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The Impact of the Passage of an Autism Mandate on Healthcare Utilization and Insurance Expenditures for Texas Children 3-9, 2006-2010

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Atlanta, Georgia

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An abstract of
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Abstract

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Autism spectrum disorders (ASD) are developmental disorders characterized by decreased social functioning. While they do not have a cure, they can be treated and managed using developmental therapies, including applied behavioral analysis (ABA). These developmental therapies can cost families without insurance coverage $40,000-$50,000 annually. To ensure health insurance companies cover these services, 38 states have passed autism mandates. This study uses Truven Marketscan administrative claims data from 2006-2010 for all children in Texas between the ages of 3 and 9 with ASD to examine the impact of a mandate passed by the state of Texas in 2008. To determine the impact of the legislation, we utilized a pre-post, non-equivalent group design to exploit the policy change. We ran two-part models to examine the impact of legislation on the probability of using key services and the number annual visits. Overall, the post-mandate time period was associated with a 13 percentage point increase in the probability of using developmental services for all youth in the sample ($p<0.01$). However, the mandate was not associated with significant changes in any of the outcomes for youth that were covered by its provisions. Considered together, the findings of this study suggest that factors other than the passage of an autism mandate account for changes in developmental service use among Texas children with autism.

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INTRODUCTION

Autism spectrum disorders (ASD) have been increasing in prevalence over the past several decades. While experts debate the effectiveness of various treatments, the treatment most consistently used is applied behavioral analysis (ABA). Generally targeted at young children immediately following diagnosis with ASD, ABA is both time intensive and expensive. For many years, health insurance companies refused to pay for these treatments, arguing that they were educational interventions and not healthcare. In response to advocacy by families of children with ASD, states began to pass mandates requiring insurance companies to cover ABA and similar treatments. The first mandate was passed in 2001 and currently 38 states have some form of a mandate (1).

Texas first passed its mandate in 2008, requiring coverage of ABA and other autism therapies for children under the age of six (1). The following year, the mandate was expanded to cover all children under 10 and in 2014 age limits were completely removed (2). The initial mandates passed in Texas were fairly moderate, falling somewhere between the most generous mandates passed later by states such as California and New Jersey, and the most restrictive mandates in states like Maine (1). Additionally, the diversity of the state's population and the amended age requirements provided a unique opportunity to study the impact of autism mandates on the insurance coverage of autism treatments. Therefore, this study will examine the impact of Texas's autism mandate on coverage of autism services and on insurance expenditures.

LITERATURE REVIEW

Background on Autism Spectrum Disorders

Autism spectrum disorders are a group of developmental disabilities characterized by impaired communication and deficits in social functioning (3).In recent years, the worldwide prevalence of ASDs has risen (4-7). In 2006, the Centers for Disease Control and Prevention (CDC) reported that approximately one in 110 eight-year-olds in the U.S. had an ASD, a number that rose to one in 68 by 2010 (4, 8). Researchers attribute the rapid increase in diagnosed prevalence to a combination of improvements in screening and diagnosis, as well as to an actual rise in the baseline number of cases. Regardless of what is driving this increase, CDC's official statistics have been mirrored by reports that Medicaid payments for ASD services are on the rise. This increase in prevalence has grave implications for healthcare spending, as children with ASD utilize more services, resulting in higher expenditures (9-12).

Comorbidity, Increased Utilization and Costs

Individuals with autism face a range of comorbidities that lead to higher utilization of healthcare services, which in turn results in higher costs than for their peers without ASD (13-18). A large portion of this spending is driven by frequently occurring comorbid mental disorders, which are highly prevalent in children with ASD, and result in higher service use.(13-18)

Children with a diagnosis of ASD use a range of services more frequently than their peers, including outpatient visits, physician visits and pharmaceuticals (13). Additionally, several researchers have found that children with ASD are more likely to visit the emergency department (ED) (17-18). In fact, the risk that a child with ASD will end up in the ED for an injury is 1.2 times the risk faced by his or her peers. Injuries, including head, face and neck injuries, self-injury and poisoning are much more commonly the cause of these ED visits than for children without developmental disabilities (14). Additionally, patients with ASD are nine times more likely to have a psychiatric ED visit followed by a subsequent admission (15). Interestingly, physicians are also spending more time during each visit with these patients, whose care is often more complicated (16).

As a result of this increased use of conventional medical services, children with ASD have larger healthcare expenditures (9, 11, 17-18). Recent estimates are that children with ASD have annual healthcare costs that are more than $3,000 higher than those of their peers (11). Others have found similar results, estimating that expenditures for children with ASD are four to six times those of other children (9). Estimates of overall lifetime costs for those with ASD range from $2.4 million to $3.2 million (17-18). Whatever the exact figure, the cost of providing necessary care to an individual with ASD is staggering.

Besides more traditional health and mental health services, the primary driver of these expenditures is behavioral therapy, one of the most common methods of treatment for ASD (19). This group of therapies is commonly referred to as applied behavioral analysis and can cost families $40,000-$50,000 or more per year if they pay all costs out-of-pocket (20). These costs are so high in part because of the intensity with which ABA is often practiced; children must work with a therapist daily for several hours per day for best results (21).

Controversy exists among researchers and healthcare providers as to how effective ABA is for treating ASD(22-23). Most studies include small sample sizes, and as a result, findings have ranged widely (21-24). Some past studies have found ABA to be significantly effective, while others have found it to have no measurable impact on symptoms (21). A recent systematic review by the Agency for Healthcare Research and Quality of 65 studies found growing evidence that behavioral therapies like ABA are associated with improvements in symptoms (24). However, they caution that further research is still needed before these treatment regimens can be deemed truly effective (24).

State Insurance Mandates

To deal with the impact of high ABA costs on families, many states have passed mandates requiring that state-regulated insurance plans cover these treatments. As of February 2015, 38 states and the District of Columbia have some form of insurance mandate requiring coverage of treatments for ASD (22). Because they are intended to reduce the financial burden of out-of-pocket costs on families, most mandates include specific provisions requiring the coverage of ABA (23). These mandates are patterned on earlier state mandates requiring insurance coverage of other health services, such as contraception, which have been shown to significantly increase access, and substance abuse treatment and mental health treatment, which have had mixed results (25-33).

Mental Health Mandates

Mental health coverage is perhaps most analogous to ASD mandates because of the type of treatment necessary, the often chronic nature of more severe cases and the resulting need for long-term, expensive therapies (34-42). Research on the impact of mental health parity laws has not reached a consensus as to their efficacy (34-42). Some studies have found that parity laws lead to an increase in follow-up care after a mental health-related hospitalization, a positive increase in service use likely to help reduce the risk of readmission (34). However, others have shown that while there was an increase in the likelihood of service use by those with less severe mental disorders, there was no significant change for those with the most severe illnesses (42). Even for those groups of patients who did experience an increase in service use, the rise was only one to two percentage points (35).

However, there is no consensus among experts, as other work has contradicted these findings. Parity laws seem not to result in a consistent, significant increase in service use of any type and for some patients may even lead to a decrease (36-37). Studies using suicide rates as an outcome measure have found that the implementation of parity legislation had no significant effect on the rates of suicide (38). These results may partly be explained by the fact that states with lower than average mental health service use were the states most likely to pass parity laws in the first place (39).

Another area that has received attention is the impact these laws have on costs associated with mental health services. Research has shown that for families with a child with mental illness, parity laws lead to a reduction in the financial burden of paying for their care, mostly because these laws decrease out-of-pocket costs (40-41).

In a study focusing specifically on children with ASD, researchers found that when compared to other users of mental health services, those with an ASD had a 92 percent higher probability of having high out-of-pocket costs (above $1,000) (41). This was especially true in states that had stricter parity legislation, and is one of the reasons legislators began to pass mandates specifically requiring coverage of ASD treatments (41).

Autism Mandates

Because mental health coverage mandates proved ineffective at increasing access to needed services for those children with ASD, many states passed subsequent legislation that specifically covered ABA and related behavioral therapies. There are currently 38 states with an ASD mandate in effect, and several more states are in the process of considering enactment of similar legislation (23). While popular support for these mandates is high, little research has been done to evaluate their impact on access, utilization, costs and outcomes. A recent paper examined the impact of state ASD mandate laws on out-of-pocket costs and found that families in states with a mandate were 29 percent less likely to report spending more than $500 out-of-pocket on their child's care. However, this study used parental reports to measure expenditures rather than claims data, and thus may not provide a full measure of the financial impact on families (43). Others have written about the variation in mandates passed by states and found that the states most likely to pass mandates had a high prevalence of ASD and a lower median income. While informative, this work does not examine the impact of these laws on costs or utilization and again only makes use of survey data (44). Most recently, researchers used survey data to examine the impact of state mandates on family financial burdens and found no association.

To our knowledge, no study has yet been conducted comparing overall insurance expenditures before and after a mandate's enactment. This study will quantify the impact of mandate passage on expenditures and service use for those with ASD by conducting difference-in-difference modeling before and after Texas's 2008 mandate went into effect. Additionally, this analysis will make use of administrative claims, allowing for a more accurate picture of insurance expenditures.

METHODOLOGY

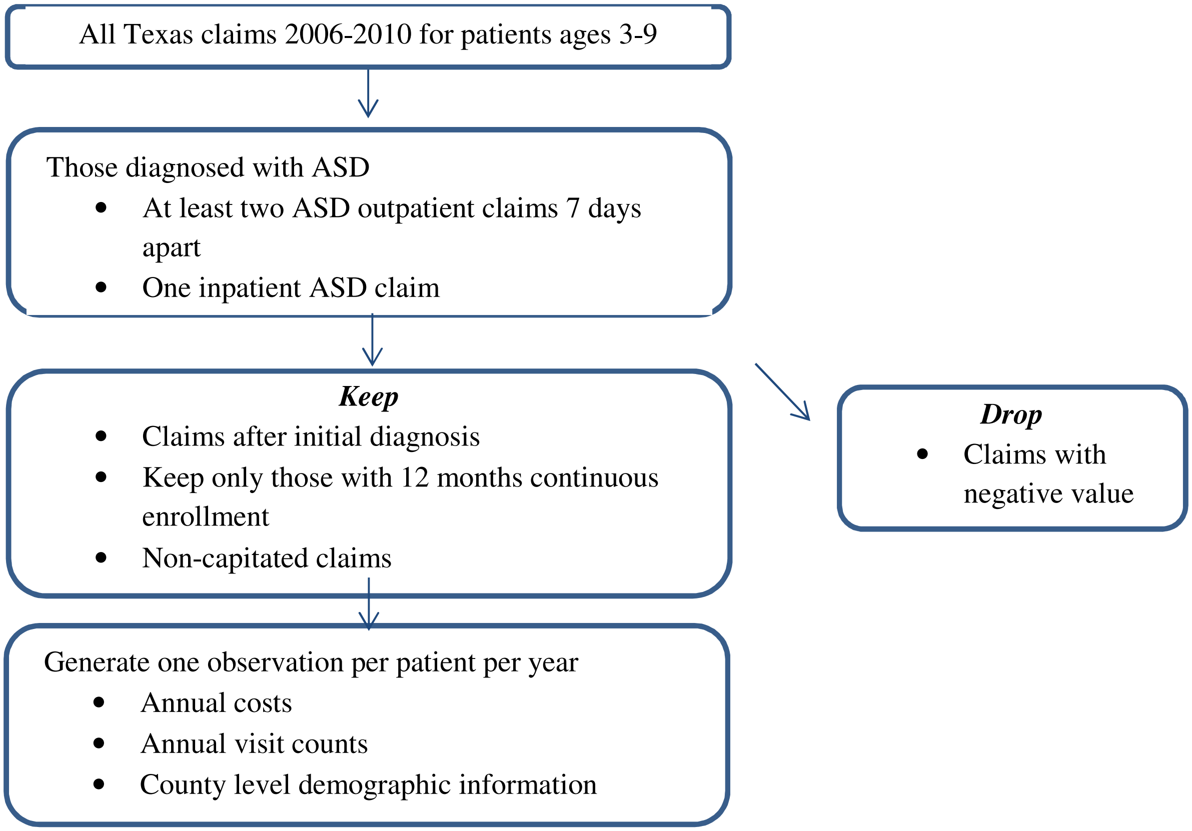
Data Source

Data used in this analysis is from Truven Marketscan, a national database of all insurance claims from patients with private insurance. For this analysis, we used Texas claims filed between January 1, 2006, and December 31, 2010. During the period under consideration, Texas's autism mandate applied only to children under age 10, so we restricted our analysis to claims for children between the ages of 3 and 9 diagnosed with ASD (1). As a result, some older children included in early years may age out of our sample. To receive a diagnosis of ASD, patients must have either:

1) two outpatient claims with one of six ASD-associated codes from the International Statistical Classification of Diseases and Related Health Problems (ICD-9) that occurred at least seven days apart or;

2) one inpatient claim with an ASD-associated ICD-9 diagnosis code (Appendix A).

Figure 1. Analytic Sample



We analyzed all claims filed after the initial diagnosis. Using an indicator variable in our data, we kept all non-capitated claims and restricted our analysis to patients who had insurance for all 12 months of a given year (45). There were a number of claims with a negative dollar value. After consultation with Truven, the administrators of the data, we recalculated this value using the constituent expenditures. In instances where the result was still negative, we set the value to missing and these costs were not included in our analysis (46). Our final sample included a total of 4,431annual observations from Texas children between the ages of 3 and 9 with ASD (Figure 1).

Analytic Framework

The analytic framework underpinning this analysis draws heavily from Andersen and Aday's Model of Healthcare Utilization (47). In this model, contextual and individual characteristics are associated with the use of health services that in turn affect health outcomes (48). Andersen further breaks down individual characteristics into three categories: predisposing characteristics, those inherent traits that make an individual more likely to utilize certain health services; enabling characteristics (in this case the presence of an autism mandate), which are those that facilitate an individual's use of health services; and need characteristics, which motivate health care use in the first place. Individual and contextual characteristics interact with each other and influence health behaviors (utilization of medical, mental health and developmental services), which ultimately drive long-term health outcomes.

There are several other important individual factors that have an impact on service use and may moderate the relationship between the passage of a mandate and utilization of healthcare services. Children with the most severe cases of ASD are more likely to take advantage of newly covered services than children with less severe cases (13). Younger children will probably change their service use more dramatically because ABA is most effective when administered to young children immediately after their initial diagnosis (24). Finally, urbanicity likely also has an important effect on the actual benefits to patients of the passage of a mandate because it largely determines access to providers of developmental services (44).

Research Questions and Hypotheses

This study examines the impact of state-level autism mandates on developmental service use and insurance expenditures. Specifically, it will test the following hypotheses:

H_1: The passage of a state-level autism mandate in Texas is associated with changes in healthcare use.

H_{1A}: The passage of state-level autism mandates is associated with an increase in the probability of having a developmental visit and in the number of visits for children aged 3 to 9 who have been diagnosed with ASD.

H_{1B}: The passage of state-level autism mandates is associated with a decrease in the probability of emergency department use.

H_2: The passage of state-level autism mandates is associated with an increase in insurance expenditures among children aged 3 to 9 with ASD.

In this study, the main relationship of interest is the influence of a state-level mandate that requires insurance companies to pay for the treatment of ASD services on the use of these services in the population covered by the mandate. If such mandates work as intended, we would expect to see an increase in the use of the developmental services specifically covered by the mandate and a decrease in the use of mental health and general medical services (21). This change in the number of medical services used would be due largely to the potential improvements in functioning which developmental treatments can generate (21). Increased coverage of developmental services will likely lead to higher rates of insurance payments per patient, although the amount spent on medical care, especially inpatient care and emergency department use, is likely to decrease (34-39).

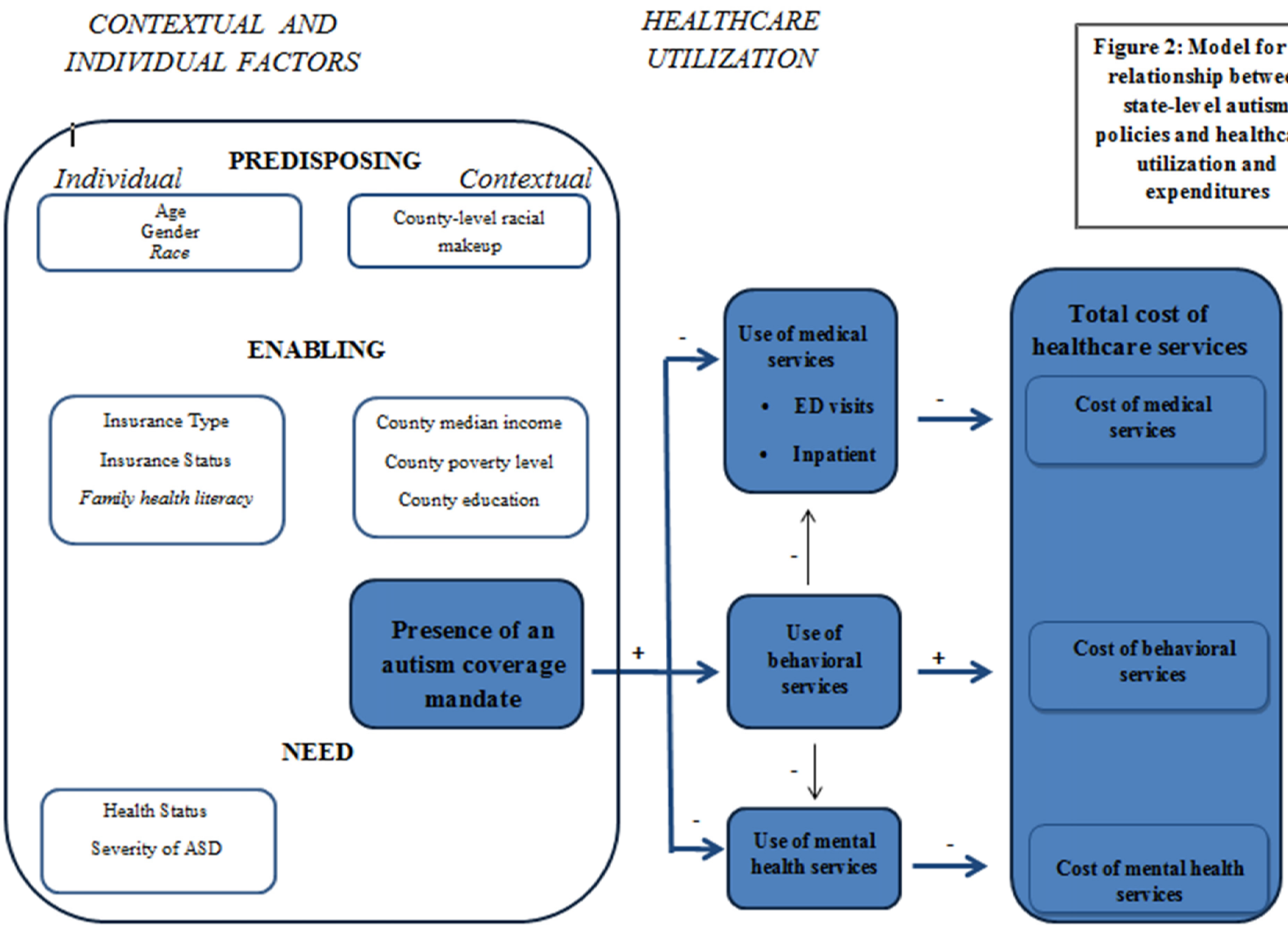


Figure 2: Model for the relationship between state-level autism policies and healthcare utilization and expenditures

Variables

Dependent Variables:

Developmental Services Visit Count

The first main dependent variable used in this analysis is visit counts for developmental services. We constructed an annual estimated visit count by summing the number of days a patient had an encounter with a medical professional (45). On days with more than one encounter, each contact with a unique physician was counted as a visit. Using ICD-9 codes, CPT codes and several other variables that described the type of visit, we generated a separate count for inpatient, mental health and developmental visits (see Appendix B). For each patient, we generated a separate visit count for each year that they were in our sample. We also created a variable to indicate whether they had any insurance coverage of developmental services throughout the year. This indicator was set to one if they had at least one developmental visit during the year.

Insurance Cost

The second main dependent variable of interest is insurance cost. We calculated a value for total healthcare costs by summing all insurance payments for each patient for each year. This value includes all outpatient, inpatient and pharmaceutical claims. We calculated these values annually by patient.

Emergency Department Visits

Finally, we looked at whether a patient had been to the emergency department or had visited a mental health professional in the past year. If the mandates function as intended, we would expect to see a shift from mental health services to developmental health services. Increased use of developmental services would be expected to reduce autism symptoms, which would in turn decrease the likelihood of visiting the ED (16-18). To create a count of annual ED visits, we used a variable that indicates where treatment was provided and included emergency room visits from both the inpatient and outpatient data set. After creating a count for each patient, we once again created a dichotomous variable to indicate whether each patient had visited the ED at all during the calendar year.

Key Independent Variable

The key independent variable used in this analysis is the passage of a state mandate requiring state-regulated insurance companies to cover treatment for ASD. Texas first enacted a limited mandate in 2008 and expanded it to cover children through age nine the following year (2). We controlled for this mandate using a dichotomous variable such that a value of zero indicates an observation from the pre-mandate time period while a value of one indicates an observation from the post-mandate time period (Figure 3).

To define our treatment group, we utilized two dichotomous variables. The first was a variable in the data that indicated whether a patient was on a state-regulated or large, self-insured health plan. Those plans that are state-regulated are required to follow state laws while large, self-insured plans are subject to the federal Employee Retirement Income Security Act (ERISA) and do not have to obey state laws (53). Second, we accounted for the changing requirements of the mandate by creating a variable to indicate a patient's age-eligibility. Using these two variables, we created a final variable to indicated whether a child was in the control or treatment group. Children who met the age eligibility requirements and were part of a state-regulated plan were assigned a value of one for this variable. All others were assigned a value of zero (Figure 3).

Figure 3. Schema for creating key independent variables

	Treatment Group	**Mandate (Post)**
0	Federally regulated or age-ineligible	2006, 2007
1	State regulated plan, age-eligible	2008, 2009, 2010

Finally, to measure the impact of the mandate on those it covered in the time after it went into effect, we created an interaction term by multiplying the values of the mandate (pre and post) variable by the value of the treatment group variable. For example, a child in the post period who was not in the treatment group would have a value of zero for the interaction term, while a patient in the treatment group would have a value of one during that period of time.

Covariates

We also included a number of important covariates in our study. Each was determined on an annual basis for each patient. We controlled for urbanicity, as it may be associated with service use and insurance expenditures because it largely determines access to providers of developmental services (54-55). To measure urbanicity we merged a variable from the data that indicates county of residence with the NCHS Urban-Rural Classification Scheme for Counties, a data set maintained by the CDC (49). In instances where county level information was missing for a patient for a year, we imputed this information from the previous year's data. We dichotomized the categorical measure of urbanicity to allow for a comparison of children living in rural areas to all other children (49).

Age is another important factor in the treatment of ASD. Treatment is most effective with young children immediately after their initial diagnosis (18-23). Additionally, there may be underlying biological processes occurring in autism that vary by age. We thus included a continuous measure of age in our model.

We also created a series of dichotomous variables to measure and control for type of ASD, a measure that serves as a proxy for severity. While some have used type as a direct measure of severity, this method has not been validated and these results should be interpreted cautiously (3). We created variables for Asperger (ICD-9 codes of 299.90 and 299.91), pervasive developmental disorder, not otherwise specified (ICD-9 codes of 299.80 and 299.81) and autistic disorder (ICD-9 codes of 299.00 and 299.01) (3). While not a perfect measure of severity, many children diagnosed with autistic disorder experience more severe symptoms than children fitting into the other two diagnostic categories (3).

Overall health status has an important impact on service use and so we chose to create a series of dummy variables to control for important comorbid conditions. We controlled for common mental health disorders, such as ADHD, anxiety and conduct disorders (15-17). On the advice of ASD experts, we also controlled for intellectual disability, hearing loss and asthma. We gave patients a diagnosis of these conditions using ICD-9 codes (see Appendix A).

While individual socioeconomic variables were not provided in this data, we did have information on county of residence and so were able to control for county-level median income, percentage living in poverty, educational attainment (percentage with at least high school diploma) and racial makeup (percentage Hispanic and African American). These data were drawn from the Health Resources and Services Administration's Health Area Resource File (AHRF) dataset (50). This is a large dataset that contains numerous county-level data points, including those listed above. For those measures only taken during census years, we used data from the previous census, conducted in 2000. These variables describe the characteristics of each child's county of residence. They also serve as a rough control for individual socioeconomic status.

We also controlled for gender because of the higher reported prevalence of ASD among males (4, 6). Finally, to account for ongoing secular time trends outside the passage of the mandate that may influence the rate of service use and reimbursement, we controlled for year fixed effects.

Statistical Methods

Descriptive Statistics

Before running any models, we generated descriptive statistics for all of our main variables. Additionally, to get a better understanding of the way age interacts with autism in our sample, we generated average age at diagnosis for each year, with further delineation between those who are on state-regulated plans and those who are on federally-regulated plans.

Main Analysis

Texas passed its ASD mandate in 2008 and modified it in 2009 to extend coverage to older children. To evaluate the impact of the mandate on service use and insurance expenditures, we utilized a pre-post, non-equivalent group design to exploit the policy change.

Model 1

$$Y_{it\,=}\ \alpha + \beta 1\text{post-mandatet} + \beta_2\,\text{treatment}_{it} + \beta_3(\text{post-mandate}_t * \text{treatment}_i) + \beta_4\,\text{Age}_{it} + \beta_5\text{Health Status}_{it} + \beta_6\text{Gender}_{it} + \beta_7\text{Rural}_{it} + \beta_8\,\text{ASD type}_{it} + \gamma_t + \varepsilon_{it}$$

Y=log expenditures (mental health, developmental, inpatient, total) or visits (developmental) and probability of service use (ED and mental health)

β_1=the independent association of dependent variables with the post-mandate time period

β_2=the independent association of the dependent variables with membership in the treatment group

β_3=the effect of the autism mandate for those to whom it applied in the years after its enactment

γ =the time trends common to both the treated and untreated

ε=random error

We utilized a difference-in-difference analysis that included the interaction term *post-mandate*$_t$ * *treatment*$_{it}$ to identify the differences in expenditures and use between the two groups, pre- and post-mandate. After running some basic descriptive statistics on our data, we determined that because of over-dispersion and right skew, OLS regression would not be a good fit for our data. As a result, we ran a generalized linear model (glm) with a log link for our total cost variable. To look at the changes in the number of developmental visits, mental health visits and ED visits we ran a two part model; the first part used a logit regression and the second part was a negative binomial regression run on all those who had a positive value from the first part of the model. We clustered our standard errors by patient and all results are reported as marginal effects.

Marginal effects are reported using a reference group for the three key independent variables such that the coefficient on "post-mandate" represents the effect in the post period compared to the pre period, the coefficient on "treatment" represents the effect for the treatment group relative to the control group, and the coefficient on the interaction term ($post\text{-}mandate_t * treatment_{it}$) represents the effect for the treated group in the post time period compared to all others.

RESULTS

Descriptive Statistics

Figure 4 shows the average age at diagnosis for patients from Texas on state-regulated and federally-regulated plans between 2006 and 2010. In 2006, children on federally-regulated plans were diagnosed approximately six months earlier, on average, than their counterparts on state-regulated plans. The passage of an autism mandate in 2008 coincided with a significant narrowing of the gap between the average ages of diagnosis in Texas, eventually resulting in an average age of diagnosis for both groups of 4.5 years.

Figure 4. Average age at diagnosis with ASD by year and plan type, Texas children 3-9, 2006-2010

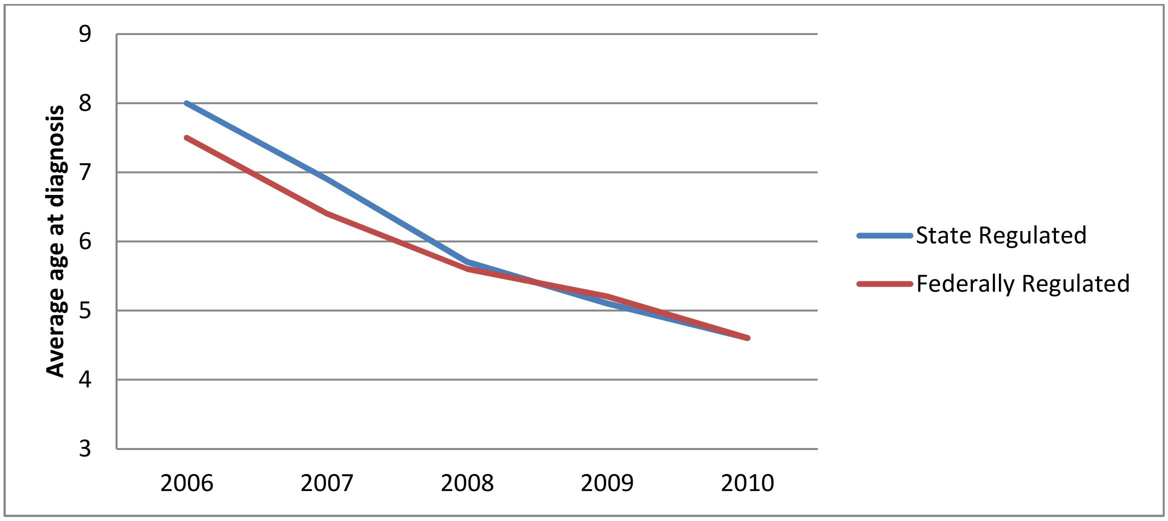


Figure 5 utilizes the same subgroups as Figure 4 and shows the proportion of each group utilizing developmental services each year. In Texas, both those on federally-regulated plans and state-regulated plans experienced no insurance coverage of developmental services before the mandate. In the years after passage of the mandate there was a large increase in service coverage for both groups, though it was slightly larger for those on state regulated than on federally regulated plans.

Figure 5. Proportion of patients with covered developmental services by year and plan type, Texas children 3-9, 2006-2010

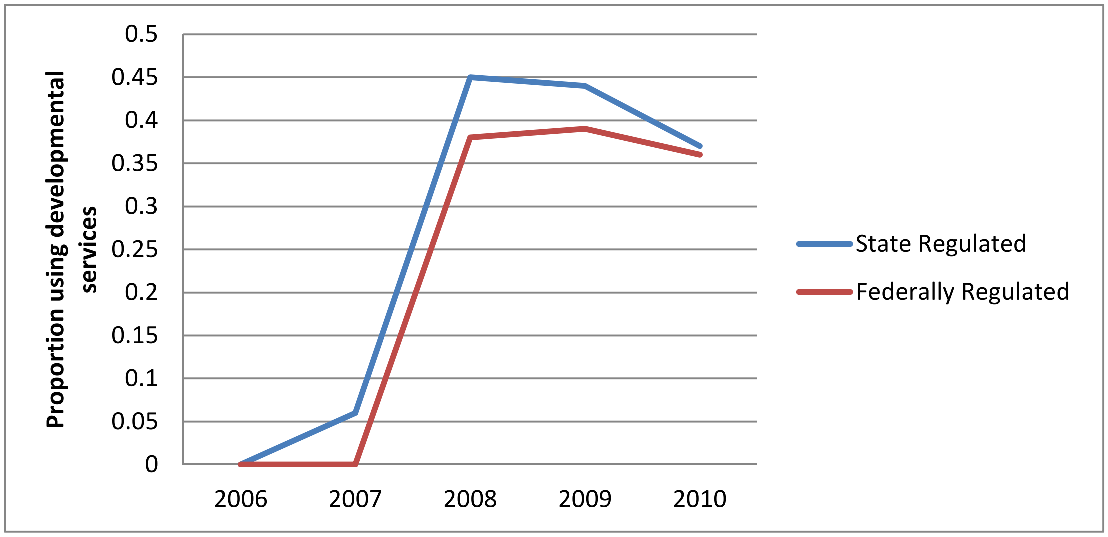


Table 1 outlines the individual characteristics of the patients on state-regulated plans (treated) and federally- regulated plans (untreated), pre and post-mandate. It illustrates several significant differences between the two groups (two tailed t-test, p<0.05). Patients from state-regulated plans have a 10% higher rate of diagnosis with ADHD in both periods and in the period after the mandate had significantly higher rates of anxiety and conduct disorders. Ninety-seven percent of patients on federally-regulated plans lived in urban or suburban areas (97%) whereas only 87-88% of those with state-regulated plans lived in urban counties. In the period after the mandate, the individuals covered by the mandate were diagnosed with anxiety, conduct disorder and intellectual disability about twice as frequently as their federally-regulated peers.

Table 1. Descriptive statistics for Texas patients, state and federally regulated plans before and after passage of autism mandate

	Federally Regulated (n=1,223)		State Regulated (n=3,208)	
	Pre-Mandate (n=283)	Post-Mandate (n=940)	Pre-Mandate (n=1,015)	Post-Mandate (n=2,193)
Male, percent	81.98	79.89	83.05	82.22
Urban/Suburban[c], percent	97.01*	97.4*	87.91	88.76
Comorbidities				
Hearing loss, percent	2.12*	5.21	5.62	6.61
Intellectual disability, percent	2.83	2.34*	4.93	5.15
ADHD, percent	31.8*	29.89*	41.38	42.36
Conduct disorder, percent	3.53	1.81*	6.21	5.61
Anxiety, percent	2.12	2.34*	3.94	4.51
Asthma, percent	8.83	6.06	6.7	7.34

**p<.05 with two sided t-test*
c: excludes rural and micropolitan counties

Table 2, which describes the county level demographic characteristics of the patients from Texas, shows that patients covered by the mandate came from counties with higher Hispanic populations and where more people lived in poverty. These counties had significantly lower median incomes and rates of high school graduation.

Table 2. County level characteristics for Texas patients, before and after adoption of autism mandate

	Federally Regulated (n=1,223)		State Regulated (n=3,208)	
	Pre-Mandate (n=152)	Post-Mandate (n=1,071)	Pre Mandate (n=548)	Post-Mandate (n=2,660)
Hispanic Population, Percent	25.3*	25.3*	32.0	30.5
African-American Population, Percent	12.4*	12.2*	10.7	10.86
Poverty, Percent	13.2*	14.7*	16.1	17.1
Median Income, Dollars	$58,675*	$59,191*	$52,678	$53,731
High School Diploma or More, Percent	82.6*	82.9*	80.2	80.8

**p<.05 with two sided t-test*

Finally, Table 3 contains the mean values of the cost and visit count variables we analyzed for our sample. Patients covered by the mandate had significantly higher payments for outpatient visits, behavioral services and mental health services in both time periods. Children affected by the passage of Texas's law had more outpatient, emergency department, mental health and behavioral visits in both time periods.

Table 3. Mean visit counts and insurance payments[a] for federally regulated and state regulated patients, before and after mandate

	Not Covered by Mandate (n=1,223)		Covered by Mandate (n=3,208)	
	Pre-Mandate (n=152)	Post-Mandate (n=1,071)	Pre Mandate (n=548)	Post-Mandate (n=2,660)
Total Payments	$11,476	$10,771	$8,936	$8,661
Mental Health Visit Count	10.0*	14.8*	6.1	6.5
Behavioral Visit Count	8.5*	19.6*	13	18.9
Emergency Department Visit Count	0.61*	0.35*	0.62	0.39

a: All expenditures have been inflation adjusted to 2010 USD.
**p<.05 with two tailed ttest*

Main Analysis

There were significant differences in service use for those who were in the treatment group (age eligible children on state-regulated plans during the entire study period) compared to those who were not. More specifically, during the entire study period, those eligible for the mandate had an 11 percentage point higher probability of having a developmental visit and a twelve percentage point lower probability of having a mental health visit compared to those not eligible (p<0.01 and p<0.05 respectively). The coefficient on the post-mandate time period also indicates that there was a 13 percentage point increase in the probability of having a developmental visit for all children in the years after the mandate was passed, regardless of their eligibility for additional coverage under the mandate (p<0.01). Additionally, there was a trend towards a significant decrease of 14.4 mental health visits associated with this time period ($p<0.10$).

The effect of the state mandate on service use for youth covered by the legislation was assessed with an interaction between the post-mandate time period and the mandate eligible group. Our results indicate that Texas's mandate was not associated with any significant change in total costs or use of developmental services for those youth to whom it applied.

Several covariates in the model had a significant association with health care utilization and costs in the sample, including age, urbanicity, severity of ASD, and comorbidities. A one year increase in age was associated with a 4 percentage point decrease in the probability of using developmental services and with one less visit per year ($p<0.001$ and $p<0.01$ respectively). It was also associated with two fewer annual mental health visits ($p<0.01$).

Children living in urban areas had a little more than 11 more annual developmental visits on average than children from rural counties ($p<0.05$). Living in urban counties was also associated with a 7.2 percentage lower probability of going to the ED during the year and with 0.3 fewer annual ED visits ($p<0.05$).

ASD type was used as a proxy for severity, as those with Aspergers and PDD generally have less severe symptoms (3). An administrative diagnosis of autistic disorder was associated with a 14 percentage point increase in the probability of having a developmental visit and with an increase of almost 17 developmental visits ($p<0.001$). Autistic disorder was also associated with a 15 percentage point decrease in the probability of having a mental health visit ($p<0.001$). However, if these children did use mental health services they had an average of almost 17 more visits per year ($p<0.001$). Additionally, a diagnosis of autistic disorder was also associated with a 6 percentage point increase in the probability of visiting the ED during the year ($p<0.001$). Finally, their annual healthcare costs were an average of $6,750 greater than those of their peers with either PDD or Aspergers ($p<0.05$).

Table 4. Adjusted marginal effects of Texas's autism mandate on medical visits and insurance payments^{A}

	Developmental Visits		Mental Health Visits		Emergency Department		Total costs
	Probability	*Count*	*Probability*	*Count*	*Probability*	*Count*	
Post-mandate	0.126**	-0.517	-0.049	-14.4†	-0.041	0.128	-$3,801
Eligible for Mandate	0.111**	7.13	-0.127*	-4.96	-0.049	0.173	-$2,789
Post-mandate*Eligible for Mandate	-0.080	-3.59	-0.002	-3.92	0.088	-0.262	$1,831
Age	-0.040***	-0.961**	-0.003	-1.93**	-0.006	0.003	-$365
Urban	0.041	11.3*	0.067	3.26	-0.072*	-0.332*	-$377
Male	-0.014	-0.052	0.037	0.527	-0.010	-0.200	-$1,248
Autistic dis.	0.140***	16.9***	-0.137***	16.7***	0.062***	0.385***	$6,750*
Comorbidities							
Asthma	-0.041	-9.76*	0.017	-9.58*	0.150***	0.222*	$1,938
Conduct	-0.103*	-2.17	0.260***	3.65	0.050	-0.074	$1,714
Anxiety	-0.024	-1.82	0.235***	0.651	0.030	0.154	$-1,153
ADHD	-0.044*	-4.13	0.300***	-15.3***	-0.013	0.086	$-3,151*
Hearing Loss	0.066†	-0.220	0.029	-6.57	0.033	-0.043	$2,833*
Intellectual Disability	-0.014	2.77	0.039	-12.7	0.128***	0.262	$1,866
Reference Group Mean	0.31	33.8	0.58	27.5	0.233	1.48	$11,870

The model also controlled for county level factors and year fixed effects.
†*p<0.10, *p<0.05, **p<0.01, ***p<0.001*

Unsurprisingly, having asthma was associated with a 15 percentage point increase in the probability of visiting the ED, while intellectual disability was associated with a 13 percentage point increase (p<0.001). Children with ADHD had a decrease of 4.2 percentage points in their probability of using developmental services but a 30 percentage point increase in the probability of using mental health care (p<0.05 and p<0.001 respectively). Anxiety and conduct disorder were also associated with approximately a 25 percentage point increase in the probability of using mental health services some time during the year.

DISCUSSION

States pass autism mandates because the most commonly used developmental treatments are beyond the financial reach of most families (10, 16-17, 19). However, until now, few studies have examined the effectiveness of mandates. Our study found that those in the group eligible for coverage under the mandate had a higher probability of having a developmental visit and a decreased probability of a mental health visit throughout the study period. The post-mandate time period was associated with an increase in the probability of at least one annual developmental visit, regardless of eligibility for increased insurance coverage under the autism mandate. These results suggest that insurance companies in Texas are more frequently covering services delivered by developmental professionals, a shift likely attributable to rising awareness of autism's symptoms, prevalence and treatment, both among parents and medical professionals. This trend was not necessarily associated with the passage of the mandate but may instead reflect growing awareness of the impacts of ASD and the importance of treating it early (6-8).

Trends in Treatment Over Time

Our study found that Texas's mandate had no significant effect on insurance expenditures, the probability of insurance-covered behavioral visits, or the number of these visits. This may be largely explained by the uniform increase in use of developmental services over time, regardless of eligibility for expanded coverage under the mandate. Texas may have passed their mandate, in part, as a response to growing public pressure to cover services. Growing public pressure may help explain the uniform increase of developmental services in the post-mandate period for all children in the sample (6-8, 20).

Awareness may also help explain the changes in average age at diagnosis with ASD shown in Figure 4 shows. Over time the average age of diagnosis for all children in our sample declined. The decrease in average age at diagnosis is encouraging because the developmental treatments covered by autism mandates have been shown to be most effective with younger children. Diagnosing children at a younger age facilitates early interventions with developmental therapies such as ABA, which in turn can provide lifelong medical and social advantages to the individual with autism and their family (20-22).

The post-mandate period was also associated with a decrease in the number of mental health visits, regardless of whether an individual was eligible for coverage under Texas's autism mandate. During this time period, many states experienced severe cuts to their mental health budgets (58). While Texas's mental health budget was only cut by 3% between 2009 and 2011, it was already low for a state of its size (58). For example, in 2011, California had 54% more residents than Texas but spent 258% more on mental health services. Connecticut, with 14% of the population of Texas, spent only 23% less on mental health than Texas (58-59). While the reduction of Texas' mental health budget was small, the system was underfunded compared to other states' mental health systems. As a result, any cut likely had a real and negative effect on the ability of Texas residents to access services, particularly those living in underserved urban or rural areas.

Underlying Differences in Service Use

As Table 4 illustrates, while the autism mandate Texas passed was not associated with any significant change in developmental service use, those children covered by the mandate had a higher probability of using developmental services throughout the study period. They also had a lower probability of using mental health services than their peers covered by federally-regulated plans. This suggests that children on state-regulated health plans may be more likely to receive services from an ASD provider. These results indicate that while the 25% of children in our sample on federally-regulated plans may be receiving care for their autism, they are potentially receiving it from mental health providers or are paying for it out-of-pocket. Because many children with ASD have co-occurring mental health conditions, much of this mental health service use may be appropriate. However, the option to seek treatment with a provider who specializes in ASD may provide benefits to the child and have implications for family finances and lifelong functioning (11-12, 20-21).

There were also important differences in service use between children with administrative diagnoses of autistic disorder and those with Aspergers or PDD. Those with autistic disorder had approximately 50% more developmental visits and almost twice as many mental health visits. These are meaningful differences in service use and point to systematic differences in the needs of these two groups. While ASD-type is not a validated method for measuring severity, these results indicate that it may serve as a useful way to predict high service use, which in turn can allow insurance companies to perhaps target care-coordination and other cost-saving efforts at this group of children.

The role of geography

Another important factor that helps determine service use is geography. In our model we controlled for several county-level characteristics, including racial makeup of the county, average level of education and income. While most of these measures were not significant in either model, median income did have a small but significant association with an increase in the probability of developmental service use. Additionally, living in a county with a larger percentage of residents who were Hispanic was associated with a significant but small increase in the probability of utilizing developmental services. Living in counties with larger Hispanic and African American populations was also associated with a small but significant increase in the number of mental health visits, indicating that children in counties with larger minority populations are more frequently accessing care from mental health professionals who may be less qualified to treat autism.

We also controlled for urbanicity, comparing children who lived in rural areas to those from cities or suburbs. We found that children in urban or suburban areas had significantly higher developmental visit counts. Children in these areas also had fewer visits to the ED. This may simply reflect that rural areas have fewer options for care, resulting in heavier use of the ED (46). However, it may also indicate that, because children with autism in rural areas have less access to developmental services, their autism symptoms continue unaddressed and more frequently result in injuries or other health-related events that require treatment in the ED.

Limitations

Internal validity

The first limitation of this study is the potential inaccuracy of our ASD diagnoses. Due to the nature of administrative claims data, these administrative diagnoses may not always be a true reflection of clinical diagnoses. As such, our sample may include children without ASD or may fail to account for some children with the disorder. To minimize the likelihood that we have mischaracterized patients, we have used diagnosis criteria established by experts at CDC that minimizes the mischaracterization of patients as much as possible (45).

The second limitation in our study is the left-censored nature of our data. Before the mandate's passage, insurance companies were not required to pay for these services (45). As a result, there are likely patients who were diagnosed and receiving developmental services before the mandate, but whose families did not go through the process of filing a claim, knowing their insurance company would not provide coverage. As a result, there may be an increase in the number of claims after the passage of the mandate unrelated to an actual increase in service use. In an attempt to minimize the impact of this bias, we focused our analysis not on actual use by patients, which we were unable to measure accurately, but on insurance coverage of key services. Additionally, we controlled for ASD severity in an attempt to mitigate the potential bias arising from the fact that those with more severe cases would be more likely to have administrative diagnoses before the passage of a mandate.

External validity

Our study also has limited generalizability because we included data from only one state in our analysis. Consequently, these results may not be applicable to the mandates passed in other states, the specifics of which may vary greatly from the law in Texas. Furthermore, our results apply only to privately insured children on non-capitated plans and thus cannot be applied to children on capitated plans or public insurance. We attempted to minimize this problem of external validity by choosing a state with a large, diverse population and a "middle-of-the-road" mandate. However, these results should be interpreted cautiously when considering smaller states, states with more homogenous populations or states with unique political climates.

Future directions

The results of our study suggest several future directions for research. First, in order to make more general statements about the impact of autism mandates, researchers should analyze a larger number of geographically diverse states. Additionally, as previously mentioned, the specific requirements of each autism mandate vary widely by state. Some have no age limitation, while others provide coverage to only very young children. Some mandates cover all employers in the state, while others apply only to large companies. Further research should examine the extent to which various mandate characteristics influence their effectiveness.

It would also be useful to more closely examine the extent to which urbanicity moderates the effect of mandates. Because we only included onestates in our study, our sample included only a small number of children who lived in rural areas; more than 80% of our sample lived in urban or suburban areas. Future studies that use larger data sets will be better able to describe the moderating impact of geography on the relationship between mandate passage and changes in service use. This will allow states to target supplemental efforts to target specific areas where the benefits of the mandate diffuse more slowly.

Finally, while this study included county level demographic factors, Marketscan data does not include access to personal information on race, ethnicity, income or education. Ideally, these factors should be considered, as they may contribute to disparities in the ability to access the benefits of autism mandates. Future research using data sets with more patient-level demographic information would enrich the findings of our study and provide further recommendations for policy makers.

CONCLUSION

Policy-makers and healthcare providers continue to disagree about both the best way to treat autism and who should pay for this treatment. However, over the past decade, the majority of states have adopted mandates requiring coverage of these services. State and federal policy makers are currently reexamining these mandates in light of the enactment of the ACA. There is a dearth of studies examining the actual effectiveness of these mandates. This study found that Texas's autism mandate had no significant effect on developmental visits. These results indicate that there are underlying factors, such as increased public awareness, that may be the true cause of increased insurance coverage of developmental services. Because this study included only one state mandate, researchers should conduct future studies examining mandates around the country.

Appendix A: ICD-9 diagnosis codes used to generate ASD diagnosis and comorbidity indicators

Condition	ICD-9 Codes
Autistic Disorder	299.00, 299.01
Asperger	299.90, 299.91
PDD-NOS	299.80, 299.81
Mental Health Comorbidities	
ADHD	314.00, 314.01, 314.9
Anxiety	300.00, 300.01, 300.02, 300.09, 300.23, 309.12
Conduct Disorder	309.30, 312.81, 312.90, 312.81, 312.00, 312.3
Physical Health Comorbidities	
Asthma	493.00, 493.01, 493.02, 493.10, 493.11, 493.12, 493.20, 493.21, 493.22, 493.80, 493.81, 493.82, 493.9, 493.91, 493.92
Hearing Loss	389.00, 389.01, 389.02, 389.03, 389.04, 389.05, 389.06, 389.08, 389.10, 389.11, 389.12, 389.13, 389.14, 389.15, 389.16, 389.17, 389.18, 389.20, 389.21, 892.20, 389.70, 389.80, 389.90
Intellectual Disability	317.00, 318.00, 318.10, 318.20, 319.00
Vision Impairment	369.00, 369.01, 369.02, 369.03, 369.04, 369.05, 369.06, 369.07, 369.08, 369.10, 369.11, 369.12, 369.13, 369.14, 369.15, 369.16, 369.17, 369.18, 369.20, 369.21, 369.22, 369.23, 369.24, 369.25, 369.30, 369.40, 369.60, 369.61, 369.62, 369.63, 369.64, 369.65, 369.66, 369.67, 369.68, 369.69, 369.70, 369.71, 369.72, 369.73, 369.74, 369.75, 369.76, 369.80, 369.90

Appendix B: Variables and variable values to create visit indicators

Additional variables used to code visit type indicator

	CPT codes	Procedure group	Provider type	Service category	Place of Service
Behavioral visits	92526, 92610, 92611, 92612, 92613, 92614, 92615, 92616, 92617, 92507, 92508, 97532, 97533, 92511, 92520, 92521, 92522, 92523, 92524, 92526, 92527, 92630, 92633, 96105, 96110, 96111, 96125, 31575, 31579, 92597, 92605, 92618, 92606, 92607, 92608, 92609, 92700, 98966, 98967, 98968, 98969, 99366, 99368, 97003, 97112, 97116, 97124, 97139, 97140, 97150, 97430, 97532, 97533, 97535, 97537, 97542, 97545, 97546, 97750, 97755, 97760, 97761, 97762, 97799, 92605, 92618, 92606, 92610, 92611, 92612, 92613, 92614, 92615, 95831, 95832, 95833, 95834, 95851, 95852, 96110, 96111, 96150, 96125, 96151, 96152, 96153, 96154, 96155, 0359T, 0364T, 0365T, 0366T, 0367T, 0368T, 0369T, 0370T, 0371T, 0372T, 0373T, 0374T, V5336	181, 182, 183, 184, 185, 478	850	10135, 10235, 10535, 12335, 22135, 30135, 30335, 30635	
Mental Health visits	90791, 90832, 90834, 90837, 90845, 90846, 90847, 90849, 90853, 90785, 90839, 90840, 90863	124, 135, 136, 137, 138, 139	365, 485, 824, 860		51, 53, 54, 56, 181, 182, 183, 184, 185, 478

Appendix C: Full regression results

Table 5. Full adjusted marginal effects of Texas's autism mandate on medical visits and insurance payments[A]

	Developmental Visits		Mental Health Visits		Emergency Department		Total costs
	Probability	*Count*	*Probability*	*Count*	*Probability*	*Count*	
Post-mandate	0.126**	-0.517	-0.049	-14.4†	-0.041	0.128	-$3,801
Eligible for Mandate	0.111**	7.13	-0.127*	-4.96	-0.049	0.173	-$2,789
Post-mandate*Eligible for Mandate	-0.080	-3.59	-0.002	-3.92	0.088	-0.262	$1,831
Age	-0.040***	-0.961**	-0.003	-1.93**	-0.006	0.003	-$365
Urban	0.041	11.3*	0.067	3.26	-0.072*	-0.332*	-$377
Male	-0.014	-0.052	0.037	0.527	-0.010	-0.200	-$1,248
Autistic dis.	0.140***	16.9***	-0.137***	16.7***	0.062***	0.385***	$6,750*
Comorbidities							
Asthma	-0.041	-9.76*	0.017	-9.58*	0.150***	0.222*	$1,938
Conduct	-0.103*	-2.17	0.260***	3.65	0.050	-0.074	$1,714
Anxiety	-0.024	-1.82	0.235***	0.651	0.030	0.154	$-1,153
ADHD	-0.044*	-4.13	0.300***	-15.3***	-0.013	0.086	$-3,151*
Hearing Loss	0.066†	-0.220	0.029	-6.57	0.033	-0.043	$2,833*
Intellectual Disability	-0.014	2.77	0.039	-12.7	0.128***	0.262	$1,866
County-Level Variables							
High School Diploma (%)	-0.0003	-0.38	-0.0001	-0.134	-0.002	-0.013	-$379*
Median Income ($10,000s)	0.004**	0.33†	-0.001	0.145	-0.001	0.005	$114
Poverty (%)	0.003	-0.114	-0.002	-1.20*	-0.005	0.002	-$288
Hispanic (%)	0.001	0.082	-0.003**	0.303*	-0.001	-0.005	-$54
African American (%)	0.005*	0.335†	0.005**	0.640**	-0.001	0.001	-$10
Reference Group Mean	0.31	33.8	0.58	27.5	0.233	1.48	$11,870

The model also controlled for year fixed effects.
*†p<0.10, *p<0.05, **p<0.01, ***p<0.001*

Works Cited

1. TEXAS: Frequently Asked Questions About the Autism Insurance Reform Law. *Autism Votes.* [Online] Autism Speaks . [Cited: March 10, 2015.] https://www.autismspeaks.org/images/advocacy/Texas_FAQ.pdf.

2. Fancher, Julie. Autism advocates, parents hail new Texas rules requiring expanded insurance coverage . *The Dallas Morning News.* 2013.

3. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders, 5th ed.* Arlington, VA : American Psychiatric Association, 2013.

4. *Prevalence of autism spectrum disorder among children aged 8 years--autism and developmental disabilities monitoring network 11 sites, United States, 2010.* Baio, J. United States : Morbidity and Mortality Weekly Report, Centers for Disease Control and Prevention, 2014, Vol. 63.

5. *Parent-reported prevalence of autism spectrum disorders in US-born children: an assessment of changes within birth cohorts from the 2003 to the 2007 National Survey of Children's Health.* Scieve, L. A. Suppl 1, s.l. : Journal of Maternal and Child Health, 2012, Vol. 16.

6. *Changes in prevalence of parent-reported autism spectrum disorder in school-aged children: 2007 to 2011-2012.* J., Blumberg S. s.l. : Natl Health Stat Report, 2013.

7. *Trends in the prevalence of developmental disabilities in US children, 1997[2008.* Boyle, C.A. 127, s.l. : Pediatrics, 2011.

8. *Prevalence of autism spectrum disorders—Autism and Developmental Disabilities Monitoring Network, United States, 2006.* Prevention, Centers for Disease Control and. s.l. : Morbidity and Mortality Weekly Report, 2009, Vol. 58.

9. *Medical expenditures for children with an autism spectrum disorder in a privately insured population.* Shimbakuro, T.T. et al. 38, s.l. : J Autism Dev Disord, 2007.

10. *Utilization and expenditures for children with autism spectrum disorder: National Health Insurance claims database analysis.* Lin, J. s.l. : Research in Autism Spectrum Disorders, 2011, Vol. 5.

11. *Economic burden of childhood autism spectrum disorder.* Lavelle, T.A. et al. 133, s.l. : Pediatrics, 2014.

12. *The cost of autism spectrum disorders.* Horlin, C. et al. 9, s.l. : PLoS One, 2014.

13. *Parental report of health conditions and health care use among children with and without autism: National Survey of Children's Health.* Gurney, J.G. et al. 160, s.l. : Arch Pediatr Adolec Med, 2006.

14. *Injury treatment among children with autism or prevasive developmental disorder.* al., McDermott S. et. 38, s.l. : J Autism Dev Disord, 2007.

15. *Psychiatric-related emergency department visits among children with an autism spectrum disorder.* al., Kalb L.G. et. 28, 2012 : Pediatr Emerg Care.

16. *Health care utilization and expenditures for children with autism; data from U.S. national samples.* Liptak, G.S. 36, s.l. : J Autism Dev Disord, 2006.

17. *Costs of autism spectrum disorders in the United Kingdom and the United States.* al., Buescher A.V. et. 168, s.l. : JAMA Pediatr, 168.

18. *The lifetime distribution of the incremental societal costs of autism.* Ganz, M.L. 161, s.l. : Arch Pediatr Adolesc Med, 2007.

19. *Autism.* Meng-Chuan, L., et al. 383, s.l. : The Lancet, 2014.

20. Berr, J. How autism can cost families millions. *MSN Money.* 2013.

21. *A randomized clinical trial comparison between pivotal response treatment (PRT) and applied behavioral analysis (ABA).* Mohammadzaheri, F., et al. s.l. : J Autism Dev Disord, 2014.

22. Speaks, Autism. State Initiatives. *Autism Speaks.* [Online] 2014. [Cited:] http://www.autismspeaks.org/advocacy/states.

23. Green, Teresa. Analysis conducted by the author from publicly available state legislation.

24. Weitlauf, A.S., et al. Therapies for Children with Autism Spectrum Disoder: Behavioral Interventions Update. *AHRQ Comparative Effectiveness Reviews.* Rockville, MD : AHRQ, 2014.

25. *An (un)clear conscientce clause: the causes and consequences of statuatory ambiguity in state contraceptive mandates.* VanSickle-Ward., R, Hollis-Brusky, A. 38, s.l. : J Health Polit Policy Laws, 2013.

26. *Contraceptive insurance mandates and consistent contraceptive use among privately insured women.* Magnusson, B.M., et al. 50, s.l. : Med Care, 2012.

27. *Health insurance coverage and prescription contraceptive use among young women at risk for unintended pregnancy.* Nearns, J. 79, s.l. : Contraception, 2009.

28. *Effect of insurance parity on substance abuse treatment.* Azzone, V., et al. 62, s.l. : Psychiatr SErv, 2011.

29. *An expensive policy: the impact of inadequate funding for substance abuse treatment.* Amaro, H. 89, s.l. : Am J Public Health, 1999.

30. Administration, Substance Abuse and Mental Health Services. *Results from the 2010 National Survey on Drug Use and Health: Summary of National Findings.* Rockville, MD : US Department of Health and Human Services, 2011. NSDUH Series H-41.

31. *What Oregon's parity law ca tell us about the federal Mental Health Parity and Addiction Equity Act and spending on substance abuse treatment services.* McConnell, K.J., et al. 124, s.l. : Drug Alcohol Depend, 2012.

32. Rosenbach, M.L., Lake, T., Young, C., et al. *Effects of the Vermont mental health and substance abuse parity law.* Rockville, MD. : Substance Abuse and Mental Health Services Administration, 2003.

33. *State parity laws and access to treatment for substance use disorder in the United Stsats: implications for federal parity law.* Wen, H., et al. 70, s.l. : JAMA Psychiatry, 2013.

34. *Impact of comprehensive insurance parity on follow-up care after psychiatric inpatient treatment in Oregon.* Wallace, N.T., McConnell, K.J. 64, s.l. : Psychiatr Serv, 2013.

35. *The effects of state mental health parity legislation on percieved quality of insurance coverage, perceived access to care, and the use of mental health specialty care.* Bao, Y., Strum, R. 39, s.l. : Health Serv Res, 2004.

36. *Mental health parity legislation: much ado about nothing?* Pacula, R.L., Sturm, R. 39, s.l. : Health Serv res, 2004.

37. *The effects of mental health parity on spending and utilizatio for bipolar, major depression and adjustment disorders.* Busch, A.B., et al. 170, s.l. : Am J Psychiatry, 2013.

38. *Are mental health insurance mandates effective? Evidence from suicides.* Klick, J., Markowitz, S. 15, s.l. : Health Econ, 2005.

39. *State mental health parity laws: cause or consequence of differences in use?* Strum, R., Pacula, R.L. 18, s.l. : Health Aff, 1999.

40. *Impact of state mental health parity laws on access to autism services.* Bilaver, L.A., Jordan, N. 64, s.l. : Psychiatr Serv, 2013.

41. *Impact of full mental health and substance abuse parity for children in the Federal Employees Health Benefits Program.* Azrin, S.T., et al. 119, s.l. : Pediatrics, 2007.

42. *The effects of state parity laws on the use of mental health care.* Harris, K.M., et al. 44, s.l. : Med Care, 2006.

43. *State insurance parity legislation for autism services and family financial burden.* Parish, S., et al. 50, s.l. : Intellect Dev Disabil, 2012.

44. *US state variation in autism insurance mandates: Balancing access and fairness.* Johnson, R.A., et al. 18, s.l. : Autism, 2014.

45. *Autism spectrum disorders and health care expenditures: the effects of co-occuring conditions* . Peacock, G., et al., et al. 1, s.l. : Journal of Behavioral and Developmental Pediatrics, 2012, Vol. 33.

46. Marketscan, Truven.

47. *A framework for the study of access to medical care.* Aday, L.A., Andersen, R. s.l. : Health Serv Res, 1974, Vol. 9.

48. *Revisiting the behavioral model and access to medical care: Does it matter?* Andersen, R.M. 36, s.l. : J Health Soc Behav, 1995.

49. Prevention, Centers for Disease Control and. Data Access. *NCHS Urban-Rural Classification Scheme for Counties.* [Online] Centers for Disease Control and Prevention, 2010. [Cited:] http://www.cdc.gov/nchs/data_access/urban_rural.htm.

50. Administration, Health Resources and Services. Health Workforce. *AHRF Databases.* [Online] [Cited: November 12, 2014.] http://ahrf.hrsa.gov/.

51. Center for Comsumer Information and Insurance Oversight, Department of Health and Human Services. *Essential Health Benefits Bulletin.* 2011.

52. *The effects of state parity laws on the use of mental health care.* Harris, K.M., et al. 44, s.l. : Med Care, 2006.

53. *Mis-Detection Controlled Estimation: Explaining Variations in the Observed Incidence of Autism.* Candon, Molly K. SSRN, 2014.

54. Larson, S. L. and J. A. Fleishman (2003). "Rural-urban differences in usual source of care and ambulatory service use: analyses of national data using Urban Influence Codes." Med Care **41**: III65-III74.

55. Casey, M. M., et al. (2001). Are rural residents less likely to obtain recommended preventive healthcare services? Am J Prev Med. Netherlands. **21:** 182-188.

56. Smulowitz, P. B., et al. (2014). "Increased use of the emergency department after health care reform in Massachusetts." Ann Emerg Med **64**: 107-115, 115 e101-103.

57. Ginde, A. A., et al. (2012). Health insurance status change and emergency department use among US adults. Arch Intern Med. United States. **172:** 642-647.

58. *State Mental Health Cuts: A National Crisis.* **Honberg, Ron.** s.l. : National Alliance on Mental Illness, 2011.

59. Statistical Compendia Branch, A. (2015). "State Rankings--Statistical Abstract of the United States--Resident Population." Retrieved April 1, 2015, from http://www.census.gov/statab/ranks/rank01.html.