

## Article

# Assessing Healthy Effects between Local Level Farmer's Markets and Community-Supported Agriculture and Physical Well-Being at the State Level

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**Abstract:** Much change has occurred in the recent past around food systems at the local level. As interest continues to rise, we were curious to examine connections of local food systems and well-being in the context of the places they operate at the state level. Health is a central component of food well-being. In this article, we focus on physical well-being. We explore the connection between food systems, as represented by farmers markets (FMs), community-supported agriculture (CSAs), and physical well-being using state level data. To investigate these relationships, we conducted an ordinal logistic regression model analyzing 2016 data from the United States Department of Agriculture for the 50 states. The results of this study suggest that there is an inconclusive relationship at the state level. While local FMs and CSAs may increase physical well-being at the state level, we did not find this in our study. This finding adds to the body of literature where the majority of the studies in this area are case studies, ethnographies, and smaller studies using some regional data and small samples for local data. We believe that this conceptual work will allow for future empirical studies to build upon this study to conduct further empirical work examining regional state and local datasets for more conclusive findings.

**Keywords:** state and local food systems; well-being; physical well-being; farmers markets; community-supported agriculture; Gallup well-being index



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## 1. Introduction

Food systems at the local levels have garnered much attention, focusing on healthier well-being both individually and collectively have increased. Local-level food systems have no precise definition and often may be geographically bounded based on growth and consumption [1]. Local food systems and incubation have been tied to community and economic development outcomes [2]. Recent studies note that food choices influence health and well-being, with more interest emerging in response to societal concerns and consumer preferences fostering positive relationships with food. Block et al. have named this the food well-being paradigm (FWB) [3]. FWB is directly influenced by environmental, cultural, economic, and other factors governing “people’s food attitudes and behaviors” [3] (p. 6). Food well-being is a paradigm for a healthy quality of life, including physical well-being is recognized by other scholars [4]. Further, more recent literature confirmed that complex social–cultural and economic factors inform food well-being in relation to health and physical well-being [5–8]. Interest in FMs and CSAs and the relationship to healthy living is a newer field of study according to Lowery et al. [9] and Apaolaza et al. [5]. Both scholars and practitioners recognize that by creating sustainable food systems, where food is traded

as a commodity and provided by farmers markets and community-supported agriculture, health benefits are created. In addition to the creation of health benefits, these food systems align with the United Nations Sustainable Development Goals “by reducing the carbon footprint” [10] (p. 292). It is under this umbrella that our aim is to explore the connection between food systems, as represented by farmers markets (FMs) and community-supported agriculture (CSAs), and physical well-being using state-level data. We are building on the previous literature, which is limited to case studies and ethnographies, by using a national dataset for empirical analysis. The place-based focus of local data for FMs and CSAs as our unit of analysis allows us to expand the field beyond small samples, case studies, and ethnographies. National data provide a “broader scope of inquiry” [11] (p. 315).

Specifically, we examine the question:

To what extent are FMs and CSAs associated with physical well-being at the state level?

We are particularly interested in direct farmer-to-consumer models, namely FMs and community-supported agriculture (CSAs). CSAs represent ways that physical well-being could be directly impacted if more people have access to local food. This assumes that food obtained directly from local growers will have traveled less distance than foods found in other outlets; this implicitly implies that local food sources may be fresher. Additionally, local food systems have the potential to help foster more direct and healthier links and connections between those who produce food and those who consume it [12,13]. Additional assumptions are worth considering: aggregate well-being in an area increases if more people have access to fresh food that travels less distance from producer to consumer (i.e., direct farm-to-consumer), and well-being is impacted when people choose, or have access to, more local fresh food options. We look at these assumptions by exploring connections between well-being and sources of local foods.

We present our hypothesis to be tested below, as well as an overview of the literature on local food systems examining FMs and CSAs and well-being concepts. The literature informs the research design for the empirical testing of whether FMs and CSAs contribute to physical well-being at the state level.

## 2. Theoretical Foundations

Theoretical foundations for this article draw from literature on local food systems, well-being, food well-being, as well as physical well-being as an aspect of food well-being.

### 2.1. Local Food Systems: An Overview

A local food system is considered to be local based on the flow of food through the production to consumption cycles within a defined area, whether a community, city, state, or in some cases, a multi-state region—in other words, it is connected to and of the place [14].

Food has been conceptualized as a commodity [15–17]. Fassio et al. suggest that food is more than a commodity, it is a public good or, at a minimum, a common good essential to our global sustainability [18]. We also believe that food is more than a commodity. We suggest two distinct types of food system mechanisms or outlets that may influence well-being outcomes: FMs and CSAs. They are the most commonly found local food platforms in the US. For this reason, we selected these two types of local food mechanisms. Hinrichs states that “direct agricultural markets, predicated on face-to-face ties between producers and consumers, are often seen as central components of local food systems” [19] (p. 295). Further, she suggests that “farmers’ market and community-supported agriculture move beyond commodification and provide an alternative market”, which she terms a share market. In other words, “FMs create a context for closer social ties between farmers and consumers, but remain fundamentally rooted in commodity relations” [19] (p. 295). Both FMs and CSAs have the ability to be collaborative connectors by connecting small- and mid-size local businesses, farms, community organizations, etc. [20].

We examine FMs and CSAs because the literature recognizes food as a commodity [15–17]. Like Hinrichs, we understand that FMs and CSAs provide close community ties that relate to community well-being in general and physical well-being specifically, as dis-

cussed in this article [19]. Scholars recognize that the FMs and CSAs are both commodities at the local, state, and regional levels [19–21].

Much of the research in examining the social, environmental, and health effects looks at qualitative, ethnographic, or case studies using single or small samples of local FMs and/or CSAs to regional data. Validity assumptions are then made through correlation analysis that there is a relation between the effects and well-being [22–24]. Ethnographies and case studies in the nascent area of study in this field provide great depth and help to shape the need for different types of research and analysis within and across the local food movement and its impacts at the local, state, regional, and even national levels.

As Neumann and Mehlkop achieved with testing the assumption that shopping at FMs leads to pro-environmental behavior beyond small case study samples through survey analysis, we also seek to empirically test assumptions that shopping at FMs and CSAs leads to physical well-being [25]. Correlation analysis between the behaviors would be too broad.

## 2.2. *Well-Being, Food Well-Being, and Physical Well-Being*

### 2.2.1. Well-Being

There is no simple definition of well-being as it is a wide-ranging concept with multiple dimensions, perspectives, and theoretical constructs. Identifying and defining well-being reflects “discourses that hold implicit and explicit messages about the nature of individuals and society, the relationship of citizens and the state, the agents of change and their impact, the causes of problems and their solutions. These discourses influence the ways that well-being is conceptualized and measured, which accounts hold great legitimacy and who holds the authoritative view. Individual well-being is described as the range of conditions necessary for individuals and their communities to flourish and fulfill their potential” [26] (p. 358). It seems that it is within the overarching context of society and social collectivity that well-being can be identified [27].

Well-being can also be viewed in the context of communities, where community well-being could then be defined as, “comprehensive and integrated concepts developed by synthesizing research constructs related to residents’ perceptions of the community, residents’ needs fulfillment, observable community conditions, and the social and cultural context of the community” [2] (p. 2). In other words, community well-being is embedded with many values across the spectrum that influence people—economic, social, and environmental aspects [2].

### 2.2.2. Food Well-Being

The paradigm of food well-being allows researchers and practitioners a sustainable lens to examine aspects of both individual and community well-being of local foods but also aspects of community and economic development, building social capital, and citizen engagement. Feenstra, early on in the community food systems movement, suggested that the “development of a local level food economy which includes farmers and consumers increase a community’s vitality and sustainability” [28] (p. 28). Scholars agree that the local food economy is driven by FMs and CSAs [1,29–31]. Community food systems may enhance citizen engagement and social equity. Central to a connected individual and community centered local food system, is collaboration. Sustainable local food systems require “[a] collaborative effort to build more locally based, self-reliant food economies—one in which sustainable food production, processing, distribution, and consumption is integrated to enhance the economic, environmental and social health of a particular place” [32] (p. 100).

Relationships between well-being and food play an integral role in people’s perception of health and well-being [33]. Food well-being (FWB) is emerging as a way to consider the impacts of food choices. Apaolaza and colleagues look at the relationships between subjective well-being and consumption of organic foods, pointing out that prior studies mostly consider well-being “as a motivational antecedent of organic food consumption,

not as a consequence” [5] (p. 51). They found that consumers’ subjective well-being was improved by consuming organic foods, and that while little research addresses the impact of organic versus conventionally grown foods on health, an increase in subjective well-being conveys positive outcomes.

Apaolaza et al. explain, “[a]fter all, organic food consumption, apart from somewhat higher costs for the individual, will not have any negative consequences, while the impact on the environment as well as on the economies of more local and smaller producers should be mostly positive” [5] (p. 59). Other studies are less clear about the role of local foods and well-being, and instead indicate that local foods are driven by demand [34,35] and the “mere presence of local foods activity is not sufficient to result in healthier community outcomes” [35] (p. 675).

### 2.2.3. Physical Well-Being

Gallup has developed a well-being index that examines both the objective and the subjective determinants of well-being [11,36,37]. Diener and Tay note that there are differences amongst nations on elements of subjective well-being and quality of life [11]. In this article, we focus on the aspects of physical well-being in the United States. The physical aspects of well-being are what many equate overall with such areas as improvement to public health through healthy food access [38], ecological impact on the community [39], and diet quality [40,41].

Oftentimes, it is assumed that conversations are about the physical state of being, with simple questions from “how are you” to more in-depth explorations of states of well-being. Physical dimensions and status of health are accepted and recognized indicators or even proxies for overall well-being. Closely related are mental or emotional states of well-being, which often are interconnected or grouped together into physical well-being. This is a critical indicator by most measures, whether via incidence of disease or medical conditions that influence the overall status of health or self-reported status of physical dimensions of well-being. This is often reflected in more popular press rankings of the healthiest cities, states, or nations, for example. The Gallup National Health and Well-Being Index data are robust and lend more insights or nuances into states of health, including physical indicators.

We present our hypothesis to be tested, as well as an overview of the literature on local food systems examining FMs and CSAs, and well-being concepts. The literature informs the research design for the empirical testing of whether FMs and CSAs contribute to physical well-being at the state level.

**Hypothesis 1 (H1).** *CSA and FMs are positively associated with physical well-being.*

## 3. Types of Local Foods Outlets: By the Numbers

Local food outlets producing healthy food alternatives are described as FMs (direct to consumers markets), agritourism, co-ops, farm to table, CSAs, and other alternative arrangements [42–45].

An Economic Research Service report found in 2012, 7.8% of US farms were marketed locally through direct sales or intermediate markets [46]. Farms with less than \$75,000 income represented 85% of local farms but only accounted for 13% of sales [46]. Farms with income above \$350,000 generated 67% of sales while only representing 5% of farms [46]. Local farms were defined as farms that sold through on-farm sales, FMs, CSAs, and roadside stands since most data are only available for these markets [1].

### 3.1. Farmers Markets by the Numbers

FMs are one type of direct-to-consumer market that has grown rapidly in popularity. According to the USDA, “USDA’s Agricultural Marketing Service began tracking FMs in 1994, the number of markets in the United States has grown to 8720, an increase of about

7.07 percent from 2013. Total annual sales at U.S. FMs are estimated at \$1 billion” [46,47]. In 2016, the U.S. had 8478 FMs in operation.

Table 1 displays data showing five states with either the highest or lowest quantity of FMs in operation. The state of California has the most (764); the state with the least amount of FMs was Delaware with 32 [47].

**Table 1.** States containing the largest and smallest number of farmers’ markets in 2016 [47].

States with the Most Farmers Markets	# of Farmers’ Markets	States with the Least Farmers Markets	# of Farmers’ Markets
California	764	Delaware	32
New York	666	Alaska	38
Michigan	338	Nevada	39
Illinois	325	South Dakota	41
Ohio	321	Utah	41

However, an increase in FMs does not mean a wider availability of these outlets. If we look at FMs per 100,000 individuals, there would be only 1.95 per 100,000 residents in California compared to 3.37 per 100,000 residents in Delaware. Table 2 displays information on the five states with either the highest or lowest quantity of FMs in operation per 100,000 residents. Vermont, in this instance, has the largest amount of FMs when standardized by population, with 15.55 FMs available, while Texas has the least amount of FMs available by population at 0.73. Notably, the earliest of the top five states by quantity of FMs is Michigan with the 22nd greatest number of FMs in operation per 100,000 residents, and New York at 23rd. Alaska which has the second least amount of FMs in operation by quantity, is 11th when standardizing for FMs per 100,000 residents [47].

**Table 2.** States containing the largest and smallest amounts of farmers’ markets in 2016 per 100,000 residents [47,48].

States with the Most Farmers Markets	# of Farmers’ Markets per 100,000 Residents	States with the Least Farmers Markets	# of Farmers’ Markets per 100,000 Residents
Vermont	15.55	Texas	0.73
North Dakota	8.62	Florida	1.22
Maine	7.36	Nevada	1.34
Iowa	7.35	Utah	1.35
New Hampshire	7.23	Arizona	1.35

National-level studies on FMs are limited, but the available state analyses are consistent. A multi-state analysis was conducted in 2013 using 2009–2010 data of FMs in zip codes with high levels of poverty found that 60% of the sample believed prices were lower in FMs compared to grocery stores; 17% of those who did not shop at FMs responded with perceived higher prices as their reason [49]. Lack of awareness can be one possible cause for smaller numbers of FMs in low-income areas [50].

### 3.2. Farmers Markets Impacts

In a review of FMs, Brown and Miller cited various studies showing markets generating over \$100,000 of direct and indirect economic benefit as well as positive economic impact to neighboring businesses [29]. Several states’ estimated impacts in this review ranged from \$31.5 million in Iowa to over \$1 million in West Virginia. From a national viewpoint, in 2006 FMs sales accounted for all farm income for 25% of vendors [29]. In Indiana, FMs established by community members or organizations had a greater turnout than markets created by farmers [29]. This could possibly be due to higher demands for markets in those areas as well as greater levels of outreach since the markets were created at the community level. Markets in Iowa, New York, and California created opportunities



for social growth for local farmers [29]. The majority of vendors reported markets offered them the ability to grow their business as well as make strides in customer relations and branding due to the active in-person interface [29].

#### 4. Community-Supported Agriculture (CSA)

Community-supported agriculture originated in Japan and Switzerland [1]. A CSA is typically defined as a group of people paying for shares of a future harvest from a farm. CSAs vary in payment methods, from annual fees to payment plans and discounts for contributions to labor. CSAs also operate under a wide variety of business structures, from sole proprietorships to co-operatives (co-ops). In 2015, CSAs accounted for \$226 million (7%) of total direct to consumer sales in the United States. Several studies cite either social or nutritional benefits and positive utility from direct farm-to-consumer systems as benefits that CSAs provide [29,51]. This includes healthier eating habits and enjoying a wider variety of vegetable consumption [52].

##### 4.1. CSA Characteristics

According to the Agricultural Marketing Service, in 2016, the US had 6684 CSAs, with 478 located in New York and Delaware having the least with a total of 12. Scholars suggest that the number of CSAs in a region correlates directly to the increase in population [53,54]. When reviewing CSA by 100,000 residents to understand the availability of CSAs to the population, Vermont had the most CSAs available per 100,000 residents at 23.73 CSAs, while Louisiana had the lowest number of CSAs available per 100,000 residents at 0.47 CSAs [54]. CSAs are primarily located in the Northeast, the East Coast, Midwest, and West Coast, with Colorado being an interior outlier [55].

Table 3 below lists the top and bottom five states by total number of CSAs. The top five states, all being notably larger population states, relate to the literature suggesting increased CSA operation with New York, Massachusetts, and California having the most CSAs in operation within their states [53,54]. However, standardizing CSAs by population (per 100,000 residents) produces comparable results to FMs by population when understanding total quantity does not equate to availability to total population [47].

**Table 3.** States containing the largest and smallest CSAs in 2016 [47].

States with the Most CSAs	# of CSAs	States with the Least CSAs	# of CSAs
New York	478	Delaware	12
Massachusetts	390	Wyoming	13
California	375	Alaska	14
Pennsylvania	329	North Dakota	20
Michigan	304	Nevada	21

Table 4 lists the top and bottom five states when standardizing population by 100,000 residents to number of CSAs in operation. Low-population states such as Vermont and Maine contain the greatest number of CSAs per 100,000 residents. Larger population states, while more likely to have increased quantities of CSAs, does not indicate availability through population. Florida (2nd least), Texas (6th least), and California (8th) have some of the lower amounts of CSAs in operation per 100,000 residents [47].

**Table 4.** States containing the largest and smallest CSAs in 2016 per 100,000 residents [47,48].

States with the Most CSAs	# of CSAs per 100,000 Residents	States with the Least CSAs	# of CSAs per 100,000 Residents
Vermont	23.73	Louisiana	0.47
Maine	10.97	Florida	0.50
New Hampshire	7.75	Arizona	0.65
Oregon	6.38	Oklahoma	0.72
Massachusetts	5.72	Nevada	0.73

#### 4.2. CSA Impacts

Brown and Miller suggest that CSA members have high levels of satisfaction in Illinois and Pennsylvania, where the majority of members increased the variety of produce as well as their intake [29]. Other qualitative studies in the review found that members changed to healthier eating habits. Macias' Vermont case study noted that CSAs did little to impact food equity [56]. This was caused by higher cost barriers and selective membership practices that discouraged diversity. Though CSAs promote social interaction between members and farmer(s), they tend to typically share the same income or educational background. If the CSA offers personal harvesting or farm labor, human capital can be developed through the process of harvesting food and educating members and their children about farm practices.

### 5. Materials and Methods

In this article, we examine our measures by bringing together the literature on well-being and the element of physical well-being with reported data from the Gallup-Healthways Well-Being Index Survey, data from the United State Department of Agriculture, and data from the U.S. Census Bureau from 2016. National data from Gallup have been used by scholars to provide a broader scope for analysis of well-being [11]. Other scholars also suggest that the use of national data and their scope for analysis is appropriate [57–59]. The 2016 Gallup-Healthways Well-Being Index Survey data were the most recent year of data available at the time of our initial analysis. We then selected measures from USDA and U.S. Census Bureau data from 2016. This gives us the ability to examine a snapshot of the relationship between FMs and CSAs and physical well-being at this point in time.

While the number of FMs and CSAs, as well as state-level well-being, are indicators certainly likely to have changed in more recently released data, there is little reason to expect that the relationship between FMs and CSAs and physical well-being has changed in this time period. We, therefore, concluded that more recent data would not contribute substantially to our ability to examine our research question so as to justify incurring the additional cost. Scholarly and applied research shapes the construct of the measures used for our analysis in a limited dataset, noting that most data in this field are limited and emerging as a field of study which is multidisciplinary. Prior empirical work has demonstrated a relationship between shopping at FMs and pro-environmental attitudes [25]. However, prior studies examining the relationship between FMs and CSAs and physical well-being are limited to small sample case studies and ethnographic work, therefore, the empirical analysis of a national dataset in the present study advances our understanding of this relationship.

#### 5.1. Measures

To examine our research question, we utilized state-level data to understand the relationship between the number of FMs and CSAs to state physical well-being. For this research, the 2016 Gallup-Healthways Well-Being Index contains information on the physical well-being element rankings per state and questions on physical well-being to assist in explaining physical well-being within the state [60,61].

The 2015, the USDA Local Foods Directory [47] was utilized to estimate FMs and CSAs within the state in conjunction with U.S. Census National Populations totals in 2016 [48] data to estimate the population within each state. Additionally, the U.S. Census American Community Survey (ACS) 2016 provided a “measure of state-level poverty”. We included in our analysis due to the previously studied connection of “poverty to lack of food access in the United States and lowered physical well-being” [62] (p. 1).

Table 5 provides a summary description of all variables included in the model. The Gallup-Healthways National Health and Well-Being Index survey provides “a ranking score per state, for a total of 50 observations” [60]. In our empirical model, we examine the relationship between our key variable of interest (the number of FMs and CSAs per 100,000 residents) and several measures (“questions regarding healthy eating and servings

of fruits and vegetables, as well as state-level poverty and state-level physical well-being”) from the Gallup-Healthways National Health and Well-Being Index [60,61].

**Table 5.** Summary statistics for variables in model.

Variables Observed	Observations	Mean	Std. Dev	Source
# of Farmers Markets per 100,000 Residents	50	3.87	2.54	2016 USDA and US Census-NST
# of CSAs per 100,000 Residents	50	3.01	3.56	2016 USDA and US Census-NST
Survey Question: Did You Eat Healthy All Day Yesterday?	50	0.35	0.03	Gallup-Sharecare
Survey Question: In the last seven days, on how many days did you have five or more servings of fruits and vegetables?	50	4.10	0.16	Gallup-Sharecare
Percentage of State Living Under Poverty	50	13.52	3.02	US Census—ACS

#### 5.1.1. Gallup National Health and Well-Being Index: Physical Well-Being Element

The research examined the physical well-being element of the 2016 Gallup National Health and Well-Being Index reported in 2017. The index is a commonly used means to measure and rank communities and states in terms of their composite well-being score using five elements known as the Well-being Five [63]. These elements are identified and defined as follows:

- “Purpose: Liking what you do each day and being motivated to achieve your goal” [60].
- “Social: having supportive relationships and love in your life” [60].
- “Financial: managing your economic life to reduce stress and increase security” [60].
- “Community: liking where you live, feeling safe and having pride in your community” [60].
- “Physical: having good health and enough energy to get things done daily” [60].

These five areas guide the questions that Gallup uses to gauge well-being [60]. As FMs and CSAs are connected to the perception of “health” as these outlets provide access to fresh food products, we can review their linkages specifically to a direct cause rather than a broad multi-element view of well-being [64–66].

The rankings provided within the Gallup National Well-Being Index report are defined by constructs of self-reports by individuals and aggregating those from within each state [60]. While it is not ideal to use an aggregation of individual responses to represent overall collective well-being and its elements that tally the overall well-being result, the data for assessing collective well-being are not readily available. Because so many factors can influence well-being and its elements, aggregate data are used to examine relations between the physical element and the presence of local and regional food systems mechanisms as represented by FMs and CSAs. Data on individuals’ self-reported physical well-being status will be used by geographical area, and in this case, states.

Data of the physical element rankings were sorted on an ordinal ranked score of 1 to 50, representing each of the States in the United States. A score of 1 equates to the top state on the physical well-being element index. A score of 50, however, stands for the state with the worst physical well-being index.

#### 5.1.2. Gallup National Health and Well-Being Index Physical Well-Being Survey Questions

Gallup-Healthways is constructed using responses from questions reflecting the five elements discussed above, along with other Gallup survey questions like income, business ownership, and related. These data include responses from 177,192 telephone interviews of a national sample of adults across all 50 U.S. states and Washington, D.C., weighted to match demographics of the U.S. and each individual state. Interviews are conducted in both English and Spanish [60]. “The Well-Being Index is calculated on a scale of 0 to 100, where zero represents the lowest possible well-being, and 100 represents the highest possible well-being. Scores for each of the well-being elements are also calculated on a 0 to 100 scale” [60] (p. 8).



These weighted responses are then used to create the index score for each state. For the model, we are reviewing a subjective and objective Gallup Well-Being measure and its connection to the physical element relating to potential food access from additional FMs and CSA outlets [60,67]. The expectations for both results should connect with a top physical well-being element ranking as studies indicate links between higher-ranked well-being scores and healthy eating. Hoover discusses findings from the Gallup-Sharecare Well-Being Index, which indicates that respondents with normal weights who ate fruits and vegetables four to seven days each week also described their current lifestyle as “thriving” and had lower reports of “suffering” than other subcategories [68]. Additionally, respondents who answered positively to “Yes, ate healthy yesterday” had lower percentages of current depression, experiences of depression, and other chronic illnesses [68].

#### 5.1.3. Farmers’ Markets and Community-Supported Agriculture

Examining the dispersion of FMs and CSAs, in the analysis, we recorded the number of FMs and CSAs located in each state from the USDA’s Local Food Directory [47]. Likewise, both Govindasamy and Schnell, found that research on FMs and CSA was focused on the connection of populations located in larger suburban or urban downtown areas [53,69]. Prior research utilized previous types of FMs and CSA classification by standardizing results as a total representative per 100,000 citizens [54,66,70,71].

Galt notes that these classifications provide the research and analysis with standardized classification of FMs and CSA [54]. Further, standard classification allows for comparative analysis using representation within both high and low-population states [54]. Our study shows that standard classifications remove outliers, including California and New York, which have FMs of 764 and 666, respectively. The average amount per state for FMs is 168.68.

In order to examine the effect of FMs and CSAs on physical well-being at the state level, we have controlled for the population per 100,000 people. By holding the population at 100,000 as a constant, we are preventing this variable from being a confounding variable, thereby increasing our internal validity of this study [48,72–74].

#### 5.1.4. Poverty

We control poverty in this study to avoid confounding effects in examining the effects of FMs and CSAs on physical well-being [54,70,71,75,76].

The poverty variable utilizes the 2016 ACS of the U.S. Census by state to classify the percentage of residents living below poverty within each state [62]. Both scholars and practitioners have examined connections between low-income households and the utilization of FMs and CSAs [54,70,75,76]. Low-income households are less likely to use these outlets compared to their affluent counterparts [54,65,76]. Additionally, low-income households are more likely to experience physical health risk factors, including obesity, low levels of physical activity, and increased rates of unhealthy food access [70,77–79]. In the model, we control poverty to avoid confounding effects when examining the connection of physical well-being to FMs and CSAs.

### 6. Data Analysis Methods

When measuring physical well-being, the Gallup 2016 survey examines well-being across the nation by state, covering five elements: purpose, social, financial, community, and physical [60]. For this analysis, we are only measuring the physical element. The physical element of well-being is “having good health and enough energy to get things done” [60] (p. 2). Gallup’s statewide ranking system is not an equal measure between ranks. For this reason, ordinal logistic regression analysis is employed to understand the relationship between the Gallup physical well-being ranking and the number of FMs and CSAs by state.

Ordinal logistic regression analysis models the relationship between ordinal variables and one or more explanatory variables [80]. If the degree of difference between categories

may not be quantifiable, such as rank ordering, important information can be lost [81]. It is an extension of logistic regression where the log odds of a binary response are linearly related to the independent variables within the model [80].

By examining physical well-being using ordinal logistic regression, we can see how an increase in FMs and CSAs is related to the log odds of physical well-being ranking being higher (or worse physically) or lower (or better physically). Postestimation tests looking for model specification errors were applied to confirm that physical well-being relates to the independent variables in the model [82]. Postestimation testing on the model found no significance of missing relevant variables for our analysis.

## 7. Study Results and Discussion

### *Hypothesis Testing*

Utilizing ordinal logistic regression, we examine state rank using Gallup's physical well-being index to understand if there is a positive or negative relationship between physical well-being, FMs, and CSAs [60]. In order to understand the association, we check each individual variable (FMs and CSAs per 100 thousand residents) for their log odds ratio of the outcome of a higher or lower physical well-being ranking. From the Gallup physical well-being index, we specifically examine healthy eating and the number of servings of healthy food per day while controlling for poverty [60].

We found that there was no relationship between FMs per 100,000 residents and CSAs per 100,000 residents and the log odds of an increase or decrease in physical well-being rankings. To further compound its insignificance, the expected subjective and objective measures and poverty were found to be statistically significant, showing a relationship with a state's standing within the physical well-being ranking. Table 6 below displays the model and its results. The measure of vegetable and fruit consumption per week is positively associated with increasing a state's chances of achieving a better physical ranking, connecting increased serving consumption to improved physical well-being, as expected based on previous literature. However, the subjective measure of a user's response on whether they ate healthy the day prior is associated with potentially a lower score on the physical well-being ranking. The negative relationship may be due to the variety of opinions on what foods are considered healthy within different localities [83].

**Table 6.** Physical well-being ordinal logistic regression model results.

Variables Observed	Coefficient
# of Farmers Markets per 100,000 Residents	−0.12 (0.20)
# of CSAs per 100,000 Residents	−0.09 (0.15)
Survey Question: Did You Eat Healthy All Day Yesterday?	−60.70 * (12.81)
Survey Question: In the last seven days, on how many days did you have five or more servings of fruits and vegetables?	7.33 * (2.61)
Percentage of State Living Under Poverty	−0.44 * (0.12)

Notes: Standard Errors in Parenthesis; \*  $p < 0.05$ , Pseudo  $R^2$ : 0.17; LR  $\chi^2$ : 65.18; N: 50.

Lastly, state-level poverty demonstrates a negative association with physical well-being rankings, an expected result based on previous literature linking worsening physical well-being to low-income households. As the expected scores came back with significance while FMs and CSA relations did not, it leads to further evidence that there is no connection between state-wide level physical well-being status and the availability of FMs and CSAs, going against the research hypothesis.

## 8. Implications

Considering implications for scholarship, practice, and public policy, at this time, we cannot show with state-level data that there is a positive relationship between physical well-being elements and the healthy effects of FMs and CSAs. Our findings, however, do not mean that FMs and CSAs are not potentially created to increase physical well-being. As FMs and CSAs are another established outlet for a population, factors such as community demographics, socioeconomic status, population density, and geographic classification (rural, suburban, urban) may play a role in the specific locations of FMs and CSAs [53,54,64,65,69,76].

Suppose one area is inundated with a variety of FMs and CSA outlets. In that case, it does not equate to the overall status of equitable access to the state, only potentially increasing physical well-being in a microcosm of the overall state due to specific factors that increase the probability of physical well-being already. FMs and CSAs may only be related to a specific subset of factors that define a state's physical well-being. The lack of observed relationship from the study directs future empirical research to observe the association between FMs and CSAs at more specific elements of physical well-being instead.

Further, data examination is needed at the regional and local levels to understand the physical well-being connection of FMs and CSAs with the factors mentioned previously. Geographic characteristics are particularly notable for future study as there may not be an opportunity for residents to feasibly access FMs or CSAs. Food deserts and lack of food access have been studied more widely, and there are policy implications for these aspects of local and regional food systems.

Food choice, while a part of the food well-being literature, is not the main focus of the literature or of this article. The food choice discussion becomes mired in a discussion of pro-social behavior and a positive self-image by FM shoppers [84]. Wicaksana suggests further that there are interpersonal reasons for shopping at FMs and CSAs [85]. Because food choice is not straightforward we believe for this article, including choice as an independent variable would be a confounding variable. For this reason, we have not included food choice. Food choice as a focus for the study of FMs and CSAs and its relation to well-being is a focus for a future study looking at the rationales for food choice.

For future studies, we see that another area of concern that can be explored regarding local food systems is that of access to FMs and CSAs to examine all five elements of health well-being. In many areas of the U.S., low-income residents do not often have ways to obtain fresh and healthy foods. There is much work around food deserts, both in rural and urban areas where residents do not have adequate access to healthy foods [1,86,87]. Some areas have developed programs and policies geared towards helping ensure more access for their residents, ranging from aiding the development of CSAs to direct distribution programs [88,89]. We would be able to examine this research by using our design method to gain access to FMs and CSAs at the regional, state, and local levels.

## 9. Conclusions

We have taken a new step in empirical analysis to identify local food systems at the state level that contribute to more connected communities and arguably can improve some aspects of well-being. We further aim to explore a basis for connections between local food systems, specifically FMs and CSAs, the two most commonly identified and recognized methods of delivering direct farm-to-consumer food.

From a general level, we found no association between physical well-being and FMs and CSAs. However, our coefficients are in the hypothesized direction, and failure to reach statistical significance does not provide conclusive evidence that there is no relationship between physical well-being and the presence of FMs and CSAs. More fine-grained data on state-level physical well-being and a longitudinal dataset with additional observations may yield more precise estimates of this relationship. From previous studies, FMs and CSAs seem to help promote healthier eating and, in turn, be potentially related to the notion of physical well-being. Additionally, it should be noted that this study only looked at

presence or connection and not causation. Other factors associated with these states could be associated with the presence of CSAs and FMs, including socioeconomic factors and state policies aimed at encouraging local food systems (for example, policies to support urban agriculture or the presence of state and local food councils, etc.). In those areas without access to local foods, whether via these outlets or others, there seems to be a need for more attention to gaining access for residents.

Some suggestions on how this could be aided are via programs and organizations striving to connect residents to sources of fresh, healthy, and affordable food. There could also be supportive public policies to allow for more urban gardening and use of vacant space for urban farming, for example, such as those found in several initiatives throughout Detroit, Michigan that have helped in part spur economic and social renewal within the city. While FMs and CSAs may never approach the scale and volume of commercial food systems, the benefits of linking farmers to consumers directly for access to locally produced foods can convey multiple benefits, whether these can be explicitly reflected in quantitative analysis or not. There can be inherent positive influences on community well-being overall by having strong local food systems.

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