ABSTRACT

The overall objective of this research is to perform an analysis of healthcare utilization both before and after government mandated healthcare reform under the Patient Protection and Affordable Care Act (PPACA) in states with state-based exchanges compared to those with federal exchanges. In this initial study, we perform a baseline analysis by state for the years 2012 and 2013 using data from the Current Population Survey (U.S. Census). We propose a causal model, Anderson’s Phase-2 Model of Health Services Utilization, to frame the study.

KEYWORDS: Health Care, Data Analytics

INTRODUCTION

The Patient Protection and Affordable Care Act (PPACA) requires most individuals to obtain health insurance and provides subsidies and supports to enable them to do so. In light of this legislation, it is of significant policy importance to observe and understand the impact of expansions in health insurance coverage. In order to evaluate implementation of the ACA, a pre-reform and post-reform rigorous study design and methods will be utilized to report the degree of success of the program as accurately as possible. A successful program evaluation will include SMART objectives: i.e. Specific, Measurable, Achievable, Relevant, and Timely. Our objectives include measuring the difference in the uninsured/insured utilization prior to implementation of the program, as well as measuring the overall difference in individual access and utilization following program implementation. We will include comparisons over multiple time periods as well as comparisons across multiple selected state populations. We seek to document changes in: (1) Who are the uninsured? (2) How much change in insurance coverage, patient outcomes and utilization patterns is achieved in different states representing different PPACA implementation strategies? (3) Where do the largest changes occur? (4) When do the changes occur.

Over a multiple year time frame, we plan to include both an evaluation of outcomes and of process. Outcome evaluation will assess whether implementation of the PPACA actually
produces changes in people’s insurance status, access to care, and utilization of the health care delivery system. A process evaluation will seek to describe and/or understand how the program is implemented, and the factors including health system organization and resources that influence implementation either positively or negatively. We will seek to develop an in-depth understanding of the major issues that facilitate or hinder achievement of the success of the program. In this presentation, we will present a review of some relevant literature, discuss a brief background of the PPACA goals, our data sources, and the methods we will use to collect baseline and follow up data. We intend to combine our outcomes evaluation with official state reporting as well as media activity to gain insight into environmental and political influences.

BACKGROUND

The Patient Protection and Affordable Care Act became a law on March 23, 2010 when it was signed by President Barrack Obama. The primary objective of the law, and its subsequent legislation, is to improve the health care delivery system by expanding coverage and controlling health care costs. Provisions of the law extend Medicaid to all individuals and families earning less than 133% of the poverty level and make available income related subsidies to uninsured Americans without access to employer based insurance in order to purchase coverage in newly created exchanges.

A key component of the healthcare reform initiative is the healthcare exchanges. Under the law, each state was to establish a healthcare exchange to facilitate the insurance enrollment process by the end of 2012. States were given the option of creating and administering their own health exchange, called a state-based exchange, or partnering with another state or the federal government, called a state- partnership exchange (CMS.gov). However, a number of states such as Arkansas and Nevada were unable to develop either type of exchange by the date required, and other states such as Texas were unwilling to develop an exchange. In these cases, the exchanges were developed by the federal government (Kliff, 2013).

Before the implementation of the exchanges there were a number of debates concerning what impact would be seen for a state administered exchange vs a federal administered exchange. One debate revolved around the price of premiums. One supposition was that state exchanges would have higher premiums than federal exchanges. However, as can be seen from the data of a recent analysis on premiums (Table 1), there does not appear to be a significant difference between state and federal exchanges (Archenbault, 2013).

<table>
<thead>
<tr>
<th>Table 1. Average Monthly Premium [Low-Cost Bronze Plan 2014]</th>
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<tbody>
<tr>
<td>National Average</td>
</tr>
<tr>
<td>State-based Exchange</td>
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<tr>
<td>Federal Exchange</td>
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<tr>
<td>Partnership Exchange</td>
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Another point that has been discussed when comparing state and federally administered exchanges concerns the amount of control that the states would have over healthcare issues, particularly what impact there would be upon that state’s uninsured population. That issue has not been resolved.
LITERATURE REVIEW

Below, we provide a synthesis of the current research both health care and data analytics as it applies to our research.

Literature Review of Health Care

There is a substantial literature to support the objective that expanding publically subsidized health insurance leads to improved access and utilization. (Starfield, 2005; Berdahl, 2013; Chou, 2014; Courtemanche, 2014). These studies evaluate an established setting from which policy makers can make inferences re potential patterns of care among the uninsured.

The near-universal expansion of health insurance coverage in Massachusetts offers an unique opportunity to examine the impact of a change in health insurance coverage to a large number of uninsured. The insurance coverage provisions of the PPACA are modeled on the Massachusetts health care reform of April, 2006, titled “An Act Providing Access to Affordable, Quality, Accountable Health Care”. Massachusetts is in its eighth year of this reform initiative which includes many components of the federal legislation: Medicaid expansion, insurance market reforms, establishment of a health insurance exchange, income-related premium subsidies for newly created private health plans, and individual and employer mandates. For these reasons, analyzing the effects of the Massachusetts experience provides insight into potential benefits and challenges of the federal PPACA. The literature includes many studies that have analyzed this experience. Long, Stockely and Dahlen (2014) find that uninsurance rates have decreased, access to care is strong and improvements in the effectiveness of health care delivery have been achieved. Kolstad and Kowalski (2012) show that Massachusetts health reform reduced levels of uninsurance among the inpatient hospital population by 36%. The number of inpatient admissions originating from the ER decreased, and some evidence was found suggesting an increase in preventative services, and an improvement in quality of care. Miller (2012) finds non urgent emergency room visits are reduced consistent with the newly insured having access to care in alternative settings. Several researchers have found a reduction in racial disparities after health insurance expansion for access to inpatient surgical procedures (Loehrer, et al 2013; Hanchate, et.al. 2012, Albert, et al 2014); and access to dental care (Nasseh, 2013).

In addition to the Massachusetts experience, other recent reform initiatives have been reported in the literature describing the use patterns of the newly insured. Dow (2013) describes a 13 year experience of the Virginia Coordinated Care program that provides primary and specialty care services to a low income, uninsured, urban population. Bradley et al (2011) studying the same insurance expansion experience from the Virginia program concluded previously uninsured people have fewer emergency room visits and lower costs after receiving insurance coverage.

Landmark health reform measures are beginning in 2014. Policy makers and program administrators must deal with the effects of expanding access for the uninsured and how adoption of these measures should be shaped by care delivery systems. Several researchers have explored the implications of the capacity of the care system to absorb the expected demand of new patients. (Bodenheimer, 2010; Hofer, 2011; Sommers, 2012; Abraham, 2014; Rhodes, 2014). Our research will add to the literature by reporting the overall impact of the
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PPACA on insurance coverage; access and utilization. We will look initially at the Year 1 early experience and plan to follow our analyses through multiple future years of implementation.

Literature Review of Data Analytics

Data analytics is certainly not new. Researchers have developed improved methods of analyzing data along with associated technologies for data storage and access in parallel with the growth in computing power (Gantz and Reinsel, 2011). However, more recently, the term ‘data analytics’ has become associated with the term ‘big data’ to indicate the analysis of extremely large datasets that are beyond the capabilities of most organizations to store or analyze for accurate and timely decision making (Kulkarni, 2013). New technologies have enabled affordable storage of these massive datasets, development of cloud architectures for access, capture of diverse types of data, and new analysis tools and techniques accessible to a larger group of users (Gantz and Reinsel, 2011). Studies have shown that innovative uses of ‘big data’ analytics can be directly related to value generation (Manyika et al., 2011; Heudecker et al., 2013; Davenport and Harris, 2007; Davenport et al., 2010; Davenport and Dyché, 2013). Related to healthcare, the McKinsey Global Institute reported that US healthcare could realize $300 billion in efficiency and quality value (Manyika et al., 2011) with the use of big data analytics.

Healthcare, similar to other fields, shows that “much of what’s needed for predictive analytics is already available … what’s changing is the ability to capture and store this data, and then apply new tools and algorithms to analyze the data” (Barlow, 2013). Data analytics combined with healthcare big data can provide applications as diverse as detecting fraud and waste (Srinivasan and Arunasalam, 2013) to individualized, real-time patient monitoring and care through wearable, implantable, mobile devices (Hamilton, 2013). In this study, we will analyze ‘big data’ to determine changes in utilization of health are.

THEORETICAL FRAMEWORK/MODEL

This research proposes the following causal model to represent the impacts of the PPACA; that expansion of health insurance options to the previously uninsured will result in both an increase in utilization of health services and a decrease in the uninsured population. In order to investigate the above model, the research will employ Anderson’s Phase-2 Model of Health Services Utilization (Anderson, 1995), as shown in Figure 1.

Figure 1. Anderson’s Phase-2 Model of Health Services Utilization
Economic models of the demand for health care suggest that an individual's use of medical services depends on (a) Population Characteristics and (b) the Health Care System, all of which influence the price of care for the uninsured. Population Characteristics can be thought of as those characteristics that predispose, enable or suggest need for individual use of health services (Andersen, 2008). Predisposing factors include characteristics such as demographic factors (i.e., age, sex), education, ethnicity, and family status. Enabling factors include financial characteristics (i.e., income, wealth, price of health service), and organizational factors such as regular source of care, if any, along with the convenience of health services and providers. Need factors include both perceived need, how people view their own health and evaluated need concerning health status (Babitsch et al., 2012). The health care system characteristics are included to explicitly account for the importance of health policy along with health care resources and their organization as factors in determining the use of health services (Anderson, 1995). For this study, the health policy will be political decisions made regarding the implementation of the PPACA, such as whether states have elected to expand state Medicaid programs. Organization factors will include the type of exchange (federal/state), the availability of different types of health insurance plans and the formation of health care delivery networks.

We hypothesize the determinants of a health care marketplace are likely to be important factors related to the utilization of health services for the uninsured. Aspects of the type of insurance coverage in a specific state of the local population are very likely to influence the costs of care for the uninsured and, therefore, health services utilization. In addition, the economic model of the demand for health care relates consumer satisfaction to overall accessibility issues, quality and the costs of health care.

Our analysis of population characteristics will include demographic and enabling controls—education (high school degree, some college, and college degree; less than high school as reference group), household structure (marital status and family size), gender, age (18–24, 25–34, 45–64 years; 35–44 years as reference group), gender–age interactions, race (non-Hispanic black, Hispanic; other nonwhite; non-Hispanic white as reference group), employment status, family income as a percentage of the federal poverty line (FPL) (100–200, 200–400, over 400 percent; <100 percent as reference group), and regular source of health care. We will also consider the type and number of various health care locations. In particular interest is the availability of primary care physicians.

We will construct indicators for the presence or absence of 4 chronic preventative primary care conditions (i.e. hypertension, diabetes, obesity, and asthma). Our study will compare (1) the
accessibility, and (2) the predictors of health care services utilization among the previously uninsured populations given the implementation of the PPACA. Using ANOVA procedures in comparing the means for the utilization of primary care physicians, hospitals and dentists, six hypotheses will be tested in the study.

First, we hypothesize that the population of previously uninsured will have greater access to health care services (physicians, hospitals, and dentists) during the first two years of implementation of PPACA compared to two years prior to implementation. Secondly, we hypothesize that, controlling for health status and insurance coverage (any private insurance, private insurance, and Medicaid) the previously uninsured will have equal access to health care services (physicians, hospitals, and dentists) compared to those insured pre and post PPACA.

A third hypothesis controlling for health status and insurance coverage (any insurance, private insurance, any public insurance, and Medicaid) the previously uninsured enrolled in a Federal Exchange will have equal access to health care services (physicians, hospitals, and dentists) compared to those previously uninsured enrolled in a State Exchange.

Hypotheses four through six will compare the utilization of physicians, hospitals, and dentists, among previously insured and uninsured controlling for the following variables sequentially: health status and poverty status; health status and having a primary care provider; and health status and employment status, in that order.

METHODOLOGY AND PRELIMINARY RESEARCH

The objective of this research is to perform an analysis of healthcare utilization both before and after government mandated healthcare reform. The goal is to identify changes in patterns and rates of utilization as the new healthcare exchanges become operative. The study will also examine if there are any differences in utilization rates and patterns in states with state-based exchanges and those with federal exchanges. The study begins by performing a baseline analysis for the years 2012 and 2013. As subsequent data becomes available, that will also be analyzed. The goal is to compare the two year period prior to government mandated healthcare (2012-2013) and the following two years (2014-2015). The study will consider patient demographics such as age, sex, race, ethnicity and the type of insurance.

The data to be used in the study will be derived from data obtained from Inovalon, Incorporated. Inovalon uses big data analytics within the health care market to facilitate “data-driven improvements in care, quality, efficiency and financial performance” (Inovalon Inc., 2013). Their proprietary big data sets contain data from “more than 540,000 physicians, 220,000 clinical facilities, and more than 140 million Americans” (Inovalon Inc.).

The first step in the evaluation was to select those states to be included. The goal was to obtain a comparable set of states that were running their own exchanges with those that had a federal exchange. Using data from the Current Population Survey (U.S. Census), the number of insured and uninsured was obtained by state. Within the insured population, statistics were also obtained on the percentage of the population that had public vs private insurance, as well as the number of primary care physicians within the state (United Health Foundation, 2012). Using this data, a total of 13 candidate states were selected for the analysis, as shown in Table 2. The ultimate goal of this effort is to determine 2-3 states, in each of the categories to study.
longitudinally. These states should be as similar as possible based on the statistics described above.

### Table 2: State Comparison 2013

<table>
<thead>
<tr>
<th>State</th>
<th>Exchange type</th>
<th>Uninsured</th>
<th>Private Insurance</th>
<th>Public Insurance</th>
<th>Primary Care Physicians (per 100,000 population)</th>
<th>Total Population (1000’s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona</td>
<td>Federal</td>
<td>18%</td>
<td>46%</td>
<td>11%</td>
<td>96.0</td>
<td>6,644</td>
</tr>
<tr>
<td>Florida</td>
<td>Federal</td>
<td>21%</td>
<td>44%</td>
<td>12%</td>
<td>107.6</td>
<td>19,184</td>
</tr>
<tr>
<td>Kansas</td>
<td>Federal</td>
<td>13%</td>
<td>53%</td>
<td>16%</td>
<td>106.1</td>
<td>2,835</td>
</tr>
<tr>
<td>New Jersey</td>
<td>Federal</td>
<td>14%</td>
<td>59%</td>
<td>12%</td>
<td>140.4</td>
<td>8,725</td>
</tr>
<tr>
<td>Ohio</td>
<td>Federal</td>
<td>12%</td>
<td>54%</td>
<td>13%</td>
<td>123.8</td>
<td>11,411</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>Federal</td>
<td>12%</td>
<td>57%</td>
<td>14%</td>
<td>129.8</td>
<td>12,692</td>
</tr>
<tr>
<td>Tennessee</td>
<td>Federal</td>
<td>14%</td>
<td>48%</td>
<td>12%</td>
<td>122.4</td>
<td>6,428</td>
</tr>
<tr>
<td>Virginia</td>
<td>Federal</td>
<td>12%</td>
<td>56%</td>
<td>15%</td>
<td>124.4</td>
<td>8,011</td>
</tr>
<tr>
<td>California</td>
<td>State</td>
<td>18%</td>
<td>51%</td>
<td>9%</td>
<td>118.2</td>
<td>37,985</td>
</tr>
<tr>
<td>Kentucky</td>
<td>State</td>
<td>16%</td>
<td>49%</td>
<td>11%</td>
<td>102.5</td>
<td>4,354</td>
</tr>
<tr>
<td>Maryland</td>
<td>State</td>
<td>12%</td>
<td>60%</td>
<td>13%</td>
<td>175.3</td>
<td>5,899</td>
</tr>
<tr>
<td>Oregon</td>
<td>State</td>
<td>15%</td>
<td>51%</td>
<td>14%</td>
<td>129.4</td>
<td>3,877</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>State</td>
<td>12%</td>
<td>53%</td>
<td>14%</td>
<td>173.4</td>
<td>1,036</td>
</tr>
</tbody>
</table>

The next step was to determine which of the states selected above would be best to include from the standpoint of the Inovalon data. While Inovalon does have data on patients and providers from 99.9% of the counties in the United States and across all general payer types (private, Medicare and Medicaid) (reference user guide), it is desirable that the data be as representative as possible. Therefore, the goal was to include states that had a similar percentage of their population represented in the Inovalon data sets. This information is shown in Table 3.

### Table 3. Percentage of Population Represented by Inovalon Data
While this does provide a starting place, (for example, a comparison of Kentucky and Arizona shows that one is a state-based exchange and one a federal exchange, there is a comparable amount of uninsured in both states, and both have a comparable amount of Inovalon data) more analysis is required. It is important that other demographic features are equally represented such as insurance type, gender, and ethnicity.

FUTURE STEPS

The next step of the research will involve a more in depth analysis of the Inovalon data in an attempt to determine those states that will be selected for the study. Once this has been completed, we will begin the detailed data collection. Most of these data will be obtained through the Inovalon claims data, although it will be necessary to supplement it with the Current Population Survey data to ensure that the data is representative of the population as whole.

We intend to build upon the methodology employed by Albert et al. (2014) in their study on Massachusetts Health Care Reform. Data concerning utilization patterns and rates will be gathered for the first two years of the study period, 2012 and 2013. Using ANOVA procedures we expect to find that there is not a significant difference in the variables of interest for this time period. We will then collect the same data for 2014 and 2015. When comparing this post reform data to the data collected previously, we anticipate a significant difference in the variables of interest in terms of utilization.

REFERENCES


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\[ R_1 = \alpha (X_1) + \beta (X_2) \] (1)

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