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The Effect of Medicaid Expansion in New York State on Use of Subspecialty Surgical Procedures by Medicaid Beneficiaries and the Uninsured

Aviram M Giladi, MD, Oluseyi Aliu, MD, MS, and Kevin C Chung, MD, MS, FACS

From the Department of Surgery, Section of Plastic Surgery, University of Michigan Health System (Giladi, Aliu) and Department of Surgery, Section of Plastic Surgery, University of Michigan Medical School (Chung), Ann Arbor, MI

Abstract

BACKGROUND—Understanding the benefits of Medicaid is crucial as states decide whether to expand Medicaid under the Patient Protection and Affordable Care Act. We used the 2001 Medicaid expansion in New York to evaluate changes in use by Medicaid beneficiaries and the uninsured of breast cancer reconstruction, panniculectomy, and lower-extremity trauma management.

METHODS—Data for all patients 19 to 64 years old having undergone the selected procedures between 1998 and 2006 were obtained from the State Inpatient Database. We used an interrupted time series using variance weighted least squares regression to evaluate the effect of Medicaid expansion on the probability that Medicaid beneficiaries or uninsured patients received the procedures. We also determined the predicted use had there been no expansion. New York Census data were used for population-adjusted case-volume calculations.

RESULTS—Likelihood of Medicaid as the primary payer increased significantly after expansion, 0.34% per quarter (95% CI, 0.28–0.40), without a decrease in uninsured patients receiving these procedures. This resulted in a 7.2% increase in the proportion of Medicaid beneficiaries receiving these procedures, an additional 1.9 Medicaid cases per quarter per 100,000 New York residents. In subgroup analysis, the proportion of Medicaid beneficiaries increased for breast reconstruction (0.28% per quarter; 95% CI, 0.21–0.35) and panniculectomy (0.19% per quarter; 95% CI, 0.1–0.28) without a decrease for the uninsured. Lower-extremity trauma procedures had a decreasing

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Correspondence address: Kevin C Chung, MD, MS, Department of Surgery, Section of Plastic Surgery, University of Michigan Medical School, 2130 Taubman Center, SPC 5340, 1500 East Medical Center Dr, Ann Arbor, MI 48109. kechung@med.umich.edu.

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trend in use by uninsured patients with a slight increase for Medicaid beneficiaries (not significant).

CONCLUSIONS—Subspecialty surgeons responded to expansion by increasing volume of procedures for Medicaid beneficiaries. This occurred without decline in care for the uninsured, suggesting that Medicaid expansion resulted in increased access for underserved patients. Although more patients received needed care once they had coverage, subgroup analysis identified persistence of additional barriers to use of certain surgical services.

The Patient Protection and Affordable Care Act was signed into law in 2010. Since then, federal and state governments have been preparing for substantial changes in the health insurance system. One of the most staunchly debated issues at the state level is whether to participate in Medicaid expansion beginning in January 2014.^{1–3} Although numerous issues have been cited in this debate, one of the most contentious topics is whether expansion of Medicaid coverage results in improved access to care and use of services for beneficiaries.^{4–8}

When evaluating the effects of expanding insurance coverage, certain elements unchanged by the expansion are difficult to control, including access to providers, at-home support systems, and others. As a result, evaluating “natural experiments” of health insurance in states that have previously expanded coverage can provide insight into the results of expansion. Although numerous studies have been published that evaluate such natural experiments in Oregon, Massachusetts, New York, and other states, they have focused on primary care, preventive care, and emergency services.^{9–13} The effects on much more costly specialty services, including subspecialty surgical procedures, have not been explored adequately.

Addressing how changes in government-sponsored health care coverage affect use of subspecialty services is pertinent, considering the ongoing national debate on Medicaid expansion. This issue is of particular interest because Medicaid beneficiaries already encounter substantial difficulties in accessing specialty services.^{6,14–18} We used the largest natural experiment of Medicaid-only expansion, in New York State in 2001,^{19,20} to evaluate the effects of this policy change on use of inpatient plastic and reconstructive surgery procedures by Medicaid beneficiaries. We also assessed use by patients without health insurance coverage (ie, uninsured) to understand if expanding Medicaid resulted in reduced access to previously available care for those who remained uninsured.

METHODS

Medicaid expansion in New York State

In 1999, the Health Care Reform Act (HCRA) became New York law.^{19,20} Under the HCRA, eligibility for public health insurance coverage was expanded to include parents of dependent children with annual incomes up to 150% of the Federal Poverty Level, as well as childless, nonelderly, nondisabled adults earning up to 100% of the Federal Poverty Level.²⁰ These New York citizens became eligible for enrollment in Medicaid via the Family Health Plus program starting in October (4th quarter) of 2001. This was implemented across all of New York, except for New York City, where it was delayed 1.5 years in the aftermath of the

September 11th terrorist attacks. However, in the period from September 11, 2001 to April 1, 2003, the replacement program Disaster Relief Medicaid (DRM) was implemented, and eligibility parameters were identical to those under the HCRA.²⁰ Under DRM, patients were given Medicaid coverage and classified in the State Inpatient Database in the same group as those receiving Medicaid under Family Health Plus. As DRM was phased out leading into April of 2003, those who remained eligible were shifted from DRM onto Family Health Plus Medicaid.

Data sources

Data from the New York State Inpatient Database for 1998–2006 were used. This database, which uses diagnosis and procedural codes from the ICD-9-CM, was built as part of the Healthcare Cost and Utilization Project under the Agency for Healthcare Research and Quality. The State Inpatient Database contains all discharge records from acute care hospitals in New York, including outpatient procedures performed in hospital-based ambulatory facilities.²¹

Study population

Using ICD-9-CM procedure codes, we selected all patients 19 to 64 years old who underwent inpatient subspecialty surgery procedures of breast cancer reconstruction, surgery for management of lower-extremity trauma, and panniculectomy (collectively will be called “subspecialty procedures”). Lower-extremity trauma surgery was subclassified into salvage (ie, reconstruction including local repair as well as regional and free-transfer flaps) and amputation. Because of a lack of specificity with ICD-9-CM procedure codes, we used diagnosis codes to filter for the patients and procedures associated with the appropriate diagnoses. Our procedure and diagnosis code list was reviewed and verified for completeness by the University of Michigan surgical billing and coding specialists.

We selected surgical subspecialty procedures that require an inpatient hospital stay, with the associated additional admission and care costs to hospitals. Each procedure has a unique referral pattern, which helps elucidate variation in how Medicaid expansion affects procedure use. Lower-extremity trauma procedures are high acuity and often occur after an emergency admission. Alternatively, panniculectomy and breast cancer reconstruction are often dependent on outpatient referral and are generally considered to be elective. Access to and coverage of breast cancer reconstruction is distinct from panniculectomy because of the mandatory coverage of reconstructive procedures, as provided by the 1998 Women’s Health and Cancer Rights Act (WHCRA). Under the WHCRA, enacted fully in New York, any insurance carrier providing coverage for a patient undergoing a mastectomy for breast cancer treatment must also provide coverage for breast reconstruction procedures.²² This coverage was implemented before the initiation of HCRA.

Longitudinal analysis

We used a 2-step analysis to evaluate longitudinal changes in proportion of subspecialty procedures provided to Medicaid beneficiaries and the uninsured. The 2 steps were necessary to convert our patient-visit level cross-sectional data into longitudinal data. This

allowed us to evaluate the trend in access to subspecialty surgical care over time for both patient groups.

In step 1, we used patient-level logistic regression models to predict the adjusted proportion of patients undergoing any of the selected subspecialty procedures during each 3-month block (quarter) between 1998 and 2006. Separate models were used to evaluate the Medicaid population and the uninsured population. The key predictor in these models was the quarter in which the patient was treated. These models controlled for age, race, sex, and pre-expansion hospital Medicaid burden. We confirmed good model fit by calculating a c-statistic for each model.

In step 2, we used the adjusted predictions of the quarterly proportion of Medicaid beneficiaries and uninsured patients receiving the selected procedures in an interrupted time series using variance weighted least squares regression.²³ This model accounted for the standard errors of these quarterly estimates. The variables central to this interrupted time series analysis are a dichotomous variable for the pre- vs post-intervention time period (Medicaid expansion under HCRA, pre and post October 2001), time as a continuous variable, and an interaction between these variables.²³ Good fit for all variance weighted least squares regression models was demonstrated on visual inspection of observed vs expected plots.

Variance weighted least squares regression results provided coefficients for each of these variables. We then calculated the abrupt change in percent Medicaid and percent uninsured after expansion, whether the temporal slope changed post expansion, and the absolute effect of the expansion. This absolute effect is determined by comparing the observed post-expansion results with predicted data in a scenario without expansion, using methodology described by Wagner and colleagues.²³ Based on New York demographic data,²⁴ we also calculated population-adjusted numbers of patients treated in each quarter across the study period to evaluate the absolute number of Medicaid and uninsured patients who received the subspecialty procedures.

RESULTS

A total of 185,526 patients underwent one of the selected subspecialty surgery procedures during the 9-year study period; 68,730 of these procedures took place in the 3.5 years evaluated before Medicaid expansion, and the remaining 116,796 took place after expansion ("intervention"). Seventy-seven percent of the cases for lower-extremity trauma surgery occurred after emergency department admission, and 84% of breast cancer reconstruction cases and 83% of panniculectomy cases were from admissions after physician referral. Demographic data and descriptive statistics can be found in Table 1. Logistic regression results from step 1 of the longitudinal analysis are available in Table 2.

Longitudinal time series analysis showed a significant post-expansion change in the probability that any patient receiving the selected subspecialty surgical procedures was a Medicaid beneficiary. Before expansion, there was a declining trend in the probability of treated patients being Medicaid beneficiaries ($p < 0.01$; -0.19% per quarter; 95% CI, -0.1 to

–0.29). However, after expansion, there was a significant reversal to a positive and growing trend of treated patients being Medicaid beneficiaries ($p < 0.01$; 0.34% per quarter; 95% CI, 0.22 to 0.46) (Table 3). When compared with the expected proportion from a predicted trajectory had there been no Medicaid expansion, the proportion of Medicaid beneficiaries that actually received the subspecialty surgical procedures was 7.2% higher (95% CI, 5.3 to 9.1) within the first 5 years post expansion (Fig. 1). In contrast, Medicaid expansion did not have a significant effect on the proportion of uninsured patients having these procedures (Table 3, Fig. 2).

With subgroup analysis, overall trend showed an increasing probability of Medicaid beneficiaries receiving procedures treating lower-extremity trauma both before and after expansion (0.18% per quarter pre expansion vs 0.16% per quarter post expansion; results not significant). For the uninsured, there was a change from an increasing trend before expansion (0.17% per quarter) to a downward trend after expansion (–0.33% per quarter); however, these results did not reach significance ($p = 0.09$) either. Separate subgroup analysis of lower-extremity salvage procedures and lower-extremity amputation procedures did not have significant results either (Table 4).

The probability of a Medicaid beneficiary undergoing breast cancer reconstruction had a significant increasing post-expansion trend of 0.28% per quarter ($p < 0.01$; 95% CI, 0.14–0.42) (Table 5). This resulted in a 5.5% increase in the proportion of breast cancer reconstruction cases for Medicaid beneficiaries as compared with predictions based on pre-intervention trajectory (Fig. 3). For the uninsured, at the time of expansion, a 1% decrease (from 4% to 3% of cases) was seen (Fig. 4); however, this result did not reach statistical significance ($p = 0.10$; Table 5). Trend results of proportion of uninsured patients receiving breast cancer reconstruction remained relatively constant with no significant change (Table 5).

The results for panniculectomy showed a less distinct but also statistically significant increasing trend in proportion of procedure volume for Medicaid beneficiaries. Although a decrease of nearly 1.5% was seen at the time of intervention (not significant, $p = 0.12$), the proportion of Medicaid beneficiaries having panniculectomy increased 0.19% per quarter ($p = 0.05$; 95% CI, 0.01–0.37) (Table 5). This resulted in a 2.5% increase above predicted trajectory if no expansion had occurred (Fig. 5). A much higher proportion of panniculectomy cases were provided to the uninsured as compared with other surgical procedures evaluated. At the time of intervention, a drop of 6.1% was seen (Table 4), however, this result was not statistically significant ($p = 0.17$; 95% CI, –15.1 to 3.1). Trend results of proportion of uninsured receiving panniculectomy remained relatively constant with no significant change (Table 5).

The results described here reflect proportions of case volume delivered to Medicaid beneficiaries and the uninsured. However, these proportions can also be analyzed as population-based rates. Within 5 years post intervention, the significant increase in proportion of subspecialty surgery volume for Medicaid beneficiaries resulted in an increase of > 1.9 cases/100,000 population per quarter—an increase from a predicted 3.74 cases/100,000 to 5.66 cases/100,000 (Fig. 6). For breast cancer reconstruction, the increase for

Medicaid beneficiaries was 0.18 cases/100,000 population, from a predicted 0.11 cases/100,000 population up to 0.29 cases/100,000 (not shown). For panniculectomy the increase was 0.11 cases/100,000 population, from a predicted 0.13 cases/100,000 population up to 0.24 cases/100,000 (not shown).

DISCUSSION

Medicaid beneficiaries comprised a considerably greater proportion of the patients receiving selected subspecialty surgical procedures after expansion of Medicaid coverage in New York in 2001. The increase in relative and absolute rates of procedure volume occurred without decline in volume of services provided to those who remained uninsured. This indicates that after Medicaid expansion, there was an overall increase in delivery of subspecialty surgical care to the underserved (uninsured and Medicaid). Subspecialty surgeons responded to the influx of Medicaid beneficiaries by increasing services to these newly insured patients; however, subgroup analysis revealed that this effect was more substantial for certain procedures than for others.

Lower-extremity trauma surgery did not see a substantial change in proportion of care received by Medicaid beneficiaries. This is likely due to the unpredictable nature of these injuries and procedures, as well as the proportion of these cases that might be covered by auto insurance or other accident-related coverage irrespective of the patient's health insurance plan.²⁵ The most notable result with lower-extremity trauma surgery was the slowly decreasing trend of uninsured patients having these procedures. Although these results did not reach significance in our limited subgroup analysis, we found that fewer patients requiring these emergency surgical procedures were without coverage to offset the astronomical costs. Although not the focus of this article, this result highlights another proposed benefit of coverage expansion, as fewer New York trauma victims were without insurance at a time of catastrophe.^{26,27}

The 2 procedures more dependent on outpatient referral, breast cancer reconstruction and panniculectomy, had increased proportion of care to Medicaid beneficiaries without a drop in care to the uninsured. The increase in volume of these procedures might represent an increased willingness of patients to seek appropriate outpatient preoperative consultation and care.²⁸ The difference in magnitude of change, with breast cancer reconstruction seeing a more substantial increase, might be due to WHCRA helping patients navigate through the ablative stage to receive post-mastectomy reconstruction. Once coverage was provided and the patients received oncology care, access to reconstruction was more readily available. Keating and colleagues reported that expansion of coverage in Massachusetts did not result in an increase of mammography screening or earlier cancer diagnosis.¹⁰ Although our study does not address rates of breast cancer diagnosis, the results indicate that with expansion of Medicaid, these important reconstructive procedures were provided more frequently to this already underserved population. Patients with breast cancer who did not believe they had adequate health care coverage before expansion might not have pursued reconstructive surgery even after implementation of the WHCRA, and having Medicaid coverage might have alleviated some of those concerns.

Considering the many reports that highlight the difficulties Medicaid beneficiaries and the uninsured face in receiving specialty care, these results are encouraging.^{14–17} The findings are also important, considering that the uninsured are often reluctant to seek care due to concerns about cost and, as a result, often have worse health outcomes.^{6,14,15,29–31} With the increase in Medicaid coverage, perhaps more patients in New York were willing to seek out and receive specialty care. Similar results were reported by Hanchate and colleagues, who reported that use of inpatient surgical procedures increased after institution of universal coverage in Massachusetts.²⁸ However, the increase in care delivery from that study might have been attributed to the private insurance coverage provided under Massachusetts' laws rather than Medicaid.^{32,33} In New York, we identified an increase due to expansion in Medicaid alone.

This study has limitations. As with any retrospective database study, our analysis and results are dependent on accuracy of data capture and reporting. Although we used numerous approaches to validate the data, we cannot assure complete accuracy in reporting or entry. One area where this might have been problematic, as indicated in Table 1, is in subgroup analysis capturing far fewer cases (especially for lower-extremity trauma surgery and panniculectomy). This was likely due to limitations of ICD-9 coding specificity. For example, some reconstructive options specific to the lower extremity (eg. free flaps) are not adequately coded and might have been lost. However, this might have also been caused by hospitals and coders using the general codes for the specialty services provided instead of the more specific codes needed for our subgroup analysis. This might have compromised the significance of subgroup analysis results due to fewer cases (and therefore wider confidence intervals), but also might have resulted in inaccuracy of case distribution in these groups. These coding limitations would not have affected our overall analysis of subspecialty surgery.

Considering that Medicaid administration varies in each state, and provider participation in Medicaid is also variable,^{34,35} these results might not be transferable to all expansions of Medicaid. Although the New York expansion was the largest Medicaid-only expansion in the pre–Patient Protection and Affordable Care Act era,^{20,36} in number of eligible as well as enrolled beneficiaries, this limitation in transferability is not avoidable in this study design.

After coverage expansion, Medicaid enrollment and use of services are often not instantaneous events.^{20,36} The increasing trend during the 5 post-expansion years studied is representative of this expected delay in use of expanded coverage. It is encouraging, however, to see that providers continued to increase care delivery to Medicaid beneficiaries over time rather than seeing a plateau after expansion. These results are supportive of the overall findings in this study, showing the positive response of subspecialty surgical providers to the increase in Medicaid as a primary payer in New York.

What is not clear from this study is whether these additional surgical services for Medicaid beneficiaries occur in the same hospitals already accepting high numbers of Medicaid beneficiaries, or if additional providers and hospital systems began to accept Medicaid payments for these services. Studying the change in hospital Medicaid penetration after expansion is pertinent to fully understanding the effects of this expansion in Medicaid

access. Should the trends identified in this study be seen in other states when expansion of Medicaid occurs under the Patient Protection and Affordable Care Act beginning in January 2014, it will be important to understand how provider and cost-sharing burden changes across different health care systems, as more subspecialty surgical services are provided to a growing pool of Medicaid beneficiaries.

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Figure 1.

Interrupted time series results showing probability of Medicaid as the primary payer for the selected subspecialty surgical procedures, before and after expansion. Intervention occurs at 15th quarter (red line).

Figure 2.

Interrupted time series results showing probability of patient being uninsured and receiving the selected subspecialty surgical procedures, before and after expansion. Intervention occurs at 15th quarter (red line).

Figure 3.

Interrupted time series results showing probability of Medicaid as the primary payer for breast cancer reconstruction. Expansion occurs at 15th quarter (red line).

Figure 4. Interrupted time series results showing probability of uninsured patient having received breast cancer reconstruction. Expansion occurs at 15th quarter (red line).

Figure 5.

Interrupted time series results showing probability of Medicaid as the primary payer for panniculectomy. Expansion occurs at 15th quarter (red line).

Figure 6.

Population-adjust number of cases provided to Medicaid beneficiaries and the uninsured, alongside predicted trajectory of case numbers had expansion not occurred.

Table 1

Description of Patient-Level and Treating Facility-Level Variables (n = 185,526)

	Medicaid (n = 36,341)		Uninsured (n = 18,852)	
	Pre *	Post [†]	Pre *	Post [†]
n (% of total)	13,051 (19.0)	23,290 (19.9)	7,676 (11.2)	11,176 (9.6)
Age, %				
19–34 y	20.1	18.5	26.9	26.8
35–49 y	36.5	36.2	36.4	39.8
50–64 y	42.2	44.3	35.5	32.5
Female, %	46.0	44.2	61.4	60.8
Race, %				
White	30.8	31.6	52.2	42.0
Black	33.9	32.2	14.2	15.8
Hispanic	15.8	19.3	10.2	11.0
Other	13.9	13.6	14.2	15.3
Unspecified	6.3	3.4	9.3	15.9
Procedure category, n [‡]				
LE trauma surgery [§]	282	567	326	450
Breast reconstruction	463	1,043	320	410
Panniculectomy	255	609	2,518	3,838
Hospital pre-intervention Medicaid penetration, % ^{//}				
1 st quartile	5.6	—	33.7	—
2 nd quartile	15.4	—	14.8	—
3 rd quartile	31.2	—	17.0	—
4 th quartile (highest)	47.8	—	34.5	—

* Pre expansion.

[†] Post expansion.

[‡] Procedure totals are for cases used in subgroup analysis. These totals are well below the total number used in primary analysis due largely to limitations in ICD-9-CM code specificity for these procedure and diagnosis types. The lower-extremity trauma surgery category has the most substantial loss of cases in this analysis.

[§] Surgery for treatment of lower-extremity trauma.

// Observations in the post-expansion period were assigned variable values for the pre-intervention Medicaid penetration of the hospital in which they were admitted.

LE, lower extremity.

Table 2

Results from Step 1 Logistic Regression Models of Patient-Level Data

	Medicaid			Uninsured		
	OR	95% CI	p Value	OR	95% CI	p Value
Age						
19–34 y (reference)	—	—	—	—	—	—
35–49 y	0.96	0.88–1.04	0.33	0.52*	0.47–0.57	<0.001
50–64 y	0.84*	0.75–0.95	<0.01	0.34*	0.23–0.48	<0.001
Female	1.04	0.96–1.13	0.30	1.56*	1.11–2.20	0.01
Race						
White (reference)	—	—	—	—	—	—
Black	2.72*	2.36–3.13	<0.001	0.92	0.70–1.21	0.56
Hispanic	3.25*	2.66–3.98	<0.001	1.35	0.92–1.97	0.12
Other	2.24*	1.88–2.67	<0.001	1.95*	1.57–2.43	<0.001
Unspecified	1.21	0.94–1.56	0.15	2.65*	1.62–4.30	<0.001
Referral source						
Non-ED (reference)	—	—	—	—	—	—
ED	1.82*	1.57–2.11	<0.001	0.72	0.50–1.06	0.10
Other	1.16	0.76–1.77	0.48	0.34*	0.18–0.63	<0.01
Hospital pre-intervention Medicaid penetration, %						
1 st quartile (reference)	—	—	—	—	—	—

	Medicaid			Uninsured		
	OR	95% CI	p Value	OR	95% CI	p Value
2 nd quartile	2.64 *	2.01–3.48	<0.001	0.40	0.12–1.30	0.13
3 rd quartile	3.66 *	2.82–4.73	<0.001	0.43	0.14–1.32	0.14
4 th quartile (highest)	5.74 *	4.38–7.53	<0.001	1.02	0.38–2.74	0.97

* Significant result with p 0.05.
ED, emergency department; OR, odds ratio.

Table 3

Variance Weighted Least Squares Regression Results of Interrupted Time Series Analyses

	Subspecialty surgery					
	Medicaid			Uninsured		
	Coefficient	SE	p Value	Coefficient	SE	p Value
Change at time of Medicaid expansion	0.0053	0.0055	0.96	-0.0095	0.0129	0.46
Trend before expansion	-0.0019	0.0005	<0.01 *	-0.0003	0.0013	0.85
Trend after expansion	0.0034	0.0006	<0.01 *	0.0001	0.0014	0.97

* Significant result with p 0.05.

Table 4

Variance Weighted Least Squares Regression Results of Interrupted Time Series Analyses

	Medicaid			Uninsured		
	Coefficient	SE	p Value	Coefficient	SE	p Value
Surgery for lower-extremity trauma						
Change at time of Medicaid expansion	-0.0257	0.0244	0.29	-0.0221	0.0196	0.26
Trend before expansion	0.0018	0.0022	0.41	0.0017	0.0017	0.31
Trend after expansion	0.0016	0.0026	0.53	-0.0033	0.0020	0.09
Lower-extremity salvage						
Change at time of Medicaid expansion	-0.0335	0.0256	0.19	-0.0525	0.0291	0.07
Trend before expansion	0.0006	0.0024	0.80	0.0035	0.0026	0.18
Trend after expansion	0.0020	0.0028	0.47	-0.0040	0.0029	0.17
Lower-extremity amputation						
Change at time of Medicaid expansion	0.0327	0.0494	0.51	0.0143	0.0437	0.74
Trend before expansion	-0.0047	0.0051	0.36	0.0001	0.0037	0.99
Trend after expansion	0.0083	0.0059	0.16	0.0014	0.0045	0.76

Table 5

Variance Weighted Least Squares Regression Results of Interrupted Time Series Analyses

	Medicaid			Uninsured		
	Coefficient	SE	p Value	Coefficient	SE	p Value
Breast cancer reconstruction						
Change at time of Medicaid expansion	0.0002	0.0070	0.97	-0.0105	0.0064	0.10
Trend before expansion	-0.0008	0.0006	0.18	0.0005	0.0006	0.43
Trend after expansion	0.0028	0.0007	<0.01*	-0.0006	0.0007	0.43
Panniculectomy						
Change at time of Medicaid expansion	-0.0149	0.0097	0.12	-0.0617	0.0451	0.17
Trend before expansion	0.0002	0.0008	0.78	-0.0069	0.0042	0.10
Trend after expansion	0.0019	0.0009	0.05*	0.0065	0.0048	0.17

* Significant result with p 0.05.