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Understanding the Relationship between Retail Clinics and Primary Care Infrastructure

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Abstract

Understanding the Relationship between Retail Clinics and Primary Care Infrastructure

By Andrew James Warlick

The rapid increase in retail medicine over the past 5 years has caught many off guard. Between 2006 and 2007, the number of retail clinics increased more than two-fold from 441 to 982 nationwide, but has leveled off since 2008. Yet little is known about the determinants of where these health facilities are built. Existing research has only looked at basic demographic characteristics and rarely in a multivariate context. This study expands on existing research by using new data sources to conduct multivariate analyses that examine the associations among area-level socio-demographic characteristics, primary health care infrastructure, and the location of retail clinics. Using data from the 2006 Dartmouth Health Atlas, this thesis assesses the impact that the number of primary care physicians and the number of federally qualified health centers had on the presence and number of retail clinics in a defined geographic area, after adjusting for population characteristics. After conducting a multi-stage two step model, we found that retail clinics are more likely to locate in areas that have higher numbers of primary care providers and more federally qualified health centers (FQHCs). Also, we found that the number of federally qualified health centers is positively associated with having multiple retail clinics in a given area. These findings suggest that retail clinics are using federally qualified health centers as a marker for identifying potential markets to enter

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Above all others, I thank my wife for two years of constant, loving support. Without her encouragement and willingness to endure the long separation none of this could have been possible. This thesis is dedicated to her.

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List of Abbreviations

CCA	Convenient Care Association
DHA	Dartmouth Health Atlas
FPL	Federal Poverty Level
FQHC	Federally Qualified Health Center
HRSA	Health Resources & Services Administration
IRR	Incidence Rate Ratio
HH	Household
MHI	Median Household Income
OR	Odds Ratio
PCP	Primary Care Physician
PCSA	Primary Care Service Area
RUCA	Rural Urban Commuting Area
SES	Socio-economic Status

Introduction

As a new phenomenon in the American medical landscape, retail clinics are changing the way healthcare is consumed. Between 2007 and 2008, the number of retail clinics more than doubled from 441 to 982.[1,2] But between August 2008 and mid-2010, only 64 new clinics were opened.[1]

While two companies (MinuteClinic and Take Care) dominate the retail clinic landscape, all firms share a common operating model.[3] Most, if not all, are for-profit entities. With their focus on profit maximization, retail clinics work to ensure patients can be treated quickly, efficiently, and cheaply. A retail clinic is typically staffed with certified nurse practitioners and/or physician assistants.[4] They provide a limited slate of services that focus heavily on simple procedures: testing, vaccinations, and evaluation and management of chronic conditions.[3] Insurance is optional, though most retail clinics will accept it.[3] Pricing is transparent via published "menus." Prescriptions and referrals to urgent care facilities are also available.[5] Rather than have patients make appointments, retail clinics see patients on a first-come, first-serve basis. In order to encourage patients to come in, retail clinics offer expanded hours that are better suited to working adults and parents. Many of these features are not new. Free-standing, urgent care facilities have been providing similar care for a much longer period of time. In fact, urgent care facilities outnumber retail clinics by approximately 8:1.[5] However, the facilities are not direct substitutes for one another. Urgent care facilities provide a more robust slate of primary care services than retail clinics as well as care for minor injuries and trauma that retail clinics are not equipped to manage.[5]

There is hope that retail clinics may partially address the problems associated with the growing shortage of primary care providers. An estimated 60 million Americans lack access to a primary care provider and the problem is getting worse.[6] From 1998 to 2004, the number of medical school graduates entering primary care fell 64%.[7] The long term impacts of this trend could be potentially disastrous. Individuals without regular access to primary care are more likely to have preventable hospitalizations and have lower rates of preventative screenings.[8-11] Areas with more primary care providers also have lower overall mortality.[12]

Literature Review

Cost and Quality Research

To understand how retail clinics fit into the existing primary care infrastructure, two things need to be understood. First, are retail clinics providing access to the same types of services as primary care physicians? And second, where are they providing these services? A cursory glance at the service offerings that retail clinics provide indicates that that their goal is to provide many of the same services that are commonly provided by primary care physicians, such as simple physicals, vaccinations, and lab tests. Additionally, a number of articles have looked at the reasons for visiting an retail clinic and compared them with visits at other facilities (typically physician offices and EDs).[13-15] The authors found that the most common reasons for visiting (e.g., ear infection, respiratory tract infections, immunizations, pink eye) a retail clinic comprise 12-13% of all adult primary care visits and 13-27% of adult ED visits. Furthermore, recent surveys have shown that patients at a retail clinic can effectively "triage" decisions to determine which setting is appropriate for their condition.[16]

Although quality of care has been a major public concern with retail clinics, empirical evidence suggests these concerns are unfounded. Many physician groups questioned retail clinics' ability to provide quality care as they began to spread.[4] Additionally, a survey of consumers in 2008 found that a majority (65%) were concerned about staff qualifications and misdiagnoses at retail clinics.[3] However, studies that have empirically assessed quality of care at retail clinics have found that retail clinics provide the same level of care as a physician's office. In these studies, researchers analyzed episodes of care for common medical conditions. An episode of care is generally defined as "visits, pharmaceutical claims, and ancillary tests documented over the entire course of a given illness for a single patient."[17] Episodes were analyzed in two ways: (1) the number of repeat visits per episode and, (2) whether accepted standards of care were met. The most comprehensive of these studies analyzed how frequently patients at retail clinics received standard care for common illnesses at four sites: retail clinics, physicians' offices, urgent care facilities, and emergency departments.[17] Retail clinics performed as well as primary care offices and much better than emergency departments in all quality measures. Two others studies from a large group practice in Minnesota focused on repeat visits in both children and adults in early 2008.[18,19] Both studies analyzed treatment episodes to see if patients had an extra visit within two weeks for the same condition. After adjusting for demographics and health status, both papers found that individuals seen at a retail clinic were no more likely to have a repeat visit than those treated at a physician's office.

When comparing retail clinics to other primary care providers, retail clinics often promote themselves as offering services at a lower cost. In empirical analyses, researchers have examined the cost to insurance companies for visits to retail clinics, primary care offices, and emergency departments. Comparing costs to insurance companies provides a better estimate of the per visit cost than an individual's out of pocket expenses. Results showed that retail clinics cost less, on average, than visits to all other type of facilities.[14,15]

Retail Clinic Location

Considered altogether, the existing research indicates that retail clinics can and are becoming an accepted alternative to seeing a traditional primary care provider for simple testing, monitoring, and check-up procedure services. When considering their ability to offer quality service with two key aspects of their business model, low cost and no insurance requirement, retail clinics have the potential to play an important role in the U.S. public health infrastructure. However, this will occur only if retail clinics are located in areas with underserved populations. If retail clinics are located in areas with high overall socioeconomic status then their ability to improve access to primary care will be limited. Consequently, it is important to understand which types of communities are most likely to have retail clinics to better understand how they fit into the current primary care and public health care infrastructure. Because retail clinics are so new, there is a dearth of empirical research. The short timeframe limits any longitudinal studies on retail clinics. Even with the difficulty in obtaining information about retail clinics, some research has been done. What has been published best illustrates the importance of developing better data sources to study retail clinics. Retail clinic firms are unlikely to share extensive amounts of data that might benefit their competitors. The majority of the published articles use claims data from Minnesota, because MinuteClinic, the nation's largest retail clinic chain, was founded there in 2000. Only one known study has been conducted using a larger and more representative data set.

Existing research only focuses on studying retail clinic location in terms of socio-economic and demographic factors. There is no existing research looking at how retail clinics interact with existing primary care resources. The first comprehensive analysis examining retail clinic location was written by Rudavsky et al. in 2009.[2] The article focuses on developing an initial overview of where retail clinics are located without identifying any specific factors. Only retail clinics that were open as of August 2008 were included in their study (n=982). The most significant result was to solidify the understanding that retail clinics are only located in urban and suburban areas. This is the first paper to identify that 28.7 percent of US residents live within a 10 minute drive of a retail clinic.

Pollack and Armstrong also examined the relationship between retail clinics and traditionally underserved populations.[20] They mapped the retail clinics in operation as of July 2008 to census tracts using Health Resources and Services Administration (HRSA) data and performed a general analysis on socioeconomic and demographic variables' impact on retail clinic location. The majority of the analysis consisted of bivariate analyses. Each model included random effects for county characteristics but all census tract variables were modeled independently. The authors found that retail clinics are more likely to be located in census tracts with high household incomes, more white residents, and more children under the age of five.

The article by Rudavsky and Mehrota improves upon Pollack's methodology in two ways.[1] First, the authors limit their analysis to urban areas. This eliminates the influence the large number of census tracts without retail clinics exert on the results. Second, they define the area of analysis in relationship to the retail clinic. They defined catchment areas as all urban census blocks within a ten minute driving distance of the retail clinic. The authors were also the first to use multivariate analysis to assess the determinants of retail clinic location and to look at measures of primary care access in relationship to retail clinics. They found that only 12% of the retail clinics were located within a Healthcare Professional Shortage Area (HPSA). The results of the multivariate analysis showed that area-level income was the most significant factor associated with retail clinic location (OR = 3.63) for highest income quartile compared to lowest income quartile).

In order to understand better the relationship between primary care providers and retail clinics, the two major shortcomings of the existing research must be addressed. First, better models on retail clinic location need to be developed. First, the area of analysis should be expanded beyond the census tract/block. The area is too small to measure the impact that retail clinics have on the population. Similarly, the decision to use a 5 to 10 minute drive as the standard for accessing a retail clinic is very limiting. Neither measure has any significant relationship to primary care use or access. Using a measure of distance, such as miles, or expanding the radius would have been a better choice and more consistent with research on primary care access.[21-23] Also, the use of census tracts/blocks only takes into account individuals' residence. It may be the case that people choose a primary care physician based on their place of work rather than their home. Under the assumptions made by Rudavsky and Mehrota, this should increase the population within 10 minutes of a retail clinic and may alter their results. Patients at retail clinics have listed the clinic's proximity to their office as a reason for visiting.[16]

Second, the development of better multivariate models on retail clinic location would also improve our understanding of the link between primary care and retail clinics. The article by Pollack only accounts for county-level differences as random effects in their bivariate models. Rudavsky conducts a multivariate analysis of retail clinic loctaion, but ignores key social and structural factors. The authors do not look at the influence of a working age population on retail clinic location, which is the largest group to visit retail clinics.[13] Also, neither insurance coverage nor state-level heterogeneity in population characteristics and polities are considered in the paper. When looking at a population to determine who would be more likely to visit a retail clinic, insurance status should play a significant factor. State level regulations may also have an impact on what services retail clinics or where they choose to locate.[a]

Multivariate models should also examine how retail clinics interact with existing medical resources, particularly primary care physicians. No study to date has looked explicitly at the relationship between the primary care providers and retail clinics. Although Rudavsky & Mehrota mapped retail clinics to primary care healthcare professional shortage areas, they did not examine the relationship between retail clinics and the supply of primary care providers. If we assume that retail clinics provide an alternative to a primary care physician for many types of services, then we can logically ask how they are related. Do urban areas with fewer primary care physicians attract retail clinics? Is there a relationship between other healthcare providers, such as urgent care facilities or federally qualified health centers? To better understand how retail clinics fit into the existing primary care and public health care infrastructure, these issues must be explored.

This thesis hopes to address several of these issues. First, it will use Primary Care Service Areas (PCSAs) as the area of analysis. This provides two advantages over using census blocks. First, PCSAs are directly related to the supply of primary care physicians and service utilization. Second, they are large enough to capture the distances residents are willing to travel for primary care. The data provided along with the PCSA definitions allows for more robust multivariate analyses. This thesis also improves upon prior multivariate analyses by examining additional population characteristics that have not been previously examined. Third, this thesis will examine the associations between retail clinic location and

[a] Minute Clinic offers a different slate of services and different age restrictions in Massachusetts. The differences are listed here: http://www.minuteclinic.com/services/ma/

several measures of healthcare infrastructure, including the number of primary care physicians. Lastly, it will account for state-level heterogeneity in population characteristics and policies.

Conceptual Framework

In order to frame this analysis, we developed a framework that includes both the "target market" for retail clinics and existing primary infrastructure. Retail clinics (or their parent corporations) are profit maximizing entities and will locate in areas that best serve this interest. Based on this assumption, we developed the following model:

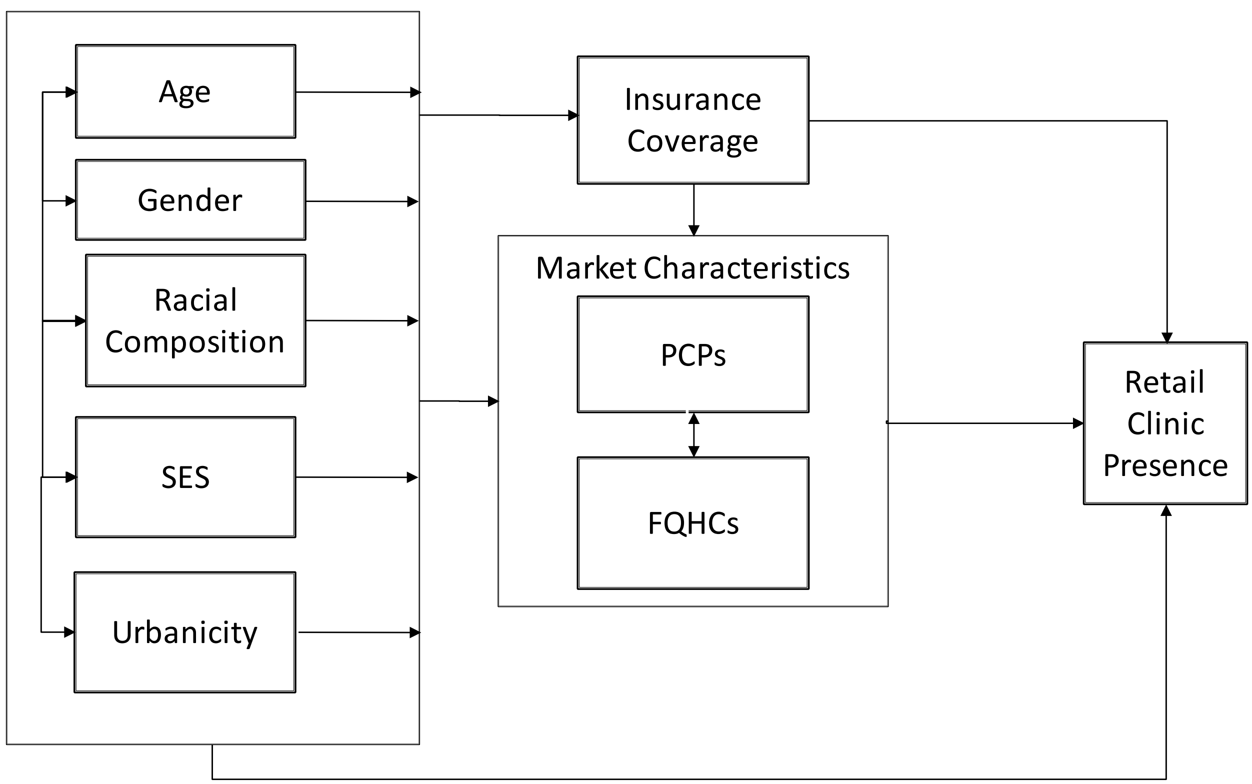

Figure 1: Conceptual Model

While we have included urbanicity as a construct in this model, it is important to understand that nearly all retail clinics are located in urban areas. As such, the relationships among the other constructs are presented for urban populations and not the population as a whole.

Population Characteristics

As profit maximizing entities, retail clinics likely have a target population or demographic they are hoping to reach. While no for profit business directly communicates their target market, it is not difficult to draw inferences from their overall marketing and organization. In our framework, we hypothesize that the following characteristics are the most important in determining retail clinic location.

Income & Insurance

Areas with higher household income levels draw more primary care providers and specialists overall, as do areas with higher levels of insurance coverage.[24] In general, individuals with higher income levels can afford more healthcare, particularly additional or elective services. Retail clinics will be attracted to areas with more financial resources for two reasons. First, individuals will have the ability to pay for the visit. Second, these individuals will have a high "time cost" and will be attracted to the convenience that retail clinics offer.

H1: Area income (measured by Median Household Income) will have a positive association with the presence of retail clinics in a given area.

Insurance status represents an interesting opportunity for retail clinics. It is generally assumed that physicians (both primary care and specialists) will avoid areas with high numbers of uninsured and publicly insured. However, retail clinics may be drawn to areas with higher numbers of uninsured individuals who have the financial resources to pay for health services (i.e., the working poor). However, we hypothesize that retail clinics will avoid areas with higher rates of public insurance for two reasons. First, they will not be drawn to areas with a large number of adults over 65 (see below), and second, they will not be drawn to areas with high rates of Medicaid coverage due to lower overall levels of income.

H2: Controlling for income, areas with more uninsured individuals will be more likely to have a retail clinic.

H3: Controlling for income, areas with more publicly insured individuals will be less likely to have a retail clinic.

Population Age

Age based differences in healthcare utilization are well documented.[25] However, retail clinics will not simply target areas with more elderly. Instead, retail clinics will focus on areas that have large populations that are most likely to utilize their services. Parents with children aged 0-4 and working age adults (21-64) are the most likely to find retail clinic services appealing. Existing research shows that willingness to use a retail clinic declines with age, so adults over 65 will be less likely to use a retail clinic.[26] Children aged 0-4 have a unique set of medical needs that closely align with retail clinic services, such as immunizations, ear infections, and pink eye.[13] Working age adults are likely to be the population that is most targeted by retail clinics. They likely have the highest time costs of any of the population groups and are the most likely to be uninsured.[27]

H4: Areas with more children between the ages of 0-4 and adults 21-64 will be more likely to have a retail clinic.

Racial Composition

While race is often used as a proxy for other variables (such as income or insurance status), we hypothesize that it should have no impact on the location of a retail clinic once other characteristics are controlled for.

H5: Having more minorities (African American and Hispanic) in an area will not impact the presence of retail clinic in a given area after for controlling other factors.

Healthcare System Factors

Areas with more economic development and organized healthcare tend to attract more primary care physicians overall.[28,29] Because retail clinics offer primary care services, our conceptual model focuses on two measures of primary access within an area.

Number of Primary Care Providers

Previous research has suggested that having large number of physicians in a market discourages other providers from coming into the area.[30] From an economic standpoint, this makes sense, as an increase in the supply of primary care providers means increased competition for patients, office space, staff, etc. Although retail clinics offer select primary care services, we do not hypothesize that they are in direct competition with primary care physicians because of their unique business model. Therefore, we hypothesize that retail clinics may be attracted to areas with more primary care providers because they may perceive that these areas consume more healthcare and there is a larger market to which they can offer their specialized services.

H6: Having more primary care providers in an area will increase the likelihood of having a retail clinic in an area.

Federally Qualified Health Centers

Federally Qualified Health Centers (FQHCs) are a clear marker for areas that historically lack sufficient access to healthcare. The eligibility requirements for FQHC status require the area to have less than a sufficient number of primary care providers.[31] FQHCs must also provide a broad range of medical services.[31] Retail clinics will find areas with more FQHCs attractive for two reasons. First, FQHCs mark areas with unmet healthcare needs, and retail clinics could move in to fill a portion of this need. This would allow them to capture part of a market without facing competition from other providers. Second, the population that visits an FQHC and a retail clinic overlap to some degree (Table 1). In terms of income, over half of the patients at a retail clinic are below 400% of the Federal Poverty Level (FPL) and 24% are below 200% FPL. Also, 27% of individuals visiting a retail clinic are uninsured. Furthermore, an analysis of FQHCs that adopted retail clinic-like methods found a significant amount of success.[32] Their success suggests that the retail clinic model is attractive to a wide range of people, including those that traditionally visit FQHCs. Because there is a lack of data on retail clinic visits, some of these values may not be accurate; most notably the percentage of Hispanic patients and the income breakdown. Despite the data limitations, the table illustrates that the two populations are similar.

> *H7: Having more FQHCs in an area will increase the likelihood of having a retail clinic in an area.*

Table 1: Comparison of Patient Characteristics between FQHCs and Retail Clinics [13,33,34]

Patient Characteristics	FQHCs	Retail Clinics
Age 0-4	11.7%	6.8%
Age 21-64	56.5%	64.5%
Age 65+	6.9%	7.2%
Male	41.1%	37.3%
African American	23.1%	-
Hispanic	34.6%	15.5%
Uninsured	39.2%	26.6%
Public Insurance	45.4%	-
<200% of FPL	91.7%	24.4%
>200% FPL	8.3%	
200-400% FPL	-	30.0%
>400% FPL	-	45.6%

Conclusion

Given the existing gaps in our understanding of where retail clinics are likely to be located, more research is needed. In particular, more research is needed about the interaction between existing primary care resources and retail clinics. By developing a more robust multivariate model using the measures discussed above, we will do just that.

Methods

Data

Data about the location and ownership of retail clinics was obtained from The Convenient Care Association (CCA), which is the trade association representing retail clinic interests. The CCA provided the complete street address and ownership information for all retail clinics in their database as of July 2010. Additional information about the retail clinics was requested, but was unavailable from the CCA.

All other data was provided by the Dartmouth Health Atlas Project (DHA). The DHA is a publicly accessible repository designed to analyze the distribution of medical resources in the US. Its primary focus is on Medicare spending, but it contains a significant amount of information useful to small area analyses including information on population demographics, primary care physicians, insurance levels, utilization, and outcomes. Data in the DHA are aggregated from three main sources: Census Current Population files, the Health Resources & Services Administration (HRSA)/American Medical Association medical file, and the HRSA Area Resource File. Healthcare utilization data is drawn from Medicare Part B 20% file.

Study Sample

The DHA contains a variety of geographic areas that can be used for analysis. We chose to use Primary Care Service Areas (PCSAs) due to their size, number, and explicit relationship to primary care usage. A PCSA is defined as the area where the majority of the Medicare beneficiaries receive most of their primary care. For example, if the majority of the individuals in ZIP code A receive most of the primary care in their ZIP code, then their PCSA is equal to their ZIP code. If the majority of individuals in ZIP code B also receive their care in ZIP code A, the PCSA represents the total area of both ZIP codes for all individuals (Figure 4, Appendix). A complete overview of the methodology used to create the 6,542 PCSAs is available from the Dartmouth Atlas of Health Care.[35]

Each PCSA was labeled as being either urban or rural, according to Rural Urban Commuting Area (RUCA) codes. These codes were developed by the federal government to measure levels of urbanicity at a census tract level. The codes are designed by identifying areas that are economically dependent on their proximity to a major urban center. The RUCA classification for each PCSA was provided by Dartmouth, and the definition of urban and rural RUCAs was provided by the Rural Health Research Center at Washington University.[36] We limited our analysis to urban PCSAs (n=2,766) to be consistent with the literature, and because retail clinics are generally located within urban areas.[2] This eliminated 3,776 rural PCSAs and 20 PCSAs with a retail clinic.

Dependent Variables

The number of retail clinics within a PCSA was calculated by assigning the ZIP code of each clinic to a single PCSA using the link provided by the DHA. Because retail clinics are not evenly distributed and tend to cluster in specific geographic areas, a binary variable was also generated for each PCSA indicating the presence or absence of a retail clinic. We identified 505 PCSAs with at least one retail clinic.

Explanatory Variables

Demographics

In each PCSA, four age variables were created to represent distinct sets of customers that a retail clinic may receive: percentage of the population age 0-4, percentage of the population age 5-20, percentage of the population age 21-64, and percentage of the population age 65 and older. Children under the age of four have a distinct set of medical needs that may significantly overlap with retail clinic service offerings.

Racial/ethnic composition was measured with the following variables: percentage of PCSA residents who are African American and percentage of PCSA residents who are Hispanic. The percentage of males was included to control for gender differences in healthcare utilization. Insurance status was measured by the total percentage uninsured and total percentage with public insurance (Medicaid+Medicare+Other Public).

Key Variables of Interest

We chose two variables of interest in this study related to primary care access. First, we included the number of primary care providers (i.e., family practitioners, pediatricians, and general internists) per 100,000 residents and second, we combined the number of Federally Qualified Health Centers (FQHCs) and FQHC look-alikes within each PCSA into a single value. Both FQHCs and look-alike organizations meet the same federal standards but only FQHCs receive grant funding. The averages for all variables, including a comparison of PCSAs with and without a retail clinic are shown in Table 2.

Analytic Sample

As stated above, we limited our analysis to only urban PCSAs. In order to reduce overall errors within our models, PCSAs with RUCA codes without a retail clinic were removed (n=96). Additionally, PCSAs in states without a retail clinic were removed, which reduced the sample by an additional 361 PCSAs. Our final sample was 2,309 PCSAs of which 505 (21.9%) had at least one retail clinic.

Analysis

In order to assess the impact that each variable had on the presence of any retail clinic, we conducted bivariate logistic regressions and estimated the odds ratio for each variable (Table 3).

After analyzing our bivariate results, we estimated a series of five models for study. Each explanatory variable was standardized to have a mean of 0 and a standard deviation of 1. Because only 21.9% of PCSAs have a retail clinic, a two-part analysis was developed. The first part consisted of logistic regressions analyzing the impact that each variable had on having any retail clinics. Our analyses used the logit functional form:

$$\Pr(y=1) = \frac{e^{(\alpha+\beta_{1i}X_{1i}+\ldots\beta_{xi}X_{xi})}}{1+e^{(\alpha+\beta_{1i}X_{1i}+\ldots\beta_{xi}X_{xi})}}$$

The second was a series of Poisson regressions conducted only using PCSAs with at least one retail clinic to determine which variables impact the number of retail clinics in each PCSA. We used the Poisson distribution because the outcome (number of retail clinics) showed no signs of over-dispersion. We conducted a series of bivariate Poisson analyses to compare which variables may be significant in a multivariate context (Table 4). All analyses were done using the standard Poisson form:

$$\mu_i = E(\gamma_i|x_i) = e^{(B_{1i}X_{1i}+\cdots B_{xi}X_{xi}+\alpha)}$$

The same five models were used in each part. Bolded beta symbols in the equations below represent vectors of variables. $\boldsymbol{\beta_1}$ represents a vector of our three age variables; and $\boldsymbol{\beta_6}$ is vector of categorical variables measuring the degree of urbanicity. $\boldsymbol{\beta_{12}}$ is the vector of variables representing our state fixed effects. All unbolded betas are single, continuous variables. The initial model was as close to Rudavsky's model as possible, controlling for basic population demographics and socioeconomic status. [1]

$$\gamma_i = \beta_0 + \boldsymbol{\beta_1} Age + \beta_2 Male + \beta_3 African\ American + \beta_4 Hispanic + \beta 5 Median\ HH\ income + \varepsilon$$

The second model used RUCA codes to measure the urbanicity of each PCSA. Core urban areas (RUCA=1) were excluded as a reference group.

$$\gamma_i = \beta_0 + \boldsymbol{\beta_1} Age + \beta_2 Male + \beta_3 African\ American + \beta_4 Hispanic + \beta 5 Median\ HH\ income + \boldsymbol{\beta 6} Urbanicity + \varepsilon$$

The third model included our measures of access to medical care including our insurance variables, primary care provider supply, and FQHC supply.

$$\gamma_i = \beta_0 + \boldsymbol{\beta_1} Age + \beta_2 Male + \beta_3 African\ American + \beta_4 Hispanic + \beta 5 Median\ HH\ income + \boldsymbol{\beta 6} Urbanicity + \beta 7 Uninsured + \beta 8 Public\ Insurance + \beta_9 \#\ of\ Primary\ Care\ proivders + \beta_{10} \#\ of\ FQHCs + \varepsilon$$

The odds ratios for median household income and number of FQHCs were both positive in our third model. This was unexpected due to the application process for an FQHC, which places them in lower income areas. To better understand this relationship, the interaction between these two variables was calculated and included in our fourth model.

$$\gamma_i = \beta_0 + \boldsymbol{\beta_1} Age + \beta_2 Male + \beta_3 African\ American + \beta_4 Hispanic + \beta 5 Median\ HH\ income + \boldsymbol{\beta 6} Urbanicity + \beta 7 Uninsured + \beta 8 Public\ Insurance + \beta_9 \#\ of\ Primary\ Care\ proivders + \beta_{10} \#\ of\ FQHCs + \beta_{11} (FQHC * IncomeInteraction + \varepsilon$$

Our final model included state fixed effects in order to account for unmeasured variation in business and practice restrictions across states.

$$\gamma_i = \beta_0 + \boldsymbol{\beta_1} Age + \beta_2 Male + \beta_3 African\ American + \beta_4 Hispanic + \beta 5 Median\ HH\ income + \boldsymbol{\beta 6} Urbanicity + \beta 7 Uninsured + \beta 8 Public\ Insurance + \beta_9 \#\ of\ Primary\ Care\ proivders + \beta_{10} \#\ of\ FQHCs + \beta_{11} (FQHC * Income Interaction + \boldsymbol{\beta 12} State\ Effects + \varepsilon$$

We calculated odds ratios for the logistic regressions (Table 6) and incidence rate ratios for the Poisson regressions (Table 7).

In order to highlight the relationship between FQHCs and retail clinics, two reduced models were developed. The first reduced model was:

$$\gamma_i = \beta_0 + \beta_1 Median\ Household\ Income + \boldsymbol{\beta_2} State\ Effects + \varepsilon$$

The second model was:

$$\gamma_i = \beta_0 + \beta_1 Median\ Household\ Income + \beta_2 \#\ of\ FQHCs + \boldsymbol{\beta_3} State\ Effects + \varepsilon$$

For each model (full and both reduced) we calculated the percentage of PCSAs that were correctly identified as having a retail clinic. Additionally, we calculated the area under the receiver/operator curve to better understand the accuracy of the reduced models (Table 5). All calculations were done using STATA version 11.[37]

Results

Descriptive Statistics

The differences in the population characteristics between PCSAs with and without retail clinics are presented in Table 2. PCSAs with retail clinics have a higher median household income than those without a retail clinic and fewer publicly insured individuals (p<.0001 for both). Additionally, PCSAs with retail clinics also have more primary care providers and more FQHCs (p <.0001).

Table 2: Select Characteristics of PCSAs With and Without Retail Clinics

Characteristic	Overall (N=2,309)	With a Retail Clinic (n=505)	Without a Retail Clinic (n=1,804)	p*
	Mean (SD)			
Age				
% 0-4	6.4 (1.4)	6.7 (1.1)	6.4 (1.4)	<.0001
% 5-20	22.2 (3.2)	22.2 (2.8)	22.2 (3.3)	0.9
% 21-64	58.3 (3.5)	59.2 (3.4)	58.0 (3.5)	<.0001
% 65 and up	13.1 (4.4)	12.0 (4.4)	13.4 (4.3)	<.0001
Demographics				
% Male	49.2 (1.6)	49.1 (1.3)	49.2 (1.6)	0.1
% Black	10.5 (15.2)	11.2 (14.3)	10.2 (15.5)	0.1
% Hispanic	11.2 (17)	11.2 (12.6)	11.2 (18)	0.6
Median HH Income in $10K	5.6 (1.9)	6.5 (1.9)	5.4 (1.9)	<.0001
Healthcare Infrastructure				
% Uninsured	14.2 (4.6)	14.8 (5)	14.1 (4.5)	0.006
% Public Insurance	23.3 (4.8)	21.0 (4.6)	23.9 (4.7)	<.0001
# of PCPs per 100,000 residents	77.4 (26.5)	80.2 (23.7)	76.6 (27.2)	<.0001
# of FQHCs (FQHCs + look alikes)	1.0 (2.3)	1.4 (2.9)	0.9 (2.1)	<.0001
# of Retail Clinics	0.4 (1.3)	2.0 (2.0)	-	<.0001

*Two tailed t-test of significance between PCSA

Bivariate Analyses

Next, we estimated logistic regressions with a single predictor of the odds of having a retail clinic. Consistent with previous literature, median household income exhibited a strong influence on this outcome. An increase of $10,000 improves the odds of having a retail clinic by 30% (OR=1.30, 95% CI=1.09, 1.26). Surprisingly, the next largest predictor of having a retail clinic was the percentage of children age 0-4. A one percent increase in that population increased the odds of having a retail clinic by 17% (OR=1.17, 95% CI = 1.09, 1.26). As expected, an increase number of primary care physicians in an area (OR=1.01, 95% CI= 1.00, 1.01) and number of FQHCs (OR=1.09, 95% CI= 1.05, 1.13) also increased the likelihood of having a retail clinic.

Table 3: Bivariate Logistic on the Probability of Having a Retail Clinic

Variable	Odds Ratio (95% CI)
Age	
% 0-4	1.17*** (1.09, 1.26)
% 5-20	1.00 (0.97, 1.03)
% 21-64	1.10*** (1.07, 1.13)
% 65 and up	0.91*** (0.88, 0.94)
Demographics	
% Male	0.98 (0.91, 1.04)
% African American	1.00 (1.00, 1.01)
% Hispanic	1.00 (0.99, 1.01)
Median HH Income in $10K	1.30*** (1.24, 1.37)
Healthcare Infrastructure	
% Uninsured	1.03** (1.01, 1.05)
% Public Insurance	0.87*** (0.85, 0.89)
# of PCPs per 100,000 residents	1.01** (1.00, 1.01)
# of FQHCs (FQHCs + look alikes)	1.09*** (1.05, 1.13)

* p<.05, ** p<.001, *** p<.0001

We also estimated bivariate Poisson regression models to examine predictors of the number of retail clinics, conditional on having at least one clinic (Table 4). PCSAs with a higher percentage of adults aged 21-64 (IRR= 1.03, 95% CI= 1.01, 1.05) and children aged

0-4 (IRR= 1.10, 95% CI= 1.04, 1.16) were more likely to have multiple retail clinics. Interestingly, higher median household income did not predict having multiple retail clinics in this bivariate analysis (IRR= 0.99, 95% CI= 0.96, 1.02). Having more primary care providers slightly reduced the probability of having multiple retail clinics (IRR= 0.99, 95% CI= 0.99, 1.00) while having more FQHCs was associated with an increase in the number of clinics (IRR= 1.07, 95% CI=1.06, 1.09).

Table 4: Poisson Regression of PCSA Factors Determining the Presence of One or More Retail Clinics

Variable	IRR (95% CI)	
Age		
% 0-4	1.10***	(1.04, 1.16)
% 5-20	1.00	(0.98, 1.02)
% 21-64	1.03***	(1.01, 1.05)
% 65 and up	0.97***	(0.96, 0.99)
Demographics		
% Male	1.02	(0.97, 1.07)
% African American	1.00	(1.00, 1.01)
% Hispanic	1.00	(1.00, 1.01)
Median HH Income in $10K	0.99	(0.96, 1.02)
Healthcare Infrastructure		
% Uninsured	1.01	(1.00, 1.02)
% Public Insurance	0.98*	(0.97, 1.00)
# of PCPs per 100,000 residents	0.99**	(0.99, 1.00)
# of FQHCs (FQHCs + look alikes)	1.07***	(1.06, 1.09)

* p<.05, ** p<.001, *** p<.0001

Multivariate Analyses

The results of our multivariate logistic models are presented in Table 6. Model 1 represents our attempt to replicate previous multivariate studies with the available data. When considering the factors that determine having any retail clinic within a PCSA, our conceptual model proved accurate. An increase of one standard deviation (1.4%) in the population of children aged 0-4 nearly doubles the odds of having a retail clinic (OR=1.98, 95% CI= 1.52, 2.53). The same is true for a one standard deviation (3.5%) increase in the population of working age adults (OR 1.88, 95% CI= 1.56, 2.27). Consistent with the existing literature, a one standard deviation increase in the median household income in a PCSA ($19K) increased the odds of having a retail clinic by 69% (OR 1.69, 95% CI= 1.52, 1.89). Also consistent with the existing research, a 15.2% increase the African American population increased the odds of having a retail clinic by 13% (OR=1.13, 95% CI= 1.00, 1.27). In concordance with our conceptual framework, as the proportion of male residents increased by one standard deviation (1.6%) the likelihood of having a retail clinic decreased (OR=0.83, 95% CI= 0.73, 0.83).

Our second logistic regression, shown in Table 6, also included measures of urbanicity. Living in a PCSA classified as being a small town (RUCA code 7.1) reduces the odds of having a retail clinic by 92% (OR=0.08, 95% CI= 0.01, 0.60) compared to living in a core urban area.

Model 3 adds health care infrastructure measures to the analysis. As expected, a one standard deviation increase in the uninsured population (4.6%) within a PCSA increased the odds of having a retail clinic by 37% (OR=1.37, 95% CI=1.19, 1.59). Increasing the number of FQHCs by 2.3, one standard deviation, improved the likelihood of the PCSA having a retail clinic by 29% (OR=1.29, 95% CI= 1.16, 1.44). Also as expected, raising the number of individuals with public insurance by one standard deviation (4.8%) reduced the odds of having a retail clinic by 51% (OR=0.49, 95% CI= 0.41, 0.58). The number of primary care physicians was not significantly associated with the presence of a retail clinic (OR=1.11, 95% CI= 0.96, 1.29). The fourth model includes an interaction between income and FQHCs, which was not a significant predictor of having a retail clinic (OR=1.16, 95% CI=0.99, 1.36, p=0.07).

The last logistic model in Table 6 included state fixed effects (state effects shown in Table 8, Appendix). The number of primary care providers became a significant predictor of having a retail clinic for the first time in this model (OR=1.21, 95% CI=1.03, 1.42). Although significant in several other models, the percentage of African Americans (OR=1.06, 95% CI= 0.89, 1.25), Hispanics (OR=0.88, 95% CI= 0.68, 1.14), and adults over 65 (OR=1.33, 95% CI=0.94, 1.86) were not significant predictors of having a retail clinic once we included state fixed effects. Our interaction term remained marginally significant (OR=1.20, 95% CI=1.00, 1.44, p=0.052). Because the term was very close to being significant, we wanted to better understand how it affected our outcomes. We graphed the odds ratios for various levels of income at specific numbers of FQHCs (Figure 2).

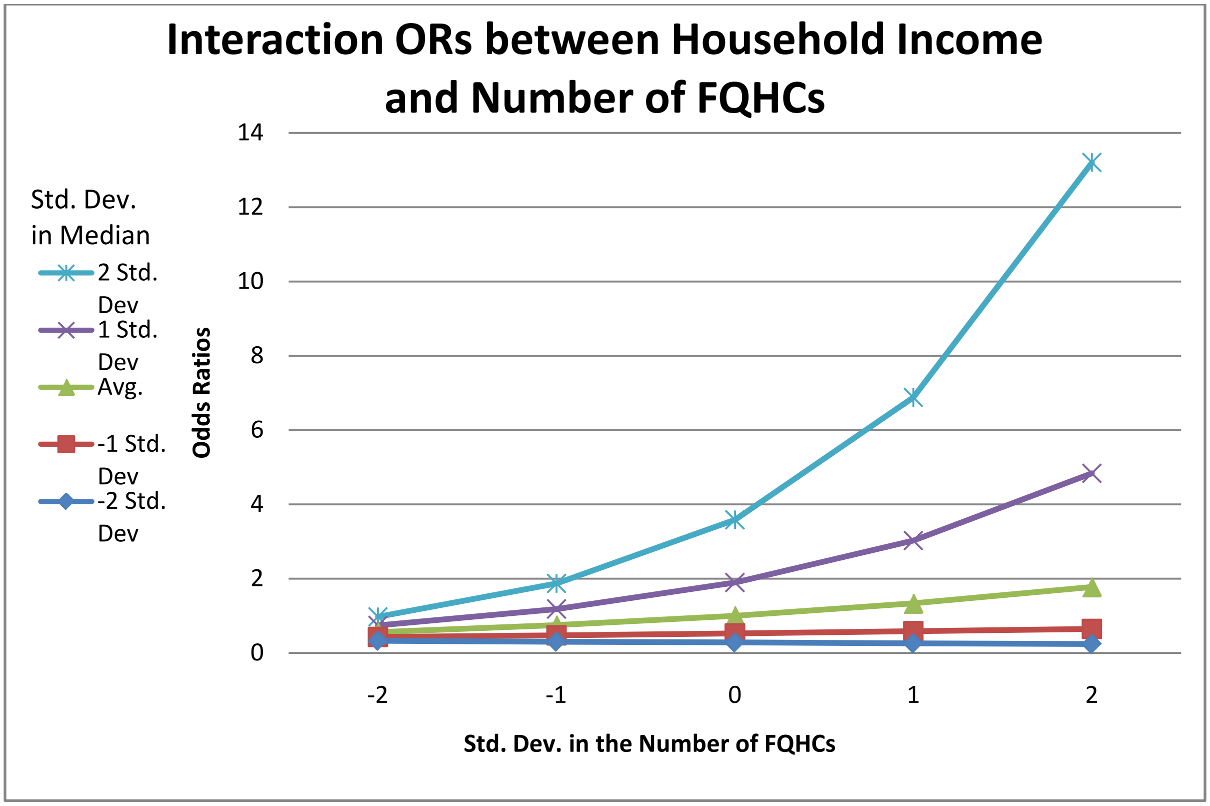

Figure 2: Interaction ORs between Household Income and Number of FQHCs

To understand which predictors played the largest role in understanding whether PCSAs have a retail clinic, we analyzed the area under the receiver/operator curve (Table 5). The results from these analyses indicated that the model containing only income and state fixed effects (Reduced model 1) accurately classified PCSAs as having a retail clinic 79.7% of the time and including the number of FQHCs (Reduced model 2) increased the accuracy to 80.5%.

Table 5: Comparison of the Accuracy between the Full and Reduced Models

	% Accurately Classified	Area under the ROC curve	Test of Area Equivalency (vs. Full Model)
Reduced Model 1	79.77%	0.77	p<.0001
Reduced Model 2	80.55%	0.80	p<.0001
Full Model	83.60%	0.86	-

Table 6: Multivariate Logistic Regression on the Probability of Having a Retail Clinic in a PCSA

# Obs.	2,309		2,309		2,309		2,309		2,309	
Variable	Model 1: Demographic Factors Only		Model 2: Urbanicity		Model 3: Health Care Infrastructure		Model 4: FQHC*Income Interaction		Model 5: State Level Fixed effects	
	Standardized Odds Ratios (95% CI)									
Age										
% 0-4	1.98***	(1.54, 2.53)	1.71***	(1.34, 2.18)	1.83***	(1.43, 2.33)	1.81***	(1.42, 2.31)	1.64***	(1.23, 2.19)
% 21-64	1.88***	(1.56, 2.27)	1.57***	(1.30, 1.88)	1.44***	(1.19, 1.75)	1.40***	(1.16, 1.70)	1.65***	(1.31, 2.07)
% 65 and Over	1.33*	(1.02, 1.71)	1.09	(0.85, 1.41)	1.59***	(1.21, 2.09)	1.57**	(1.20, 2.06)	1.33	(0.94, 1.86)
Demographics										
% Male	0.85*	(0.73, 0.98)	1.00	(0.87, 1.15)	0.84*	(0.71, 1.00)	0.84*	(0.71, 0.99)	0.66***	(0.53, 0.81)
% African American	1.13*	(1.00, 1.27)	1.04	(0.92, 1.18)	0.87*	(0.75, 1.00)	0.89	(0.77, 1.03)	1.06	(0.89, 1.25)
% Hispanic	0.95	(0.82, 1.09)	0.81**	(0.70, 0.94)	0.65***	(0.53, 0.78)	0.65***	(0.54, 0.79)	0.88	(0.68, 1.14)
Median HH Income in $10K	1.69***	(1.52, 1.89)	1.48***	(1.32, 1.66)	1.24**	(1.08, 1.41)	1.29***	(1.12, 1.49)	1.89***	(1.55, 2.30)
Urbanicity										
Metropolitan core			1.68	(0.81, 3.50)	1.56	(0.75, 3.26)	1.56	(0.74, 3.26)	1.80	(0.81, 4.02)
Metropolitan area with move to a core area			0.15***	(0.09, 0.22)	0.13***	(0.09, 0.21)	0.14***	(0.09, 0.21)	0.12***	(0.08, 0.19)
Metropolitan area			0.69	(0.30, 1.59)	0.76	(0.32, 1.80)	0.77	(0.32, 1.81)	0.64	(0.26, 1.61)
Small town			0.08*	(0.01, 0.60)	0.09*	(0.01, 0.69)	0.09*	(0.01, 0.68)	0.07*	(0.01, 0.54)
Healthcare Infrastructure										
% Uninsured					1.37***	(1.19, 1.57)	1.36***	(1.18, 1.56)	1.34*	(1.05, 1.72)
% Public Insurance					0.49***	(0.41, 0.58)	0.49***	(0.41, 0.59)	0.52***	(0.39, 0.68)
# of PCPs per 100,000 residents					1.11	(0.96, 1.29)	1.11	(0.96, 1.29)	1.21*	(1.03, 1.42)
# of FQHCs (FQHCs + look alikes)					1.29***	(1.16, 1.44)	1.38***	(1.20, 1.58)	1.33***	(1.15, 1.54)
Interaction between MHI & FQHCs							1.16 §	(0.99, 1.36)	1.20§	(1.00, 1.44)

§p <0.1, * p<.05, ** p<.001, *** p<.0001

Table 7 shows the results of our Poisson regressions predicting the number of retail clinics in a PCSA, conditional on having at least one. Repeating the same model order, our first model found that only the percentage of children aged 0-4 (IRR=1.35, 95% CI= 1.16, 1.56) and adults aged 21-64 (IRR= 1.30, 95% CI=1.16, 1.47) were significantly associated with having multiple retail clinics.

When controlling for the urbanicity of each PCSA, we found that less urban areas were much less likely to have retail clinics. Our Poisson model showed results similar to our logistic models, with less urban areas being less likely to have retail clinics. However, different RUCA codes were significant. Living in a micropolitan area reduced the expected number of retail clinics by a factor of 0.44, compared to core urban areas (95% CI= 0.21, 0.94).

When looking at our third model, which included health care infrastructure, we found that insurance status had no statistical relationship to the number of retail clinic in PCSAs with at least one clinic. However, an increase in the number of FQHCs by 1 S.D. (2.3 FQHCs) increased the predicted number of retail clinics by a factor of 1.21 (95% CI 1.16, 1.26). However, having an additional 26 primary care physicians per 100K residents, a one standard deviation increase, reduced the number of retail clinics by a factor of 0.87 (95% CI= 0.79, 0.97). The interaction term included in our fourth model was a significant predictor of having more retail clinics even before the state effects were added (IRR=1.20, 95% CI=1.25, 1.24).

Once the state fixed effects were added in model five, a number of changes took place in our model. The population percentage of children was no longer a significant predictor of having more retail clinics, while median housing income became significant (IRR=1.17, 95% CI=0.94, 1.38). Also, an increase the male portion of the population reduced the expected number of retail clinics by a factor of 0.85 (95% CI= 0.74, 0.98). Also, increasing the number of primary care physicians (IRR= 0.95, 95% CI= 0.85, 1.06) and the population percentage uninsured (IRR=0.92. 95% CI=0.80, 1.06) predicted having fewer retail clinics. Because the interaction term was significant in our count model, we developed a graph of the incidence rate ratios at the same fixed levels of income and FQHCs that we used for our logistic regression (Figure 3).

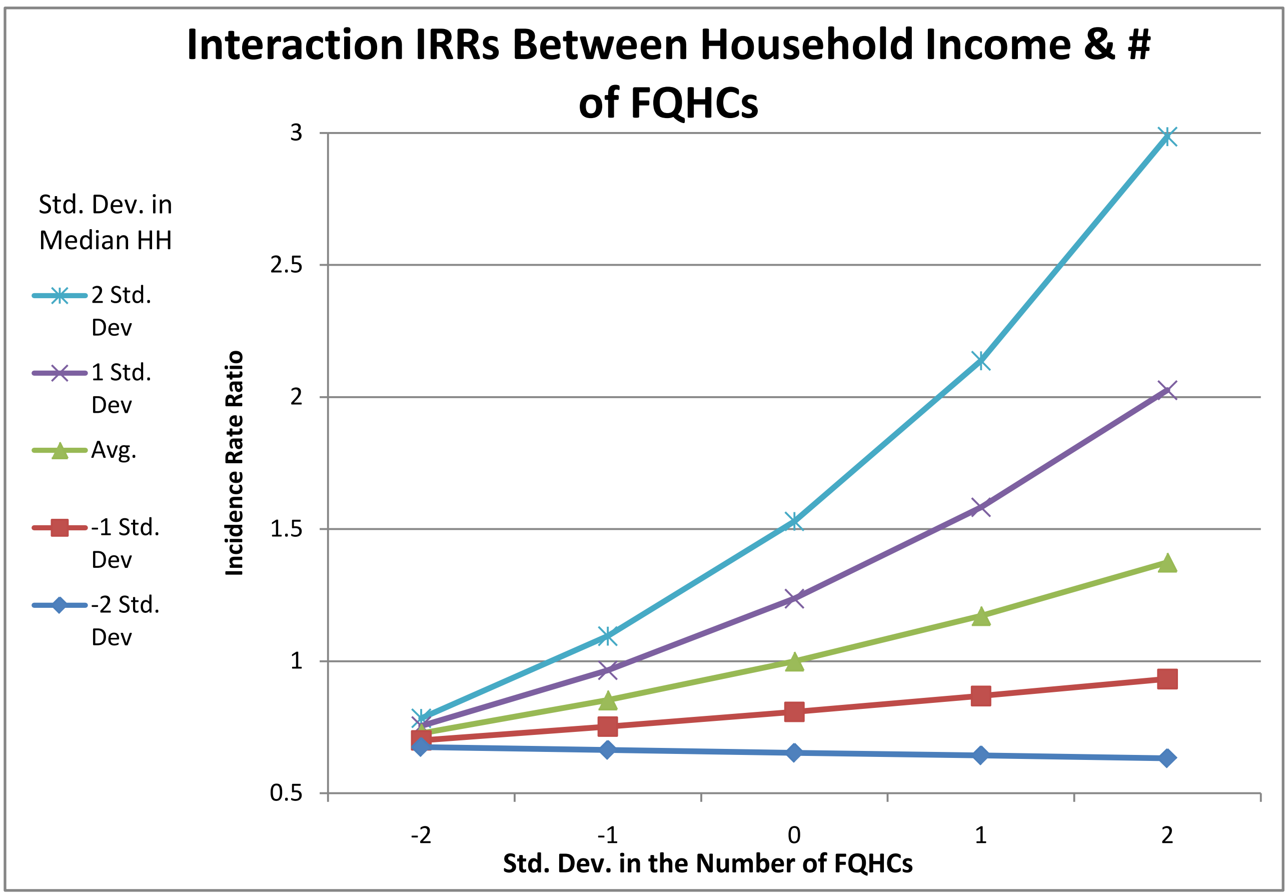

Figure 3: Interaction IRRs between Household Income and Number of FQHCs

Table 7: Multivariate Poisson Regression on the Probability of Having Multiple Retail Clinics in a PCSA

# Obs.	505		505		505		505		505	
Variable	Model 1: Demographic Factors Only		Model 2: Urbanicity		Model 3: Health Care Infrastructure		Model 4: FQHC*Income Interaction		Model 5: State Level Fixed effects	
	Standardized Incidence Rate Ratios (95% CI)									
Age										
% 0-4	1.35***	(1.16, 1.56)	1.34***	(1.16, 1.56)	1.35***	(1.16, 1.57)	1.32***	(1.13, 1.53)	1.17	(0.99, 1.38)
% 21-64	1.30***	(1.16, 1.47)	1.27***	(1.13, 1.44)	1.30***	(1.15, 1.48)	1.28***	(1.12, 1.45)	1.27***	(1.11, 1.46)
% 65 and Over	1.13	(0.97, 1.32)	1.12	(0.96, 1.30)	1.22*	(1.02, 1.46)	1.20	(1.00, 1.43)	1.07	(0.87, 1.32)
Demographics										
% Male	1.00	(0.92, 1.08)	1.00	(0.92, 1.08)	0.91*	(0.84, 0.99)	0.95	(0.87, 1.04)	0.99	(0.89, 1.10)
% African American	0.96	(0.87, 1.06)	0.94	(0.85, 1.04)	0.79***	(0.69, 0.91)	0.81**	(0.70, 0.92)	1.02	(0.87, 1.20)
% Hispanic	0.97	(0.90, 1.05)	0.96	(0.89, 1.04)	1.04	(0.95, 1.13)	1.04	(0.95, 1.14)	1.24***	(1.11, 1.38)
Median HH Income in $10K	1.00	(0.92, 1.08)	1.00	(0.92, 1.08)	0.91*	(0.84, 0.99)	0.95	(0.87, 1.04)	0.99	(0.89, 1.10)
Urbanicity										
Metropolitan core			0.86	(0.55, 1.32)	0.85	(0.54, 1.31)	0.85	(0.55, 1.31)	1.12	(0.71, 1.77)
Metropolitan area with move to a core area			0.67*	(0.48, 0.93)	0.72	(0.51, 1.01)	0.73	(0.52, 1.02)	0.69*	(0.48, 0.97)
Metropolitan area			0.44*	(0.21, 0.94)	0.53	(0.25, 1.12)	0.51	(0.24, 1.08)	0.43*	(0.20, 0.91)
Small town			0.41	(0.06, 2.94)	0.54	(0.07, 3.89)	0.53	(0.07, 3.83)	0.45	(0.06, 3.33)
Healthcare Infrastructure										
% Uninsured					1.10*	(1.02, 1.19)	1.10*	(1.01, 1.19)	0.92	(0.80, 1.06)
% Public Insurance					0.98	(0.87, 1.10)	0.99	(0.88, 1.11)	1.01	(0.83, 1.22)
# of PCPs per 100,000 residents					0.87*	(0.79, 0.97)	0.87*	(0.79, 0.97)	0.95	(0.85, 1.06)
# of FQHCs (FQHCs + look alikes)					1.21***	(1.16, 1.26)	1.20***	(1.15, 1.24)	1.17***	(1.13, 1.22)
Interaction between MHI & FQHCs							1.08**	(1.03, 1.13)	1.09**	(1.03, 1.16)

* $p<.05$, ** $p<.001$, *** $p<.0001$

Discussion

The goal of this study was to investigate the relationship among the location of retail clinics, community socio-demographic characteristics, and existing primary care resources. Consistent with our hypotheses, retail clinics locate in areas that are younger, have higher household incomes, and more working age adults. We also found a significant, positive association between the number of primary care physicians and the presence of a retail clinic within a PCSA and a positive association between the number of FQHCs and the presence of a retail clinic. Both these findings support our hypotheses. Furthermore, we found that an increase in the number of FQHCs was also associated with having more retail clinics in a given area. Also, there is an interaction between area income and the number of FQHCs that predicts having more retail clinics within an area. Our findings concerning the number of working age adults, primary care providers, and FQHCs have not previously been reported.

Comparing Key Findings to the Existing Literature

Our findings were consistent with our conceptual model and most of our hypotheses. We found a strong positive relationship between area-level household income, the percentage of residents without insurance, and the presence of a retail clinic. We found previously reported results for the population of adults between 21 and 64. Our findings that this population is positively related to the probability of having a retail clinic and the number of clinics confirms our hypotheses and is consistent with data about retail clinic usage. As expected, we found that the population percentage of minorities was not related to the presence of a retail clinic in a given area. However, the percentage of Hispanics was positively associated with having multiple retail clinics in an area, which we did not predict.

Also consistent with our expectations was the positive relationship between the number FQHCs and presence of a retail clinic. The relationship between the number of retail clinics and FQHCs fit within our framework. The positive association between the number of primary care providers and the presence of retail clinic was also expected.

While our findings were consistent with our conceptual framework, they were inconsistent with the existing literature in many places. In particular, our findings concerning the percentage of males, seniors, and Hispanics living within an area were inconsistent with findings from Rudavsky's study[1]. We found an inverse relationship between the percentage of males, which is the exactly opposite of Rudavksy's findings. We found no significant relationship between the population of adults over 65 and the presence of a retail clinic. When comparing our bivariate analyses to Pollack's results, we found that the number of children under five was strongly associated with the probability of having a retail clinic, where Pollack found no relationship. We believe that our findings are more consistent with the existing data on the top reasons for retail clinic visits.

Our findings may differ from prior studies due to several differences in methodology. First, the area of analysis for studying retail clinic location has traditionally been the census block. While this is a logical unit to analyze population characteristics, it has no direct relationship to the distribution and use of healthcare resources. PCSAs are designed to identify areas where individuals receive primary care. Additionally, Rudavsky's and Pollack's logic for using a ten minute driving distance to define the catchment area around a retail clinic is problematic because they assume that the willingness to travel to a retail clinic is similar to a grocery store.[38,39] However, others have argued that the willingness to travel to receive medical care does not resemble willingness to travel for retail goods.[21,40] Again, PCSAs are designed to reflect individuals' ability and willingness to travel to receive primary care. Another strength of our methodology over Rudavsky's is the inclusion of state level fixed effects. Retail clinics are present in only 33 states. It would also be unwise to assume that state level policies would have no impact retail clinic location. In fact, the inclusion of state fixed effects greatly improved the power of our model.

Expanding the Literature

Returning to our original question "What is the relationship between retail clinics and primary care resources," we found that retail clinics are located in areas with more primary care resources. Both the number of primary care physicians and the number of FQHCs were positively associated with a PCSA having any retail clinic. The number of FQHCs was also positively associated with having multiple retail clinics.

Targeting areas with more primary care resources makes good business sense for retail clinics. These areas have a high demand for primary care services and retail clinics should be able to attract more customers from them.

The relationship between FQHCs and retail clinics is more difficult to understand. There is a great deal of population overlap between the individuals who use retail clinics and those who visit FQHCs, as discussed earlier (Table 1). While the overlap makes it easy to understand why retail clinics would target FQHCs, it is less clear what is causing the overlap. In particular, what is causing individuals under 200% FPL to visit a retail clinic instead of an FQHC? Below 200% FPL, FQHCs offer discounted pricing on all services, something retail clinics do not do.[31] It may be the case that even with discounted prices, FQHCs still cost more than retail clinics, particularly for individuals near but not over 200% FPL. Also, it may be the case that individuals at or near 200% FPL lose a larger percentage of their overall income while waiting for services at an FQHC. Because demand for FQHC services often outstrips their capacity, this can cause long wait times to get an appointment and long waits to be seen.[41] Combining these factors could make retail clinics a very attractive substitute to individuals traditionally served by FQHCs. The interaction between the number of FQHCs and median household income was unexpected. Physicians gravitate towards areas with higher incomes, which would make an FQHC unnecessary.[1] The interaction suggests that the PCSA with a heterogeneous population in terms of economics and access to care are attractive to retail clinics, which could occur for at least two reasons. First, the high area income suggests that there is a sizable population that has a high time cost and the ability to pay for additional medical services. These individuals would most likely prefer the convenience and speed of a retail clinic. Second, the number of FQHCs suggests that there is could be a history of limited access to primary care services in an area. FQHCs do not shutdown or lose their status easily. Areas with higher income levels and more FQHCs could be a sign that wealthier individuals have moved in recently. It could also be a sign that there are disadvantaged communities within the PCSA that have a shortage of primary care providers. A retail clinic could draw enough business from the wealthier clients to remain open while attracting individuals that might rely on an FQHC for most of their care. As shown previously shown, there is some overlap in the populations that use both FQHCs and retail clinics (Table 1).

Policy Implications

Findings from our study have several policy implications. Despite their initial concerns with retail clinics, FQHCs may consider incorporating retail clinics into their resource planning or business model. First, it may be possible to open a retail style clinic under the FQHC's management. Several sites have tried this approach, both at the FQHC and within the community, and met with success.[32] Doing so would allow the clinic to provide better convenience and continuity of care for patients. FQHCs could also look for ways to improve service delivery by modeling after retail clinics. They may be able to improve the efficiency of certain procedures or develop better operating procedures. Additionally, FQHCs may find it advantageous to partner with existing retail clinics in the area. Doing so may help the retail clinic offer more appropriate referrals to patients without access to a primary care physician or insurance.

From a broader public health perspective, local officials should consider ways to encourage retail clinics to move to their area. In particular, rural areas should consider ways to encourage retail clinic growth. Rural areas often have difficulty encouraging physicians to serve the community.[42] Retail clinics may be an innovative way to expand coverage by using less skilled (and expensive) labor to achieve similar results.

While existing physicians or FQHCs may oppose the development of a retail clinic, they appear to be an effective method for improving access to care. Because retail clinics are for-profit businesses, tax incentives could be an effective method to encourage them to locate to underserved areas. Tax incentives have the added benefit of not directly increasing public spending. Because most retail clinics are within chain pharmacies, localities could also provide incentives for existing stores to expand by making permits easier to obtain or reducing fees. With many state and localities facing budget constraints, retail clinics could provide a useful solution to increasing access without increasing overall spending.

Limitations

Several study limitations are noted. First and foremost, using cross sectional data eliminates our ability to determine causality. Although we did use predictor variables from 2006 to examine factors that preceded the explosion of retail clinics in 2007, the ability to study retail clinic placement over a longer period of time would be much more informative. Unfortunately, no longitudinal data exists on retail clinics.

Another limitation was the method in which primary care service areas were calculated, which may have implications for whether or not this is the most appropriate unit of analysis to study this phenomenon. The boundaries that define a primary care service area are developed by analyzing Medicare claims data. When analyzing travel for primary care, the Medicare enrollees are not representative of other populations, which leads to significant differences in the size and shape of primary care service areas. Using Medicaid data resulted in significantly larger primary care service areas. While these data were unavailable, they may have changed our analysis. Also, primary care service areas may be too large to be used as an effective measure of access to a retail clinic. The average primary care service area is 178 square miles, which means that not all individuals will have access to a retail clinic. This could lead to population clusters influencing the overall distribution within a PCSA. It is unclear what effect this would have on our results. A third limitation affecting all research on retail clinics is the small sample size of clinics. The limited number of retail clinics poses an issue with the overall power of the study. However, because we were able to find a number of significant results, we do not consider this a serious issue.

Future Research and Data Needs

While the expansion of retail clinics has slowed, they are showing no signs of disappearing. A better understanding of how retail clinics interact with existing healthcare resources requires more research and improved data collection efforts. Nationally, more data can be collected on retail clinics and included in major data sets, including the HRSA Area Resource File and the Dartmouth Health Atlas.

Future research on retail clinics should focus on three areas. The first is to continue to refine the methods for classifying retail clinic location. A better definition of the catchment area around a retail clinic is required. This will solve the problem of either using areas that are too big or have no relationship to medical care. Second, it will allow more research into how retail clinics interact with existing public health resources.

The second need for future research is analysis on how retail clinics impact access to health care within communities. Longitudinal studies could examine how retail clinics influence a variety of healthcare measures, such as preventable hospitalizations, emergency room and primary care visits, and FQHC usage. In doing so, future research can help policy makers evaluate the impact that a retail may have on their area. It may also help justify specific policy actions designed to encourage retail clinics to locate in a specific area.

Finally, future research should also focus on obtaining better data on clinic level usage. Better data about research clinic quality and outcomes will go a long way to addressing the public's concerns. As retail clinics began to expand their services into areas such as chronic disease management, it will be critical to understand their effectiveness and who is using these services. If they prove effective, retail clinics could be a powerful tool in addressing the health issues of an aging population.

Conclusion

Retail clinics are a new and potentially innovative way to deliver basic primary care in this country. Our results show that retail clinics are located in generally more well off areas but have the potential to increase access to certain underserved populations. This thesis contributes to the existing literature in several ways. First, the multivariate model building approach allowed us to understand better the impact that each variable had on the presence and number of retail clinics in an area. Second, we found previously unreported data on the relationship between retail clinics and working age adults. Third, we identified the relationship between retail clinics and existing primary care resources. Fourth, we identified a potentially better unit of analysis for studying retail clinics. Unlike previous studies, this includes a more robust multivariate analysis. This thesis contributes a more refined understanding of retail clinic location and identifies important areas for future research.

Appendix A: Full Models with State Fixed Effects

Table 8: Full Models With State Effects Shown

Model	Logistic (OR (95%CI))	Poisson (IRR (95%CI))
# Obs.	2,309	505
Variable		
Age		
% of PCSA Population Age: 0-4	1.64*** (1.23, 2.19)	1.17 (0.99, 1.38)
% of PCSA Population Age: 21-64	1.65*** (1.31, 2.07)	1.27*** (1.11, 1.46)
% of PCSA Population Age: 65+	1.33 (0.94, 1.86)	1.07 (0.87, 1.32)
Demographics		
% Male	0.66*** (0.53, 0.81)	0.85* (0.74, 0.98)
% Black	1.06 (0.89, 1.25)	0.99 (0.89, 1.10)
% Hispanic	0.88 (0.68, 1.14)	1.02 (0.87, 1.20)
Median HH Income in $10K	1.89*** (1.55, 2.30)	1.24*** (1.11, 1.38)
Urbanicity		
Metropolitan core	1.80 (0.81, 4.02)	1.12 (0.71, 1.77)
Metropolitan area with move to a core area	0.12*** (0.08, 0.19)	0.69* (0.48, 0.97)
Metropolitan area	0.64 (0.26, 1.61)	0.43* (0.20, 0.91)
Small town	0.07* (0.01, 0.54)	0.45 (0.06, 3.33)
Healthcare Infrastructure		
% Uninsured	1.34* (1.05, 1.72)	0.92 (0.80, 1.06)
% Public Insurance	0.52*** (0.39, 0.68)	1.01 (0.83, 1.22)
# of PCPs per 100K population	1.21* (1.03, 1.42)	0.95 (0.85, 1.06)
Total # of FHQcs (FQHCs + Look Alikes)	1.33*** (1.15, 1.54)	1.17*** (1.13, 1.22)
Interaction between MHI & FQHCs	1.20 (1.00, 1.44)	1.09** (1.03, 1.16)
State Effects		
Arizona	3.76* (1.21, 11.68)	1.20 (0.81, 1.77)
California	0.12*** (0.05, 0.26)	0.32*** (0.21, 0.48)
Colorado	0.33 (0.10, 1.04)	0.57* (0.35, 0.91)
Connecticut	0.06*** (0.02, 0.18)	0.3*** (0.15, 0.60)
Washington, D.C.	0.05* (0.00, 0.63)	0.19 (0.02, 1.51)
Delaware	0.14* (0.02, 0.92)	0.31 (0.07, 1.30)
Georgia	0.24** (0.09, 0.63)	1.14 (0.78, 1.66)
Illinois	0.33** (0.15, 0.73)	0.49*** (0.34, 0.70)
Indiana	0.36* (0.15, 0.87)	0.75 (0.48, 1.15)
Kansas	0.75 (0.20, 2.71)	0.74 (0.42, 1.30)
Kentucky	0.60 (0.19, 1.90)	1.12 (0.69, 1.83)
Louisiana	0.11*** (0.03, 0.35)	0.41 (0.16, 1.03)
Massachusetts	0.07*** (0.03, 0.20)	0.30*** (0.17, 0.54)
Maryland	0.1*** (0.04, 0.29)	0.36*** (0.21, 0.61)
Michigan	0.11*** (0.04, 0.35)	0.46* (0.23, 0.93)
Minnesota	0.60 (0.18, 1.96)	0.61 (0.36, 1.03)

Missouri	1.21	(0.43, 3.36)	0.85	(0.55, 1.32)
Mississippi	0.04**	(0.00, 0.32)	0.71	(0.17, 2.92)
North Carolina	0.17***	(0.07, 0.43)	0.66	(0.41, 1.03)
New Jersey	0.03***	(0.01, 0.07)	0.36***	(0.22, 0.59)
Nevada	0.30	(0.06, 1.47)	1.62	(0.98, 2.67)
New York	0.02***	(0.01, 0.06)	0.33**	(0.16, 0.70)
Ohio	0.36*	(0.15, 0.83)	0.46***	(0.30, 0.72)
Oklahoma	0.09***	(0.02, 0.36)	0.36	(0.11, 1.15)
Pennsylvania	0.25**	(0.11, 0.58)	0.47**	(0.30, 0.75)
Rhode Island	0.26	(0.04, 1.54)	0.25	(0.06, 1.09)
South Carolina	0.14***	(0.05, 0.43)	0.62	(0.32, 1.19)
Tennessee	1.15	(0.43, 3.09)	1.20	(0.80, 1.80)
Texas	0.15***	(0.07, 0.31)	0.71*	(0.51, 0.98)
Virginia	0.06***	(0.02, 0.16)	0.35***	(0.20, 0.61)
Wisconsin	0.87	(0.31, 2.42)	0.71	(0.43, 1.18)
West Virginia	0.06**	(0.01, 0.48)	0.65	(0.09, 4.79)

* p<.05, ** p<.001, *** p<.0001

Appendix B: Sample PCSA Development

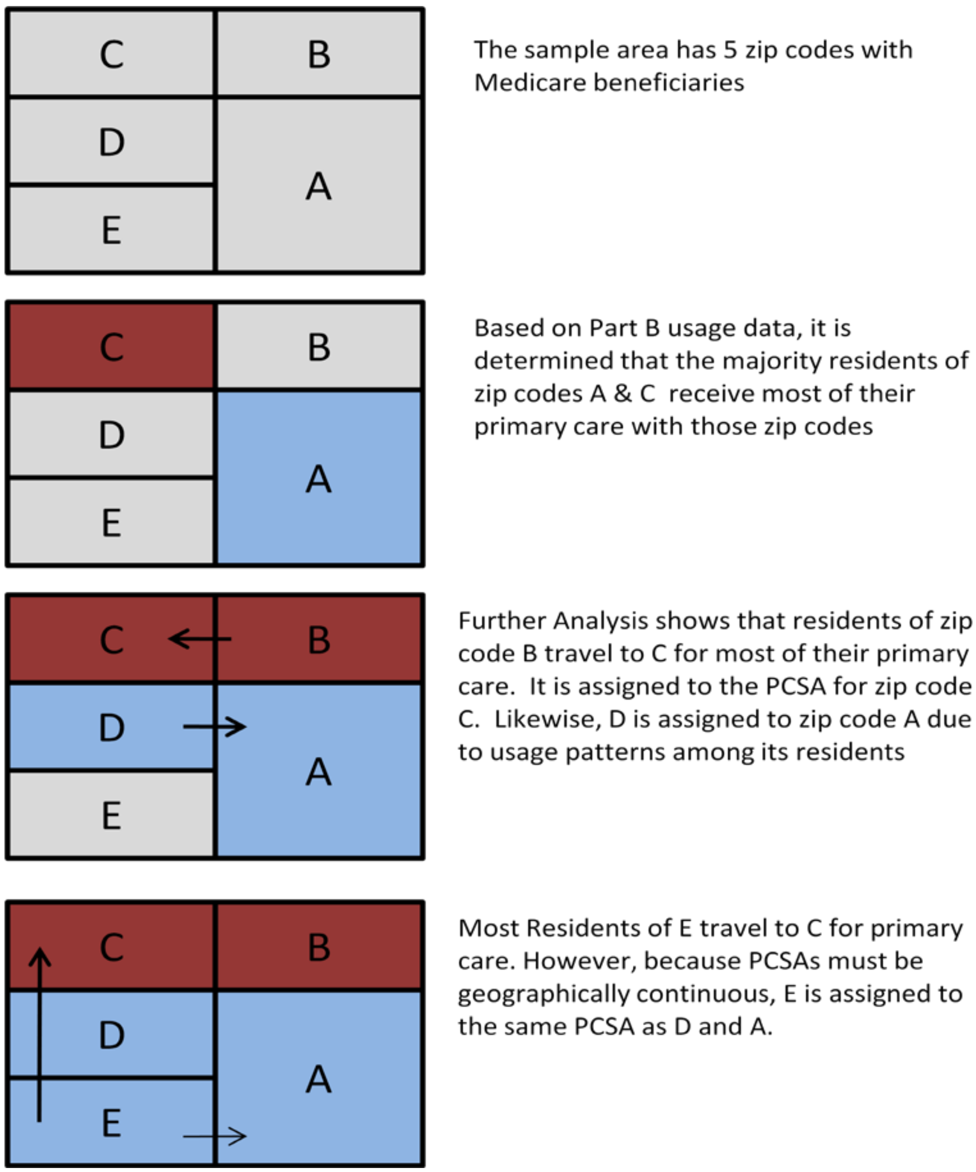

Figure 4: PCSA Development Example

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