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The Spatio-Temporal Impact of Urgent Care Clinics on Physician and ED Use

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ABSTRACT

The unsustainable trend in healthcare costs has led to efforts to shift some healthcare services to appropriate lower cost sites of care. In North Carolina, the expansion of urgent care clinics introduces the possibility that non-emergent and non-life threatening conditions can be treated at a less intensive setting. Blue Cross and Blue Shield of North Carolina (BCBSNC) conducted a longitudinal study of density of urgent care clinics, primary care providers, and emergency departments, and the differences in how patients access care near those locations. This paper focuses on several analytic techniques that were considered for the analysis. The model needed to account for the complex relationship between the changes in the population (including health conditions and health insurance benefits) over time and the changes in the types of services offered by healthcare providers proximal to them. Results for the chosen methodology are discussed.

INTRODUCTION

The urgent care market in North Carolina is rapidly expanding but little is known about how these services are used. This paper presents an initial attempt to understand urgent care utilization trends in comparison to utilization trends for other types of care. Our primary research question is whether new urgent care clinics are utilized as substitutes for emergency department (ED) and primary care or whether they are being used in addition to ED and primary care services. We begin with a discussion of the complexities of modeling healthcare utilization and touch on preliminary findings. We then discuss potential approaches including which SAS® procedures could be used with each approach.

MODELING HEALTHCARE UTILIZATION

Healthcare utilization is determined by factors that drive both patient and provider utilization as illustrated in Figure 1. On the provider side, the treatment a provider recommends to a patient is influenced by the individual provider's education and training as well as practice- and system-level characteristics such as marketing services, practice size, and practice and system resources. A provider's quality and competence, along with their individual treatment preferences and their insurance contract and fee schedule, all influence the ultimate provider treatment decision. A provider's treatment decision often may not be the ultimate outcome; patients are increasingly weighing in on the treatments they receive.

On the patient side, a patient may make treatment decisions that are influenced by their socio-economic status, environment, and underlying genetic risk. These same factors help to determine a patient's illness burden as well as their general health behaviors and lifestyle choices, which feed back into decisions about appropriate treatment. Treatment decisions are also affected by an insurance plan member's health benefit richness and plan structure.

An insurance company has two levers to change utilization within this framework: member benefit design and provider contracts. The use of these levers to promote high value and low cost utilization is known as value-based benefit design. The goal of this type of benefit design is to maintain or increase quality while reducing costs. This can be done through using benefits to influence patient decisions about appropriate site of service (by varying copays for different sites of service), implementing prior authorization processes, using step benefit plans to discourage frequently used services that may not provide high value, and contracting with designated providers to steer patients towards high value care.

Urgent care has the potential to be a high value service if it steers patients away from inappropriate ED utilization. Across the entire BCBSNC population, nearly 35% of ED visits from October 2013 to September 2014 are considered potentially inappropriate, as determined by the NYU algorithm for classifying ED utilization (NYU Wagner 2015). These visits could be potentially appropriately treated at an alternate site of care. Patient cost-sharing at an alternate site such as primary care, urgent care, and convenience care is much lower than at the ED.

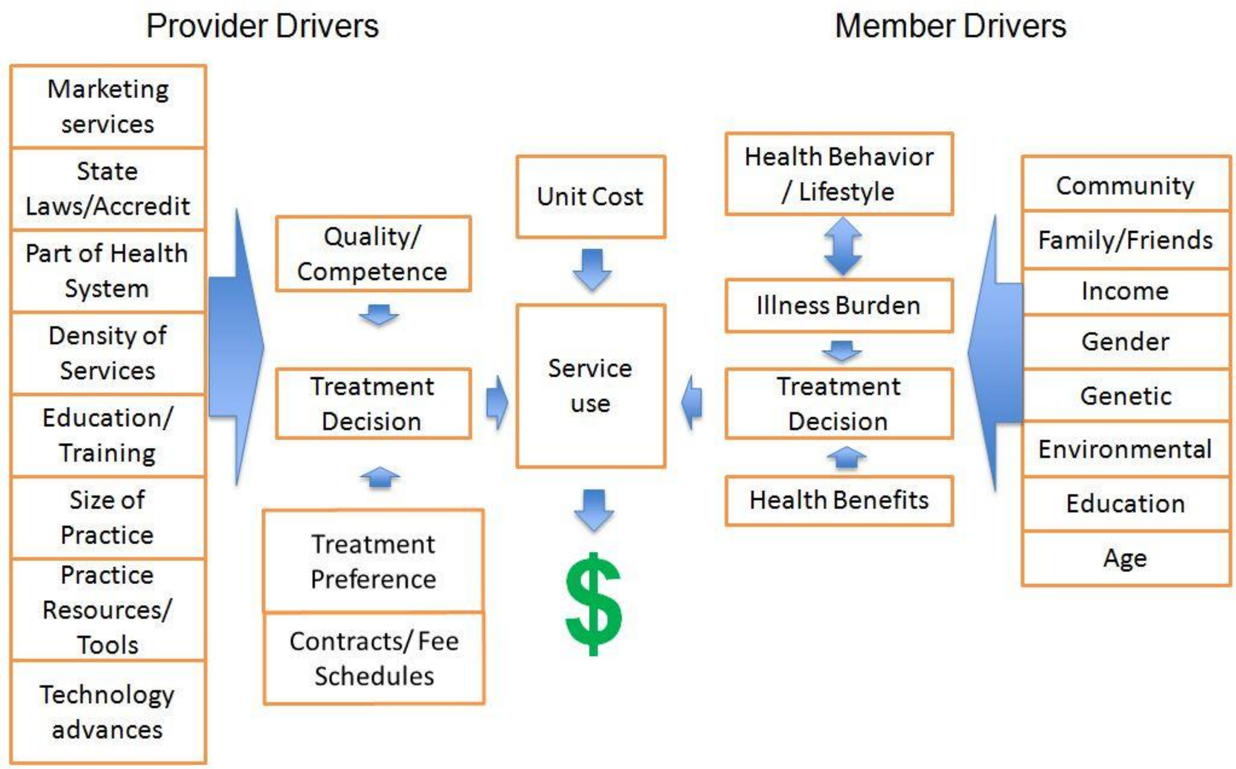

Figure 1. Modeling Health Services

PRELIMINARY ANALYSIS

There has been a steady increase in urgent care locations in North Carolina over the past 10 years, with the number of urgent care clinics nearly doubling between January 2010 and May 2014. Many of the newer locations are in smaller metropolitan areas and away from the large population centers like Raleigh, Charlotte, and Asheville. In the study time period, 75% of urgent care visits among BCBSNC members were for dermatologic conditions, minor orthopedic conditions (sprains, strains, etc.), and other minor acute episodes. These types of visits suggest that urgent care may not be replacing the ED for serious medical conditions nor is it seriously impacting care coordination with the patient's primary care physician. We sought to answer whether the increase in urgent care clinics in the state is driving care away from more appropriate settings, filling in a gap where there are shortages in physician supply, or creating demand for urgent care services.

Our first approach to determine what effect urgent care clinics were having on utilization was to create some simple charts displaying ED, urgent care, and primary care utilization over time. We selected approximately 20 new and established urgent care markets to compare. Without fail, we saw flat trends in all three types of utilization in the established urgent care markets. In the new markets, however, we saw a doubling in urgent care utilization that occurred in the months after a new urgent care clinic opened. This new utilization rate was sustained over time and did not appear to be offset by any decreases in ED or primary care utilization. This led us to examine utilization and location data in a more explicit geographic context.

Location and utilization maps created in Microsoft MapPoint 2010 did not yield intuitive results. We mapped changes in urgent care utilization at the ZIP code level between January 2010 and May 2014 and compared these rates to the locations of newly opened urgent care clinics. We did not see clear associations between a newly opened urgent care clinic and utilization, however, these maps were not dynamic, and periodic snapshots of utilization may not be the most effective way to examine the data.

Additionally, it is particularly difficult to detect changing utilization patterns related to new openings in dense markets where patients have many options for where to seek care. These preliminary analyses led us to pursue more a more advanced approach.

Any approach we considered must be able to address the following issues:

- Alternate sites of care are not available in some geographic areas; not everyone has access to the same services. Additionally, access will vary over time as urgent care locations open and close over time and as members relocate within the state.
- Member cost sharing varies across members and time.
- The data are hierarchical in nature; patients are part of family units and communities, and physicians are part of practices and health systems.
- Members can have multiple observations over time; they could use the same or different services over the course of the entire study or a single time period.
- The need for urgent care services can vary seasonally or with changes in membership. We also expect to see variations in utilization as the illness burden of the population changes over time.
- Provider density may create economic pressure for providers to compete, perhaps creating demand for utilization. Patients may have more choices in dense areas and choose care differently than patients in less dense areas.

Although claims and provider data can help control for the issues addressed above, there are several utilization drivers that cannot be explained by claims data alone. Most importantly, we lack information about a patient's decision to seek care. We don't know when they choose not to seek care or what factors they consider when making a care decision. Awareness of services and personal sense of urgency about medical issues will play a role in care seeking that we will not be able to measure.

METHODS CONSIDERED

We considered a number of modeling options to address the complexity of the problem. The main options are discussed below along with potential advantages and drawbacks.

SMALL AREA VARIATION

Small area variation is an early spatial analysis method that gained popularity in the 1950s. This research seeks to determine whether there is variation in health care utilization across areas and to identify the factors associated with any variance. It has been used in the past to analyze hospital admissions, inpatient length of stay, office visits, and mortality (Paul-Shaheen 1987). On the surface this appears to address our research question of what drives the differences in urgent care utilization across the state. However, under this approach, individuals are associated with a service area and the service area is considered the unit of observation rather than the individual or the encounter. There are several drawbacks to this approach. First, we have no predefined areas of interest. Patients commonly cross ZIP Codes, counties, and metropolitan statistical areas to seek care. The region served by an ED may be significantly broader than the region served by an urgent care or primary care office. Second, by aggregating encounters to the area level we lose all the richness of our claims-level data. We moved on to consider more advanced spatial analysis techniques.

SPATIAL REGRESSION

A spatial regression approach can be used to consider how the characteristics of an individual interact with the characteristics of the health care system and physical environment to affect behavior. Individuals tend to behave like individuals in their community both due to demographic factors and cultural norms and due to similar choice sets of providers, transportation systems, and distance to facilities (Khan 1994). This methodology has been used to examine elderly access to primary care services (Mobley 2006), the diffusion of endoscopy (Mobley 2011), and hospitalization rates for low back problems (Joines 2003). A spatial regression approach is appealing because we know that patients in the same area face similar choice sets when deciding where to seek care and often have similar sets of cultural values that may determine their attitude towards seeking care. PROC MIXED and PROC GLIMMIX in SAS® can both be used for spatial regression, however, the complexity of our model with hierarchical and temporal considerations required more flexibility than spatial regression techniques could currently offer.

MULTINOMIAL MODEL

Multinomial models are used to model a categorical dependent variable. These models include multinomial logit models and conditional logit models, the difference being that conditional logit models make full use of explanatory variables on the selected option as well as all other potential choices whereas the multinomial model uses explanatory variables related only to the selected option (Cameron 2009). We would model whether an individual sought care at an ED, urgent care, or primary care clinic. This approach is obviously appealing, as we have data on all options a patient faces as well as the characteristics of each option (for example, the distance to each site of care and the out-of-pocket cost likely to be faced at each site of care). A conditional logistic approach would allow us to estimate the effect of a change in distance to one type of care on the demand for the other two types of care. This type of modeling can be handled in PROC MDC in SAS/ETS®.

If we assumed that urgent care clinics serve only as substitute sites of care then this model would allow us to examine the factors that influence trade-offs between each type of care. However, the spikes in urgent care utilization without offsetting drops in ED and primary care utilization that we see when a new urgent care opens indicate that urgent care may be an additional site of care rather than a substitute site of care. In order to model this potential increase in demand for care with a multinomial model we would need information on all the occasions where a patient chooses not to seek care. We would expect to see some of the no-care decisions shifting to urgent care decisions as urgent care becomes more accessible.

LIMITED DEPENDENT VARIABLE MODEL

After ruling out a number of approaches, we decided to proceed with exploration of limited dependent variable models. These models would allow us to estimate utilization of a particular type of care during a given period. The question then becomes what form the dependent variable should take. We examined the distribution of visits to each site of care to determine whether a linear, count, zero-inflated count, or logistic model would be most appropriate. ED visits were the most rare of the three visit types. In a given 6-month time window, more than 97% of the sample did not have a visit. Less than 0.5% had more than two visits. Linear and count models were discarded on the basis of visit distribution. We first attempted a zero-inflated negative binomial model using PROC GENMOD but the model failed to converge. We then oversampled events and ran the models using weights but continued to have convergence issues. For ease of implementation and interpretation we selected a logistic model using PROC GENMOD as the best fit for the data.

MODELING METHODOLOGY

We included all commercial members with at least 12 months of continuous enrollment between January 2010 and May 2014. Each member's enrolled months were divided into 6-month intervals and we measured utilization within each interval. Due to timing of the data pull we were not able to include any new Affordable Care Act enrollees in the sample. Many of the members who joined in response to the Affordable Care Act may be new to insurance, and from our experience with these new enrollees we have seen that they access care differently than members who have insurance experience. This limits the application of our findings to members with plans existing prior to January 1, 2014.

Each member was required to have at least two complete consecutive time periods of data because the observation for a given period incorporated utilization data from the previous period. Members with cancer, end stage renal disease, HIV/AIDS, pregnancy, and sickle cell anemia were excluded due to concerns about determining appropriate place of service.

The final dataset contained more than 10 million observations. We were not able to implement a model of that size in our SAS® system, so we oversampled observations that contained ED or urgent care visits to reduce the dataset to a more manageable 2 million observations. In the reduced dataset, 13% of members visited an ED, 18% of members visited urgent care, 30% of members visited primary care, and

51% of members received no service in a given time period. Members could utilize multiple types of care and each type of care was modeled separately.

The main dependent variables of interest in the models were the distance to each type of care. All three distance measures were included in each model so that we could estimate the effect of decreasing distance to urgent care on each type of utilization. We also controlled for the cost burden of each type of care, whether the member had a high deductible health plan, whether the member was a member of a self-funded group, median income at the Census tract level, illness burden, prior urgent care, ED, or primary care utilization (depending on the model), and the density of primary care providers in the county. With the exception of illness burden and prior utilization, all measures were captured at the beginning of each time period.

We built separate models looking at care utilization for all conditions and care utilization for conditions commonly treated at urgent care clinics. These included dermatologic conditions, minor orthopedic conditions, minor wounds, and acute ear, nose, and throat conditions.

We used the REPEATED statement in PROC GENMOD to cluster observations at the member and subscriber (i.e. household) level. This helped to control for the correlation of observations for a single individual across time and for the correlation of observations across members living in the same family unit. Unfortunately, our provider-health system association data is incomplete historically so we were unable to account for clustering on the provider side.

Our goal was to evaluate the differences in predicted likelihood of different types of visits at current distances to urgent care compared to the predicted likelihood of different types of visits if urgent care clinics were to be located one mile closer. To generate these predictions we created a copy of the dataset where every member was one mile closer to urgent care. We set the outcome variables of these copy observations to missing so that the model would not use them in creating estimates. We unioned the original dataset and the copy and ran the models on this combined dataset. We then used an output statement to generate predicted probabilities for all observations in the dataset, whether they were used in the model or not. We used bootstrapping to generate confidence intervals around these predicted probabilities.

RESULTS

The results presented here are for the subset of visits commonly seen at urgent care clinics. The set of models looking at all conditions had similar results but the effects were diluted in the all condition models. Additionally, we are presenting the results for the most recent 12 months of data (June 2013 – May 2014) as this is the time period in which the effects of urgent care location are the strongest. In all models, nearly every included variable was a significant predictor of utilization. Coefficients were in the expected direction and our focus in model interpretation is on changes in predicted utilization.

Table 1 shows the predicted change in utilization of each type of service for a one mile decrease in distance to an urgent care clinic.

Service	**Change in utilization per 10,000 members over 6 months**
ED	-4.2
Urgent Care	38.5
Primary Care	-9.2

Table 1. Effect of urgent care distance change.

We see that improved geographic access to urgent care increases utilization by nearly 40 visits per 10,000 members over a 6 month period. This increase is not fully offset by decreases in ED or primary care. All results are significantly different from one another with p-values less than 0.0001.

CONCLUSION

Our statistical model results confirm what our exploratory analysis suggested: as an urgent care clinic moves to an area, the utilization increase in urgent care services is not offset by decreases in other types of care. We were able to control for the density of providers in an area, but density may not reflect the true availability of services. Our data do not include time of day a service was sought, and it could be that the increase in urgent care services are occurring after business hours when primary care offices are closed. There may also be strong regional effects that were not captured in our data. We recommend that future analysis on the topic continues to explore the utilization of spatial regression techniques as these utilities evolve in SAS® and other statistical programs.

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