	1	2	3	4	5

8. In your opinion, what is the meaning of “local” in the term to local foods? Please check all that apply.

- Regional Boundaries
- County location and adjacent counties
- Distance (miles) – How many miles? \_\_\_\_\_
- Production Practices
- Other: \_\_\_\_\_