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## **Identifying Factors Influencing a Hospital's Decision to Adopt a Farm-to-Hospital Program**

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## **Abstract**

Using data from our 2012 regional Farm-To-Hospital program survey of Hospital Food Service Directors in the Northeastern U.S. and from the U.S. Department of Agriculture, this study estimates a logit model to determine the factors that influence a hospital's decision to adopt a farm-to-hospital program. 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.

**Keywords:** Community Supported Agriculture, Farm-To-Hospital Program, Locally Produced Fresh Foods, Logit Model

## **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 “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 cultivates

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 the Healthy Food in

<sup>1</sup> In this paper, 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.

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 study 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 primary goal of the research 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.

### **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.

## **Data**

Primary data on hospitals and FTH programs were obtained by an online regional survey sent to a random sample of 160 food and nutrition service directors of hospitals in the NE from April 2012 to November 2012. The eight-question online survey was developed

utilizing the Cornell University Qualtrics web survey software. 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 final number of hospital food service directors that completed the survey was 101, which was a 63% response rate. 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 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 1. About 58% of the hospitals reported that they had adopted a FTH program, and 63% have self-operated foodservice. The average amount of meals served per day among the respondents is 498 meals. The average percent of farms participating in CSAs is 1.62% within a hospital's county, and 36% of the hospitals signed the healthy food in health care pledge. 21% of the hospitals 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.

[Table 1 Here]

## **Empirical Model**

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:

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

assumes a logistic cumulative distribution function,  $\Lambda(\cdot)$ , and  $(Y=1)$  indicates that a hospital has adopted a FTH program. The vector  $\mathbf{x}$ , 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 2 and indicates a low degree of correlation among the explanatory variables and therefore the model appears free of multicollinearity.

[Table 2 Here]

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

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

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

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

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

### **Empirical Results**

Table 3 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 3 Here]

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 3 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.

## **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. In this study, 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.

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. There is also an implication for farmers who are in areas that have a strong CSA presence and are looking for alternative markets to participate in, can begin to establish a relationship with hospitals and vice-versa. This can be achieved through the usage of regional food distributors or a direct relationship with hospitals.

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, farmers, and advocates for local food systems. These systems will improve the economy of these communities and preserve the environment. The ultimate goal of this research was to identify the factors that influence a hospital's decision to adopt a FTH program which have been identified. 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 intellectual ideas related to working towards a healthier, more accessible local food system.

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**Table 1. 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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**Table 2. Correlation Matrix of Variables**

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<b>Variables</b>	FTH Program	Health Pledge	Meals/Day	Food Service	NonmetroAdj	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			
NonmetroAdj	-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

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**Table 3. 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.

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