The Massachusetts health reform and children's health: Can we achieve health and health care equity among all children?

Introduction

On March 23, 2010 President Obama passed the Patient Protection and Affordable Care Act (ACA), which is comprehensive health care reform for the United States. The central idea of the ACA is to expand health care coverage to all Americans (OECD Publishing, 2011). The lack of health insurance has been widely associated in the literature as a risk factor to poor health care and health outcomes. The new expansion is projected to have a significant impact on the wellbeing of adults, but what kind of impact will expanding insurance coverage have on children? Even though the number of uninsured children is lower than that of adults (7% vs. 21%, respectively) (Cohen & Martinez, 2012), it is still important to evaluate how children would benefit if we can come close to eliminating the lack of insurance coverage as a risk factor to poor health outcomes.

Historically, we know that health care expansion leads to increased health care coverage. There is robust evidence supporting improved health insurance coverage and access to care for children through Medicaid expansion in the late 1980s and early 1990s, and the creation of the State Children's Health Insurance Program in 1997 (Howell & Kenney, 2012). Massachusetts has cut the proportion of uninsured children in half by enacting comprehensive health reform in 2006 (Kenney, Long, & Luque, 2010).

Despite these improvements in health coverage among children, subgroups of children experience poorer health and health care outcomes. Children who have special health care needs (CSHCN) and live in low or moderate-income households are less likely to have health insurance (Honberg, McPherson, Strickland, Gage, & Newacheck, 2005). CSHCN from lower income households are more likely to have unmet vision needs, and to have one or more unmet health care needs (Heslin, Casey, Shaheen, Cardenas, & Baker, 2006; Honberg et al., 2005). In England, income inequalities reflect differences in health outcomes despite having universal health coverage (Martinson, 2012).

Poor health outcomes in childhood has also been associated with low educational attainment, poor health in adulthood, and substantially diminished labor market earnings in adulthood (Haas, Glymour, & Berkman, 2011), which can lead to a less productive workforce. Therefore as we embark on expanding health care coverage to all US citizens, it is important to evaluate the effects of universal health care on children's health and its effects on disparities. One way researchers have evaluated the effects of universal health care in the US is to study the Massachusetts health reform. Therefore, this paper aims to examine the extent to which universal insurance coverage in Massachusetts reduces disparities among children in low/moderate-income households who are eligible for health insurance expansions programs compared to children in high-income households who are ineligible.

Methods

Data Source: The data used for this analysis comes from the National Survey of Children's Health (NSCH), which is a random-digit dial telephone survey funded by the Maternal and Child Health Bureau and conducted by the National Center for Health Statistics (NCHS) using the State and Local Area Integrated Telephone Survey (SLAITS) mechanism. The NSCH is a cross-sectional survey, and has three iterations. Data was first collected in January 2003 - July 2004 (NSCH-1), and the latest iteration was collected in February 2011 - June 2012 (NSCH-3). The purpose of the NSCH is to derive national and state level population-based estimates of the health and well-being of children ages 0 to 17 years old in the United States. One child is randomly selected from each household, and a detailed interview is conducted with an adult (18 years or older) who knows about the health and health care of the child (Blumberg SJ, Foster EB, Frasier AM, 2012).

Measures: Disparities will be examined by income, which includes children ages 0-17 years who live in households with an income ≤300% of the Federal Poverty Level (FPL) and >300% FPL (referred to as low/moderate-income and high-income, respectively). This threshold was chosen based on eligibility of health insurance expansions programs through the Massachusetts health reform, such as expanding

Medicaid to households <150% FPL, and providing subsidies for health insurance to households ≤300% FPL.

The exposure (treatment) that will be examined is universal insurance coverage through the Massachusetts health care reform. The dependent variables of interest are two selected health indicators that are comparable between the NSCH1 (before reform) and NSCH3 (after reform). The health indicators examined in this analysis are binary and consists of: excellent/very good overall health status (vs. fair/good/poor); children with no special health care needs (SHCN); was ever breastfeed, ages 0-5 years old; has low/no risk of developmental delay (vs. moderate/high risk), ages 1-5 years old; has no school absences, ages 6-17 years old; has health insurance at time of interview; has consistent health insurance; has a personal doctor or nurse (PDN); and had one or more preventive care visits. The developmental delay indicator was derived from the Parents' Evaluation of Developmental Status (PEDS) questionnaire included in the NSCH. The PEDS questionnaire used parental concern to identify levels of risk for delay. SHCN status was derived from a five-item screening tool included in the NSCH. Health indicators represent estimates from all children less than18 years old, unless age group is otherwise indicated.

Analytic Approach: The analytical plan for this study design is as follows: 1) Provide unadjusted estimates per health indicator before reform and after reform (yr), and 2) conduct multivariate regression analysis using a difference-in-difference-in-difference (DDD) approach (Gruber, 1994) per health indicator (Yijt) controlling for sex and age (Xijt). In this analysis, Massachusetts is the experimental state, and the control sates include Rhode Island, New Hampshire, and Connecticut (expmt) since they have similar socioeconomic and demographic characteristics. A comparison analysis was conducted to make sure these states are appropriate to use as a control group. A DDD analysis essentially consists of two steps: 1) conduct a difference-in-difference (DD) analysis of income disparities for the experimental and for the control states, and 2) calculate another difference-in-difference using the DD estimates from the experimental and control states produced in step one. The second step is basically controlling for events that happen before and after reform that can affect the outcomes (ie. new pharmaceutical drugs or medical technology, an economic downturn, etc). In the DDD analysis, children in households >300%FPL would theoretically not be affected by the benefits of health reform. The literature does support this by showing that there is no change in health coverage rates for those ≥400%FPL after SCHIP expansion (Choi, Sommers, & McWilliams, 2011). The following regression analysis will be used in the DDD analysis:

$$Pr(Y_{ijt}|IVs)=\beta_0 + \beta_1 X_{ijt} + \beta_2[yr_t] + \beta_3[exprmt_j] + \beta_4[treat_i] + \beta_5[exprmt_j \times yr_t] + \beta_6[yr_t \times treat_i] + \beta_7[exprmt_j \times treat_i] + \beta_8[exprmt_j \times yr_t \times treat_i]$$

i=individual, j=indexes of states, t=time period, IVs= Independent variables

Goodness of fit (GOF) analyses (Pearson Correlation, Pregibon Link Test, Hosmer Lemeshow Test) were conducted for each model. Each health indicator used logistic, probit, or cloglog regression analyses depending on which regression was the best fit from the GOF analysis. To get adjusted percent estimates for Tables 3 & 4, recycled predictions were used. Statistical significance was derived for the adjusted estimates by producing 500 bootstraps for each estimate. All unadjusted and adjusted estimates will be weighted using the appropriate survey specific commands on STATA 12. Estimates will be adjusted first by sex and age. A second adjustment by independent variables that were selected based on the Andersen-Newman model framework (enabling, predisposing, and need characteristics) will be conducted in the future. Less than 2% of the explanatory variables and socio-demographic variables are missing. Approximately 8% of the respondents did not answer questions about family income. Additional analysis on missing income values show that missing cases are not missing at random. Therefore, missing income values were produced with single imputations, using imputation files provided by NCHS.

Result

Table 1 shows changes in socioeconomic compositions before and after reform for Massachusetts and the control states. For both Massachusetts and control states, race and ethnicity, poverty level, and primary language significantly changed at the α=0.05 level between both time periods.

Table 2 shows each health indicator for Massachusetts and control states by year. There was a significant increase in breastfeeding, having health insurance, having consistent insurance, and having a personal doctor or nurse from 2003/2004 to 2011/2012 for both Massachusetts and control states.

Table 1. Socioeconomic Characteristics Before and After Reform for Massachusetts and Control States.

Characteristics	Massachusetts					Controls				
	2003-2004 (n=2,114)		2011-2012 (n=1,861)		Chi-Sq p-value	2003-2004 (n=6,090)		2011-2012 (n=5,711)		Chi-Sq p-value
	Percent (Standard Error)									
Age Group										
0 to 5	31.7%	(0.012)	31.1%	(0.014)	0.4195	31.3%	(0.008)	29.7%	(0.009)	0.2661
6 to 11	33.8%	(0.012)	31.9%	(0.014)		34.1%	(0.008)	33.8%	(0.009)	
12 to 17	34.5%	(0.012)	36.9%	(0.015)		34.6%	(0.008)	36.5%	(0.010)	
Sex										
Female	48.8%	(0.013)	49.0%	(0.015)	0.921	49.0%	(0.009)	48.6%	(0.010)	0.7749
Male	51.2%	(0.013)	51.0%	(0.015)		51.0%	(0.009)	51.4%	(0.010)	
Race/Ethnicity										
NH-white	75.4%	(0.012)	65.2%	(0.015)	<0.001	75.9%	(0.008)	66.1%	(0.010)	<0.001
NH-black	6.8%	(0.008)	7.5%	(0.010)		7.4%	(0.006)	7.9%	(0.006)	
Hispanic/Latino	10.5%	(0.008)	14.9%	(0.012)		11.4%	(0.006)	16.8%	(0.009)	
NH-Other	7.4%	(0.008)	12.5%	(0.011)		5.3%	(0.004)	9.1%	(0.006)	
Total kids in household										
1	21.9%	(0.008)	25.8%	(0.012)	0.0669	21.9%	(0.006)	25.0%	(0.007)	0.0011
2	41.9%	(0.012)	43.0%	(0.015)		42.2%	(0.008)	42.2%	(0.010)	
3	26.6%	(0.013)	23.0%	(0.015)		25.0%	(0.008)	24.9%	(0.010)	
4 or more	9.6%	(0.011)	8.1%	(0.010)		10.8%	(0.007)	7.8%	(0.006)	
Poverty Level										
<100% FPL	11.8%	(0.010)	14.2%	(0.013)	0.0115	10.2%	(0.006)	14.2%	(0.008)	<0.001
100%-<200% FPL	14.9%	(0.010)	15.1%	(0.012)		16.7%	(0.007)	16.8%	(0.008)	
200%-<400% FPL	33.0%	(0.012)	26.6%	(0.014)		34.2%	(0.008)	27.7%	(0.009)	
400% FPL/more	40.3%	(0.012)	44.1%	(0.015)		38.9%	(0.008)	41.4%	(0.010)	
Primary Language										
Non-English	9.8%	(0.008)	12.6%	(0.011)	0.0326	7.9%	(0.005)	12.8%	(0.008)	<0.001
English	90.2%	(0.008)	87.4%	(0.011)		92.1%	(0.005)	87.2%	(0.008)	

Overall Health: Before the reform in both Massachusetts and control states, parents of children in high-income households are significantly more likely to report excellent/very good health than those in low/moderate income households by 11.6 percentage points (p-value<0.001) and 11.0 percentage points (p-value<0.001), respectively (Table 3). After reform this disparity increased to 12.9 percentage points in Massachusetts (p-value<0.001), and 15.6 percentage points in control states (p-value<0.001). If health reform had not occurred, the disparity between high and low/moderate would have been 16.3 percentage points. Table 4 shows that disparities in Massachusetts did not significantly change before to after reform; however, disparities worsened in the control states by 4.6 percentage points (p=0.021). The overall effect of the reform was a 3.3 percentage point improvement in the disparity, but this DDD estimate was not statistically significant.

Table 2. Health and Health Care Outcomes for Massachusetts and Control States by Year.

	Massachusetts					Controls				
Outcomes	2003-2004 (n=2114)		2011-2012 (n=1861)		Chi-Sq p-value	2003-2004 (n=6090)		2011-2012 (n=5711)		Chi-Sq p-value
	Percent (Standard Error)									
Overall Health is excellent/very good	88.7%	(0.01)	88.7%	(0.01)	0.9700	88.2%	(0.01)	87.1%	(0.01)	0.2511
CSHCN	22.2%	(0.01)	22.3%	(0.01)	0.9516	19.0%	(0.01)	20.6%	(0.01)	0.1217
Was Ever Breastfed (ages 0-5 yrs)	71.5%	(0.02)	80.5%	(0.02)	0.0064	70.4%	(0.01)	83.8%	(0.01)	<0.001
Low/No Risk of Dev. Delay (ages 1-5 yrs)	73.1%	(0.02)	72.8%	(0.03)	0.9464	75.7%	(0.01)	72.7%	(0.02)	0.2072
No School Absences (ages 6-17 yrs) *Old*	17.7%	(0.01)	16.9%	(0.01)	0.6987	19.5%	(0.01)	19.5%	(0.01)	0.9584
Has Health Insurance	96.4%	(0.01)	99.0%	(0.00)	0.0002	95.7%	(0.00)	97.0%	(0.00)	0.0145
Has consistent Health Insurance	90.9%	(0.01)	94.5%	(0.01)	0.0024	91.1%	(0.00)	92.7%	(0.01)	0.0289
Has a Personal Dr/Nurse	91.4%	(0.01)	96.7%	(0.01)	<0.001	91.2%	(0.00)	95.2%	(0.00)	<0.001
≥1 Preventive Medical Visit	92.3%	(0.01)	91.5%	(0.01)	0.4912	88.7%	(0.01)	90.5%	(0.01)	0.0348

Special Health Care Needs: Before reform (Table 3), children from high-income households were more likely to have no SHCN (80.4%) than children in low/moderate income households (73.9%). However, after reform, having no SHCN decreased in children in high-income households (78.4%), and increased for children in low/moderate households (76.5%). As a result, the significant disparity before reform (p=0.009), was no longer significant after reform (p=0.475). If reform had not occurred, the disparities would have been 10.1 percentage points (p=0.002) between income groups. The opposite occurred for control states where ~81% of children had no SHCN in both income groups before the reform, but no SHCN decreased among low/moderate income children (77.2%) resulting in a significant disparity after reform (p=0.012). Table 4 shows that the change in disparity for control states before and after reform was significant at the α=0.1 level (p=0.079). Therefore, the overall effect of reform was a 5.6 percentage point improvement in disparities that is significant at the α=0.1 level (p=0.059).

Breastfeeding: For both Massachusetts and control states (Table 3), children in high-income households were more likely to be breastfed than those in low/moderate income households (p=0.006, p<0.001, respectively). However, this disparity between income groups decreased from 13.2-percentage points to 10.7-percentage points in Massachusetts, and increase from 15.3-percentage points to an 18.5-percentage point difference in control states. In the absence of reform, the disparity could have increased to 16.5-percentage points in Massachusetts (p=0.016). Table 4 shows that the changes in disparities between both time periods were not significant in Massachusetts or the control states. Therefore, the improvement in disparities of 5.7-percentage points due to health reform was not statistically significant (p=0.524).

Table 3. Adjusted Health Indicator Estimates Before and After Reform for Massachusetts and Control States by Income Level of Child's Household.

Child Health Indicators	Household Income ≤300% FPL		Household Income >300% FPL		Disparity [≤300% - >300% FPL]		Disparity without Reform	
	Percent (Standard Error)							
Overall Health is Excellent/Very Good								
Before Reform								
MA	82.1%	(0.02)	93.7%	(0.01)	-11.6%*	(0.02)	-11.6%*	(0.02)
Controls	82.0%	(0.01)	93.0%	(0.01)	-11.0%*	(0.01)		
After Reform								
MA	81.2%	(0.02)	94.1%	(0.01)	-12.9%*	(0.02)	-16.3%*	(0.03)
Controls	78.4%	(0.01)	94.1%	(0.01)	-15.6%*	(0.02)		
No Special Health Care Needs								
Before Reform								
MA	73.9%	(0.02)	80.4%	(0.01)	-6.5%*	(0.02)	-6.5%*	(0.02)
Controls	80.7%	(0.01)	81.1%	(0.01)	-0.4%	(0.01)		
After Reform								
MA	76.5%	(0.02)	78.4%	(0.01)	-1.9%	(0.03)	-10.1%*	(0.03)
Controls	77.2%	(0.01)	81.3%	(0.01)	-4.1%*	(0.02)		
Was Ever Breastfed (ages 0-5 years)								
Before Reform								
MA	47.9%	(0.06)	61.1%	(0.06)	-13.2%*	(0.05)	-13.2%*	(0.05)
Controls	46.5%	(0.05)	61.8%	(0.05)	-15.3%*	(0.03)		
After Reform								
MA	60.4%	(0.07)	71.1%	(0.06)	-10.7%$^{\mp}$	(0.06)	-16.5%*	(0.07)
Controls	62.6%	(0.06)	81.1%	(0.04)	-18.5%*	(0.04)		
Has Low/No Risk of Developmental Delay (ages 1-5 years)								
Before Reform								
MA	59.4%	(0.07)	71.2%	(0.06)	-11.8%*	(0.05)	-11.8%*	(0.05)
Controls	64.2%	(0.06)	73.6%	(0.05)	-9.4%*	(0.03)		
After Reform								
MA	58.6%	(0.08)	71.6%	(0.06)	-12.9%$^{\mp}$	(0.07)	-9.4%	(0.08)
Controls	62.8%	(0.06)	69.8%	(0.06)	-7.0%$^{\mp}$	(0.04)		
Has no School Absences (ages 6-17 years)								
Before Reform								
MA	18.1%	(0.02)	15.1%	(0.01)	3.0%	(0.03)	3.0%	(0.03)
Controls	20.4%	(0.02)	16.5%	(0.01)	3.9%*	(0.02)		
After Reform								
MA	16.8%	(0.02)	14.4%	(0.02)	2.4%	(0.03)	6.8%$^{\mp}$	(0.04)
Controls	22.5%	(0.02)	14.8%	(0.01)	7.7%*	(0.02)		

* Disparity is statistically significant at the α=0.05 level

$^{\mp}$ Disparity is statistically significant at the α=0.1 level

Table 3. Continued

Child Health Indicators	Household Income ≤300% FPL		Household Income >300% FPL		Disparity [≤300% - >300% FPL]		Disparity without Reform	
	Percent (Standard Error)							
Has Health Insurance								
Before Reform								
MA	94.3%	.	97.9%	.	-3.6%	.	-3.6%	.
Controls	93.4%	.	97.6%	.	-4.1%	.		
After Reform								
MA	98.1%	.	99.5%	.	-1.4%	.	-3.5%	.
Controls	94.8%	.	98.8%	.	-4.0%	.		
Has Consistent Health Insurance								
Before Reform								
MA	84.1%	(0.02)	96.0%	(0.01)	-11.9%*	(0.02)	-11.9%*	(0.02)
Controls	86.2%	(0.01)	94.9%	(0.00)	-8.7%*	(0.01)		
After Reform								
MA	90.5%	(0.02)	97.5%	(0.01)	-6.9%*	(0.02)	-13.2%*	(0.02)
Controls	87.2%	(0.01)	97.2%	(0.00)	-10.0%*	(0.01)		
Has a Personal Doctor or Nurse								
Before Reform								
MA	86.6%	(0.01)	95.0%	(0.01)	-8.4%*	(0.02)	-8.4%*	(0.02)
Controls	86.6%	(0.01)	94.7%	(0.00)	-8.2%*	(0.01)		
After Reform								
MA	94.2%	(0.01)	98.5%	(0.00)	-4.3%*	(0.01)	-5.4%*	(0.02)
Controls	92.4%	(0.01)	97.5%	(0.00)	-5.1%*	(0.01)		
Had 1 or More Preventive Medical Visit								
Before Reform								
MA	87.9%	(0.01)	95.5%	(0.01)	-7.6%*	(0.02)	-7.6%*	(0.02)
Controls	85.3%	(0.01)	91.4%	(0.01)	-6.1%*	(0.01)		
After Reform								
MA	85.5%	(0.02)	95.7%	(0.01)	-10.2%*	(0.02)	-8.3%*	(0.02)
Controls	86.7%	(0.01)	93.5%	(0.01)	-6.8%*	(0.01)		

* Disparity is statistically significant at the α=0.05 level

Ŧ Disparity is statistically significant at the α=0.1 level

Developmental Delay: Before the reform, children in high-income households were significantly more likely to be at low/no risk of developmental delay than children in low/moderate income households for both Massachusetts (p=0.023) and control states (p=0.005). After reform, the disparity slightly increased to 12.9-percentage points for Massachusetts (p=0.054), and decreased to a 7-percentage point difference in control states (p=0.79). Without reform, the disparity would have improved (9.4-percentage points) in Massachusetts. Table 4 shows that the changes in disparities in both Massachusetts and control states were not significant (p=0.888, p=0.636, respectively). The overall effect of reform shows that the disparity worsened by 3.6-percentage points, but this is also not statistically significant (p=0.712).

School Absence: Before reform and after reform there are no significant disparities between high-income and low/moderate income children in Massachusetts. However, without the reform there is a 6.8 percentage point

difference were children in low/moderate income households are more likely to not miss school than high-income children (p=0.067). In control states, children in low/moderate income households are more likely to not miss school than high-income children before (p=0.024) and after reform (p<0.001). There were no significant changes in disparities before and after reform for both Massachusetts and control states. The effect of reform was also not significant (DDD= -4.4%, p=0.344).

Table 4. Unadjusted Difference-in-Difference-in-Difference (DDD) Results

Percent (Standard Errors)

Child Health Indicators	Disparities Before Reform		Disparities After Reform		DD for Location		DDD		
	Percent (Standard Error)								*p-value*
Overall Health is Excellent/Very Good									
MA	-11.6%	(0.02)	-12.9%	(0.02)	-1.3%	(0.03)	**3.3%**	(0.03)	0.342
Controls	-11.0%	(0.01)	-15.6%	(0.02)	-4.6%*	(0.02)			
No Special Health Care Needs									
MA	-6.5%	(0.02)	-1.9%	(0.03)	4.5%	(0.04)	8.2%Ŧ	(0.04)	0.056
Controls	-0.4%	(0.01)	-4.1%	(0.02)	-3.7%Ŧ	(0.02)			
Was Ever Breastfed (ages 0-5 yrs)									
MA	-13.2%	(0.05)	-10.7%	(0.06)	2.5%	(0.08)	**5.7%**	(0.09)	0.524
Controls	-15.3%	(0.03)	-18.5%	(0.04)	-3.2%	(0.05)			
Has Low/No Risk of Developmental Delay (1-5 yrs)									
MA	-11.8%	(0.05)	-12.9%	(0.07)	-1.1%	(0.08)	**-3.6%**	(0.10)	0.712
Controls	-9.4%	(0.03)	-7.0%	(0.04)	2.4%	(0.05)			
Has no School Absences (ages 6-17 years)									
MA	3.0%	(0.03)	2.4%	(0.03)	-0.6%	(0.04)	**-4.4%**	(0.05)	0.344
Controls	3.9%	(0.02)	7.7%	(0.02)	3.8%	(0.03)			
Child Has Health Insurance									
MA	-3.6%	.	-1.4%	.	2.2%	.	**2.1%**	**.**	,
Controls	-4.1%	.	-4.0%	.	0.1%	.			
Child Has Consistent Health Insurance									
MA	-11.9%	(0.02)	-6.9%	(0.02)	5.0%*	(0.03)	6.3%*	(0.03)	0.035
Controls	-8.7%	(0.01)	-10.0%	(0.01)	-1.3%	(0.02)			
Child Has a Personal Dr or Nurse									
MA	-8.4%	(0.02)	-4.3%	(0.01)	4.1%*	(0.02)	**1.1%**	(0.03)	0.673
Controls	-8.2%	(0.01)	-5.1%	(0.01)	3.0%*	(0.01)			
Child Had 1 or More Preventive Medical Visits									
MA	-7.6%	(0.02)	-10.2%	(0.02)	-2.6%	(0.03)	**-2.0%**	(0.03)	0.550
Controls	-6.1%	(0.01)	-6.8%	(0.01)	-0.7%	(0.02)			

Disparity = (≤300% FPL) – (>300% FPL)

* Changes in disparities before to after reform are statistically significant at the α=0.05 level

Ŧ Changes in disparities before to after reform are statistically significant at the α=0.1 level

Health Insurance: Before the reform (Table 3), high-income households were more likely to have insurance for their children than low-income households (97.9% vs. 94.3%, respectively) in Massachusetts. After the reform, the

income disparity decreased to 1.4-percentage points, nearly eliminating uninsurance among children in Massachusetts. Among the control states, the health insurance income disparity remained approximately 4-percentage points before and after reform. The overall effect of reform in Massachusetts was a 2.1-percentage point improvement in the disparity (Table 4). However, due to the small number of uninsured children after reform, standard errors for these estimates could not be generated by the bootstrapping method.

Consistent Insurance: There were some significant changes in having consistent insurance among children. Those in high-income households were more likely to have consistent insurance coverage than low/moderate income households by an 11.9-percentage points difference ($p<0.001$) in Massachusetts. This income disparity significantly decreased by 5-percentage points ($p=0.048$) after reform as shown in Table 4. If there were no reform, the disparity would have been a 13.2-percentage point difference between low/moderate and high-income children. In control states, significant income disparities remained before (8.7%, $p<0.001$) and after (10%, $p<0.001$) health reform (Table 3), but these changes in the disparity were not statistically different. The overall effect of reform was a significant 6.3-percentage point improvement in the disparity (0.035).

Personal Doctor or Nurse: In both Massachusetts and control states, the income disparity was approximately 8-percentage points for having a PDN before reform. After reform the disparities did significantly decrease by 4 and 3-percentage points, respectively, for Massachusetts ($p=0.043$) and the control states ($p=0.04$). However reform did not have an effect in changing the disparity in Massachusetts (DDD=1.1%, P=0.673).

Preventive Medical Care: Before the reform, children in high-income households are more likely to have a preventive medical care visit than children in low/moderate income households in Massachusetts ($p<0.001$) and the control states ($p<0.001$). The income disparity slightly increased after reform for both Massachusetts and control states by 2.6 and 0.7-percentage points, respectively; however it was not a significant change (Table 4). As a result, the income disparity became worse by 2-percentage point due to health reform, but this was not significant as well ($p=0.55$).

Conclusion

The key finding of this analysis was that health reform did have an effect in improving income disparities for having consistent insurance. We were unable to generate standard errors for health insurance status for the DDD analysis. However, after reform was enacted in Massachusetts, the disparity by income was almost eliminated, which is noteworthy.

The remaining dependent variables represent health indicators that measure different aspects of health status (overall health, no SHCN, breastfeeding, developmental delay, and school absences) or utilization of care (having a PDN, having a preventive medical visit). For the indicators pertaining to health status, all except for school absences had significant income disparities before reform. When comparing the disparity before and after the reform, there were no significant changes (Table 4) - even among indicators that did not have significant differences at the $\alpha=0.05$ level between low/moderate and high-income children after reform (Table 3: no SHCN, breastfeeding, and developmental delay). The only notable improvement in disparities as an effect of health reform was with the no SHCN indicator, but this finding was only statistically significant at the $\alpha=0.1$ level.

Among the two health indicators pertaining to utilization of care, significant disparities persisted before and after reform. Disparities did significantly increase before reform for having a PDN, but the same trend was found in control states, thus leading to a null finding for the overall health reform effect. Overall the DDD analysis showed that the Massachusetts health reform did not significantly reduce disparities by income for health indicators that measured health status or utilization of care.

Studies have shown that making health insurance coverage more attainable might increase coverage and health care utilization, but it does not eliminate disparities. There is little evidence that supports the premise that insurance improves health. The RAND Health Insurance Experiment (HIE) is one of the only experimental studies that randomized participants into health plans with various levels of cost-sharing (Levy & Meltzer, 2008; Manning et al., 1987), however they did not including a group of individuals without insurance. The study did find that decreased cost-sharing increased utilization of services, but this did not translate to better health outcomes,(Levy & Meltzer, 2008; Manning et al., 1987) except in some

subgroups of the population such as children. Parents appeared to access necessary health care services for their children despite the financial barriers to health insurance (Levy & Meltzer, 2008). Similar to these findings, we did not find any changes in utilization of health care due to health reform.

Overall there are significant challenges faced when researching this topic. Health insurance is an endogenous variable, and therefore not all factors that influence whether one has insurance are captured by the available data. Many studies, not even the RAND HIE, take endogeneity into account (Levy & Meltzer, 2008). There are also more than one pathway in which having insurance affects health and vice versa (Braveman, Egerter, & Williams, 2011; Cutler, Lleras-muney, & Vogl, 2008). For instance, someone may have insurance and still lacks access to preventive care due to other external barriers, which leads to poor health, and thus may not change reports of overall health.

There is still evidence that those who benefit the most from having health insurance are disadvantaged groups such as the poor, and people in critical periods of their life such as children and pregnant women (Ben-shlomo & Kuh, 2002; Levy & Meltzer, 2008). Therefore it can very well be that insurance did improve health outcomes for specific subgroups, for health outcomes not captured in this analysis, or that it takes a longer period of time to see changes in health outcomes. Increasing consistent health coverage may reduce financial barriers to the family and improve their quality of life, but this is not captured in this analysis. The next steps of the study would be to evaluate weather other covariates added to the model might explain or change some of the findings in this analysis, and to conduct multiple imputations of missing income values. This analysis will also be expanded to look at any changes in racial/ethnic disparities as a result of health reform.

Limitations: There are some limitations to this analysis. The data are parent reported and thus are subject to respondent bias. The study can also only be generalizable to the states that were included in the analysis. Especially since the New England states have different socioeconomic and demographic compositions compared to the rest of the US. The paper utilized single imputations for missing income values, which might result in standard errors that are a little less conservative than standard errors from multiply imputed values. There are also some differences in the sample design between the NSCH1 and NSCH3. The NSCH3 incorporated a cell-phone sample in the design whereas the NSCH1 used a landline design only. However, non-coverage bias for the NSCH1 was considered minimal at that time (Blumberg, Ph, & Luke, 2010).

References:

Ben-shlomo, Y., & Kuh, D. (2002). EDITORIAL A life course approach to chronic disease epidemiology : conceptual models , empirical What is a Life Course Approach to Chronic, (Figure 2), 285–293.

Blumberg, S. J., Ph, D., & Luke, J. V. (2010). Wireless Substitution : Early Release of Estimates From the National Health Interview Survey , July – December 2009, (December 2009), 1–17.

Blumberg SJ, Foster EB, Frasier AM, et al. (2012). Design and Operation of the National Survey of Children ' s Health , 2007. *National Center for Health Statistics. Vital Health Statistics*, *1*(55).

Braveman, P., Egerter, S., & Williams, D. R. (2011). The social determinants of health: coming of age. *Annual review of public health*, *32*, 381–98. doi:10.1146/annurev-publhealth-031210-101218

Cohen, R. A., & Martinez, M. E. (2012). Health Insurance Coverage : Early Release of Estimates From the National Health Interview Survey , 2011. *National Center for Health Statistics.*, 1–37. Retrieved from http://www.cdc.gov/nchs/nhis/releases. htm.

Cutler, D. M., Lleras-muney, A., & Vogl, T. (2008). Socioeconomic Status and Health: Dimentions and Mechanisms. *National Bureau of Economic Research Working Paper Series*, *Working Pa*, 1–53. Retrieved from http://www.nber.org/papers/w14333

Haas, S. a, Glymour, M. M., & Berkman, L. F. (2011). Childhood health and labor market inequality over the life course. *Journal of health and social behavior*, *52*(3), 298–313. doi:10.1177/0022146511410431

Heslin, K. C., Casey, R., Shaheen, M. a, Cardenas, F., & Baker, R. S. (2006). Racial and ethnic differences in unmet need for vision care among children with special health care needs. *Archives of ophthalmology*, *124*(6), 895–902. doi:10.1001/archopht.124.6.895

Honberg, L., McPherson, M., Strickland, B., Gage, J. C., & Newacheck, P. W. (2005). Assuring adequate health insurance: results of the National Survey of Children with Special Health Care Needs. *Pediatrics*, *115*(5), 1233–9. doi:10.1542/peds.2004-1503

Howell, E. M., & Kenney, G. M. (2012). The impact of the Medicaid/CHIP expansions on children: a synthesis of the evidence. *Medical care research and review : MCRR*, *69*(4), 372–96. doi:10.1177/1077558712437245

Kenney, G. M., Long, S. K., & Luque, A. (2010). Health reform in Massachusetts cut the uninsurance rate among children in half. *Health affairs (Project Hope)*, *29*(6), 1242–7. doi:10.1377/hlthaff.2010.0314

Levy, H., & Meltzer, D. (2008). The impact of health insurance on health. *Annual review of public health*, *29*, 399–409. doi:10.1146/annurev.publhealth.28.021406.144042

Manning, W. G., Newhouse, J. P., Duan, N., Keeler, E. B., Leibowitz, A., & Marquis, M. S. (1987). Health Insurance and the Demand for Medical Care: Evidence from a Randomized Experiment. *American Economic Review*, *77*(3), 251–277.

Martinson, M. L. (2012). Income inequality in health at all ages: a comparison of the United States and England. *American journal of public health*, *102*(11), 2049–56. doi:10.2105/AJPH.2012.300929

OECD Publishing. (2011). *Kaiser Family Foundation. Summary of new health reform law*. doi:10.1787/9789264122314-en