Evaluating the Impact of 2011 Tort Reform Limiting Non-Economic Damages in North Carolina and Tennessee on Testing, Imaging, and Procedure Utilization

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Abstract:

Objective: To evaluate the impact of tort reform laws passed in 2011 capping non-economic damages in North Carolina and Tennessee on rates and adjusted per user costs of tests, imaging, and procedures in the Medicare fee-for-service population.

Study Setting and Design: State-level synthetic difference-in-differences, adjusting for the percent of FFS Medicare beneficiaries in the state who were female, had ever been on Medicare Advantage, were eligible for Medicaid for at least one month of the year, and total state risk-adjusted, standardized per-capita costs. Analyses of North Carolina and Tennessee were performed separately. We measured the average treatment effect on the treated.

Data Sources and Analytic Sample: Centers for Medicare and Medicaid Services Geographic Variation Public Use File, 2007-2019.

Principal Findings: Our analysis showed no economically significant impact of these laws in either state, though we found a small but statistically significant increase (average treatment effect on the treated: $46, 95% confidence interval: $6-$87) in adjusted per user cost of procedures in Tennessee.

Conclusions: Our findings suggest that caps on non-economic damages alone may be insufficient to modify physician practice habits and impact utilization. Future work should attempt to better understand the economic and non-economic incentives that shape physician ordering decisions.

Keywords: malpractice reform, tort reform, healthcare utilization, Medicare

Callout Box:

What is known about the topic:

-Defensive medicine contributes to low-value care and overall high healthcare expenditures in the US.

What this study adds:

-We studied the impact of 2011 caps on non-economic damages in North Carolina and Tennessee using a synthetic difference-in-differences analysis.

- We found no economically significant impact in either state, though we found a small increase ($46, 95% CI: $6-$87) in adjusted per user cost of procedures in Tennessee.

-Our findings suggest that caps on non-economic damages alone may be insufficient to modify physician practice habits and impact utilization.

Introduction:

United States healthcare expenditures rose faster than gross domestic product between 2000 and 2020, reaching 19.5% of GDP in 2020.[1–3] However, recent estimates suggest that about 25% of healthcare spending may represent waste, and a significant portion of this waste, estimated at $76 to $101 billion, is due to low-value care and overtreatment.[4] Defensive medicine, the practice of providing unnecessary medical care in order to mitigate the risk of being sued, is a contributor to low-value care. Prior work has linked physician malpractice concerns to utilization of diagnostic testing.[5,6]

Medicare expenses comprise a significant portion of total healthcare expenditures and increased from $224 billion in 2000 to $832 billion in 2020.[1,3] A large body of research suggests that Medicare patients are at high risk to receive low-value care.[7–10] Thus, low-value care provided to the Medicare population is likely an important driver of high healthcare expenditures.

The extent to which changes in state-level malpractice law may lead to changes in rates of diagnostic tests, imaging, and procedures in the Medicare population is not well-understood. Prior work has found both increasing[11] and decreasing[12] rates of imaging tests and increasing spending on lab tests[11] after the initiation of damage caps. States with lower malpractice liability had higher rates of rotator cuff and humerus fracture surgeries.[13] However, another analysis did not find a significant relationship between the overall malpractice environment in a state and the level of defensive practices.[6] Overall, the pace of tort reform has been slow over the last fifteen years, but North Carolina and Tennessee both passed caps on non-economic damages in 2011. We utilized a synthetic difference-in-differences (SDID) analysis to evaluate whether these laws

were associated with changes in rates of tests, imaging, and procedures on fee-for-service (FFS) Medicare beneficiaries. Based on our clinical experience, we hypothesized that this legislation would reduce the rates of imaging and to a lesser extent testing but not a have a significant impact on rates of procedures.

Methods:

Data Source

We used the Centers for Medicare and Medicaid Services (CMS) Geographic Variation Public Use File, which contains annual data at the county, state, and national levels on demographics, spending, utilization, and quality of care for 100% of FFS Medicare patients between 2007 and 2021.[14] The dataset reports all variables for three groups: all FFS Medicare patients combined, all FFS Medicare patients ages 65 and over combined, and all FFS Medicare patients under 65 combined.

In this dataset, CMS categorizes all healthcare utilization into Berenson-Eggers Type of Service (BETOS) Code groups.[15] These groups are: evaluation and management, durable medical equipment, other, exceptions/unclassified, tests, imaging, and procedures. Each Healthcare Financing Common Procedure Coding System (HCPC) code is associated with only one BETOS code. This system was designed to allow grouping of all healthcare utilization into clinically understandable categories that are stable over time and unlikely to need modification after minor shifts in technology or practice patterns.

Outcomes of Interest

We focused on BETOS code groups for tests, imaging, and procedures (Appendix Document 1) because these categories best represented areas for which physicians' clinical decisions impact healthcare costs. Diagnostic tests include standard laboratory blood and urine tests, microbiologic testing, electrocardiograms, and cardiac stress tests.[15] Imaging includes x-rays, ultrasounds, computed tomography, magnetic resonance imaging, and diagnostic cardiac catheterization. Procedures include interventional procedures, minor and major surgeries, radiation therapy, and dialysis services.

The primary outcomes were test, imaging, and procedure events per 1,000 beneficiaries. Secondary outcomes were tests, imaging, and procedures per user standardized costs and percentage of beneficiaries receiving tests, imaging, and procedures. The standardization process CMS uses adjusted for both differences in overall regional costs (for example, due to cost of living) and regional differences in patient complexity using hierarchical condition category scores.[16]

Selection of Treatment States

We reviewed tort legislation informational resources to find states that enacted new caps (as opposed to increasing prior caps) on non-economic malpractice damages in the early 2010s that were not subsequently reversed.[17–19] North Carolina and Tennessee were the only states that met these criteria, and both initiated caps in October 2011.[19] North Carolina initiated a $500,000 cap on non-economic damages with inflation adjustment every three years. The legislation specified that the cap "does not apply in cases of disfigurement, loss of body functionality, permanent injury, or death. If the provider acted with reckless disregard, gross negligence, fraud, specific

intent, or malice, the limit on damages does not apply."[19] Also, in October 2011, Tennessee initiated a cap on non-economic damages of $750,000 (but up to $1,000,000 for catastrophic injury). The legislation specified that "Caps do not apply if the defendant acted intentionally, under the influence of alcohol or destroyed evidence, or, as of 2012, the defendant is convicted of a felony and that act or omission caused the damages or injuries."[19]

Statistical Analysis

We reported the counts of beneficiaries ages 65 and older (separate counts for those with both Part A and Part B Medicare and for those with FFS Medicare) for North Carolina, Tennessee, and the US during the year of the intervention (2011). We also reported the values in 2011 of relevant covariates - the percent of FFS beneficiaries who were female, had ever been on Medicare Advantage (MA), were eligible for Medicaid for at least one month of the year, and the total risk-adjusted, standardized per-capita costs. We also reported primary and secondary outcome values for 2011 for North Carolina, Tennessee, and the US.

We utilized a state-level SDID strategy, which uses a difference-in-differences (DID) framework that includes a synthetic control (SC) approach to building a more reliable counterfactual.[20] The synthetic control for each treatment state was a synthetic state constructed using varying weights of the other forty eight states (excluding the other treatment state). States whose covariate and outcome time trends more closely matched those of the treated state prior to the intervention were given relatively more weight. Two major benefits compared with DID and SC methods used individually are 1) the parallel trends assumption required for interpretation of a causal effect is more likely to be satisfied when relatively larger weights are assigned to control units

that are more similar to the treated unit, and 2) the treated unit need not perfectly match the outcome trends of the synthetic unit; only parallel trends are necessary for causal identification.[20,21] Given these advantages, SDID has been shown to lead to less biased and more precise estimation than either DID or SC alone.[20] Analyses were performed using the SDID package in Stata 16.1 (College Station, TX).

We calculated the average treatment effect on the treated (ATT) separately for each treatment state (North Carolina and Tennessee). The main analysis included data only for FFS Medicare beneficiaries ages 65 and over. We adjusted for relevant time-variant factors – the percent of FFS Medicare beneficiaries in the state who were female, had ever been on MA, were eligible for Medicaid for at least one month of the year, and the total state risk-adjusted, standardized per-capita costs. Each treatment state was excluded from contributing to the synthetic control for the other treatment state. For inference, we generated standard errors for the placebo method with five hundred repetitions. The pre-policy period spanned from 2007 to 2011, and the post-policy period ran from 2012 through 2019. We excluded years 2020 and 2021 due to the significant decline in overall healthcare utilization attributed to Covid-19, which was likely impacted differentially by state-level policies. In addition to the primary outcomes of tests, imaging, and procedures per 1,000 beneficiaries, we also estimated the ATT for the secondary outcomes – tests, imaging, and procedures per user standardized costs and percentage of beneficiaries receiving tests, imaging, and procedures using the same covariates. We performed two sensitivity analyses both using the same model and the same outcomes as the main analysis – one included only FFS Medicare beneficiaries under the age of 65 (instead of those ages 65 and older as in the main analysis) and the other shortened the post-policy period from 2012-2019 to 2012-2017.

Results:

In 2011, there were 983,432 FFS Medicare beneficiaries (3.6% of US total) in North Carolina and 607,233 (2.2% of US total) in Tennessee, out of a total of 27,238,019 in the US (Table 1). The total standardized, risk-adjusted per capita Medicare FFS spending was $9,285, $9,870, and $9,486 for North Carolina, Tennessee, and the US. Rates of imaging per 1,000 Medicare beneficiaries in 2011 in North Carolina, Tennessee, and the US were 4,283, 4,512, and 4,327, respectively. The ATT for these imaging rates in North Carolina and Tennessee after the tort reform was +48 imaging events per 1,000 beneficiaries (95% confidence interval (CI): -159-254) and -2 imaging events per 1,000 beneficiaries (95% CI: -208-204) (Table 2, Figure 1). There were no statistically significant associations in the sensitivity analysis looking exclusively at FFS Medicare patients under the age of 65 (Supplement Table 1). The findings in the sensitivity analysis with the shortened post-policy window were similar to the main analysis, though there was also a statistically significant increase in standardized costs per procedure in North Carolina (in addition to that noted in Tennessee in both the main analysis and sensitivity analysis) (Supplement Table 2).

Discussion:

We sought to determine if caps on non-economic damages initiated in North Carolina and Tennessee initiated in October 2011 were associated with overall changes in tests, imaging, and procedure rates and adjusted costs using an SDID approach. We hypothesized that limits on non-economic damages would lead to a measurable decrease in utilization of imaging and a smaller impact on testing. This distinction was based on our expectation that a larger portion of testing

(for example, routine bloodwork for outpatients or daily labs during a hospitalization) was for specific scenarios where there was less of a "gray area" for clinical judgement, and thus relatively inelastic. Imaging tests, on the other hand, are widely reported to be a source of overuse or low-value care.[7,22–25] Survey data has elucidated a significant relationship between emergency department physician fear of litigation and their ordering of advanced imaging.[26,27] We did not anticipate a significant directional effect on procedure utilization, as there are plausible mechanisms for changes in either direction. For example, physicians might be less likely to perform procedures they felt compelled to provide from a defensive medicine standpoint. Alternatively, they might be more likely to perform low-value procedures if the reforms decreased their perceived risk of litigation over a procedural complication.

Overall, our analysis did not find significant utilization changes after the 2011 tort reform laws. Although there were trends of marginal statistical significance for two utilization measures in Tennessee in both the main analysis and sensitivity analysis with a shorter post-treatment window (one of which – procedural costs – was also noted in North Carolina in the sensitivity analysis with a shorter post-treatment window), the effect sizes were too small to be clinically or economically significant, particularly given overall time trends in utilization that dwarf these small differences. Specifically, in the main analysis, there was a slight increase in procedures per user standardized cost by $46 per year (95% CI: $6-$87) in Tennessee. With the number of beneficiaries in the post-treatment period in Tennessee receiving procedures ranging from around 400,000 to 450,000 per year, this represents less than 0.3% of annual total Tennessee healthcare costs.

There was also suggestive evidence of an increase in tests per 1,000 beneficiaries in Tennessee with an ATT of +707 (95% CI: -62-1480), relative to a baseline of 12,120 tests per 1,000 beneficiaries in 2011. This was in the opposite direction than that which we hypothesized. However, if the Tennessee legislation led to a slight increase in procedure rates as is suggested by the higher costs (though not clearly measured in the rate outcomes), this could have led to more associated testing (like preoperative lab tests and electrocardiograms).

Prior work on the relationship between malpractice law and tests, imaging, and procedural utilization has been mixed. One study found higher rates of surgery for rotator cuff tears and proximal humerus fractures in states with lower malpractice liability.[13] A study using ambulatory data from 1999 through 2010 found that caps on non-economic damages were associated with a 1.0% decrease in radiology ordering during a primary care encounter.[12] A study focused on the impact of state-level damage caps instituted between 2002 and 2005 found that they were associated with increased rates of imaging and increased spending on lab tests and imaging.[11] The authors noted that physicians respond to malpractice risk in two ways: "assurance behavior," utilizing low-value tests, imaging, and procedures to mitigate malpractice risk, and "avoidance behavior," avoiding high-risk patients or procedures.

Defensive medicine is only one of many reasons physicians provide low-value care. Prior research found that physicians who reported higher levels of malpractice concern were more likely to perform diagnostic practices considered 'defensive' in nature.[6] That study did not, however, find a relationship between defensive practices and the malpractice risk of the physician's state. An analysis using data from 2003 to 2007 found lower rates of specialist

referrals in the ambulatory setting in states with non-economic damage caps of $250,000.[28] Of course, the conflicting research on this topic may be related to the fact that the impact of any malpractice policy change is likely in large part due to the interaction between the overall rates of healthcare utilization at a given time and the general malpractice environment at that time. Additionally, the nature of the laws themselves (exclusions, degree to which caps on damages are modified) and the level of communication within the medical community surrounding their implementation may impact the extent to which they affect clinician behavior. Finally, it should be noted that there may be positive economic impacts of tort reform (eg, lower legal expenses and malpractice insurance costs) that have no relationship to defensive medicine-associated costs or utilization.

There are several other aspects of tort law that can impact the malpractice environment and which prior malpractice reforms have targeted. A systematic review of the association between tort reform and defensive medicine, quality, and physician supply found that "Caps on total damages, caps on punitive damages, collateral source rule reform, joint-and-several liability reform, and mandatory periodic payment reform did not have a clear or consistent impact on our study outcomes."[29] Another review noted that "damage caps materially reduce claim frequency, payouts per claim, and total payouts. The effects of damage caps on malpractice premiums, physician supply, and defensive medicine are more modest."[30] The decreases in rates of imaging associated with tort reform were found to be greater in states with more types of tort reform laws.[12] Similarly, a recent analysis of the US Military Health System supports the idea that more holistic protections from liability may have a larger impact.[31] It found liability

immunity (active-duty patients cannot sue, but their dependents can) reduced inpatient spending by 5% without any impact on safety outcomes.

There are several important limitations to our study. Under certain identifying assumptions, SDID allows inference of a causal relationship between the intervention and outcomes of interest in the treatment group relative to the counterfactual. Importantly, this approach relies on the fundamentally untestable assumption that there was not another external event (besides the intervention) after 2011 that influenced the outcomes in the treatment state differently from the counterfactual, synthetic state. However, the fact that neither state had clinically and economically significant changes in the primary or secondary outcomes of interest over the course of the study is reassuring in terms of the validity of our findings, since any concurrent state-wide interventions that impacted expenditures would have had to cancel out the effects of tort reform during the same time period. Additionally, we adjusted for states' total risk-adjusted, standardized per-capita costs per year which helped to mitigate the impact of such an external event.

Another limitation is that our data include utilization for FFS Medicare beneficiaries only. Therefore, our findings may not be generalizable to Medicaid, MA, or commercially insured beneficiaries. The lack of granularity of the utilization data precluded us from measuring the relationship between malpractice reform and specific low-value care. Instead, our primary and secondary outcomes are broad state-level measures of utilization. It is, however, possible that these reforms led to a decrease in low-value care and an increase in high-value care without an aggregate change in overall utilization. Finally, BETOS codes are based on part B (physician

services) but not Part A (which covers inpatient hospital stays) Medicare claims. Therefore, through BETOS codes, these data only capture utilization of tests, imaging, and procedure performed on inpatients through professional fees. Thus, the impact of a change in utilization of these services in the inpatient setting may not be fully measured.

Our analysis of 2011 North Carolina and Tennessee tort reform limiting non-economic damage award sizes found no economically meaningful changes in utilization of tests, imaging, and procedures. Our findings suggest that tort reform efforts to reduce low-value care may need to take a more holistic approach, combining multiple types of tort reform or completely shielding physicians from direct lawsuits rather than just decreasing their likelihood of being sued or decreasing potential payouts from a lawsuit. Alternatively, non-legal strategies focused on other drivers of low-value care may be a more efficient approach. Future studies should attempt to better understand the economic and non-economic incentives that shape physician ordering decisions and determine the overall level of healthcare utilization and how these incentives can be modified to reduce low-value care without any concomitant decline in quality.

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Table 1 – State and National Patient Characteristics and Utilization in 2011 for Medicare Patients 65 years and older

	North Carolina	Tennessee	United States*
Beneficiary counts			
Number of beneficiaries with Part A and Part B Medicare	1,225,705	840,742	38,706,907
Number of beneficiaries with FFS Medicare (% of beneficiaries with Part A and Part B Medicare)	983,432 (80.2)	607,233 (72.2)	27,238,019 (70.4)
Geographic characteristics of FFS beneficiaries			
Percent ever covered by MA	20%	28%	30%
Percent female	58%	58%	57%
Percent dual-eligible	15%	16%	15%
Average HCC risk score	0.93	0.97	0.98
Total standardized risk-adjusted Medicare spending per capita (in dollars)	9,285	9,870	9,486
Primary outcomes for FFS beneficiaries			
Test events per 1,000 beneficiaries	11,544	12,120	10,507
Imaging events per 1,000 beneficiaries	4,283	4,512	4,327
Procedure events per 1,000 beneficiaries	4,245	4,330	4,930
Secondary outcomes for FFS beneficiaries			
Tests per user standardized costs (in dollars)	322	351	333
Imaging per user standardized costs (in dollars)	312	306	365
Procedures per user standardized costs (in dollars)	911	870	1,000
Percent of beneficiaries receiving tests	86%	85%	81%
Percent of beneficiaries receiving imaging	74%	73%	72%
Percent of beneficiaries receiving a procedure	66%	66%	65%

FFS – Fee-for-service
MA – Medicare Advantage

* - Including North Carolina and Tennessee

Table 2 – Average Treatment Effect on the Treated (ATT) for Primary and Secondary Outcomes in North Carolina and Tennessee for Fee-for-service Medicare Beneficiaries 65 years and older

	ATT	Standard error	95% CI	P-value
NORTH CAROLINA				
Primary Outcomes *				
Test events per 1,000 beneficiaries	-39	393	-809, +731	0.92
Imaging events per 1,000 beneficiaries	+48	105	-159, +254	0.65
Procedure events per 1,000 beneficiaries	+49	208	-358, +456	0.82
Secondary Outcomes				
Tests per user standardized costs	-2	14	-29, +25	0.86
Imaging per user standardized costs	+3	15	-26, +32	0.83
Procedures per user standardized costs	+31	20	-9, +71	0.13
Percent of beneficiaries receiving tests	+0.62%	1.10%	-1.52%, +2.76%	0.57
Percent of beneficiaries receiving imaging	-0.22%	0.67%	-1.54%, +1.09%	0.74
Percent of beneficiaries receiving a procedure	-0.39%	0.80%	-1.95%, +1.18%	0.63
TENNESSEE				
Primary Outcomes #				
Test events per 1,000 beneficiaries	+707	392	-62, +1480	0.07
Imaging events per 1,000 beneficiaries	-2	105	-208, +204	0.99
Procedure events per 1,000 beneficiaries	+183	208	-224, +590	0.38
Secondary Outcomes				
Tests per user standardized costs	+21	14	-7, +48	0.14
Imaging per user standardized costs	+12	15	-17, +41	0.41
Procedures per user standardized costs	+46	20	+6, +87	**0.02**
Percent of beneficiaries receiving tests	+1.37%	1.09%	-0.76%, +3.51%	0.21
Percent of beneficiaries receiving imaging	+0.42%	0.67%	-0.90%, +1.74%	0.53
Percent of beneficiaries receiving a procedure	+0.65%	0.80%	-0.91%, +2.22%	0.41

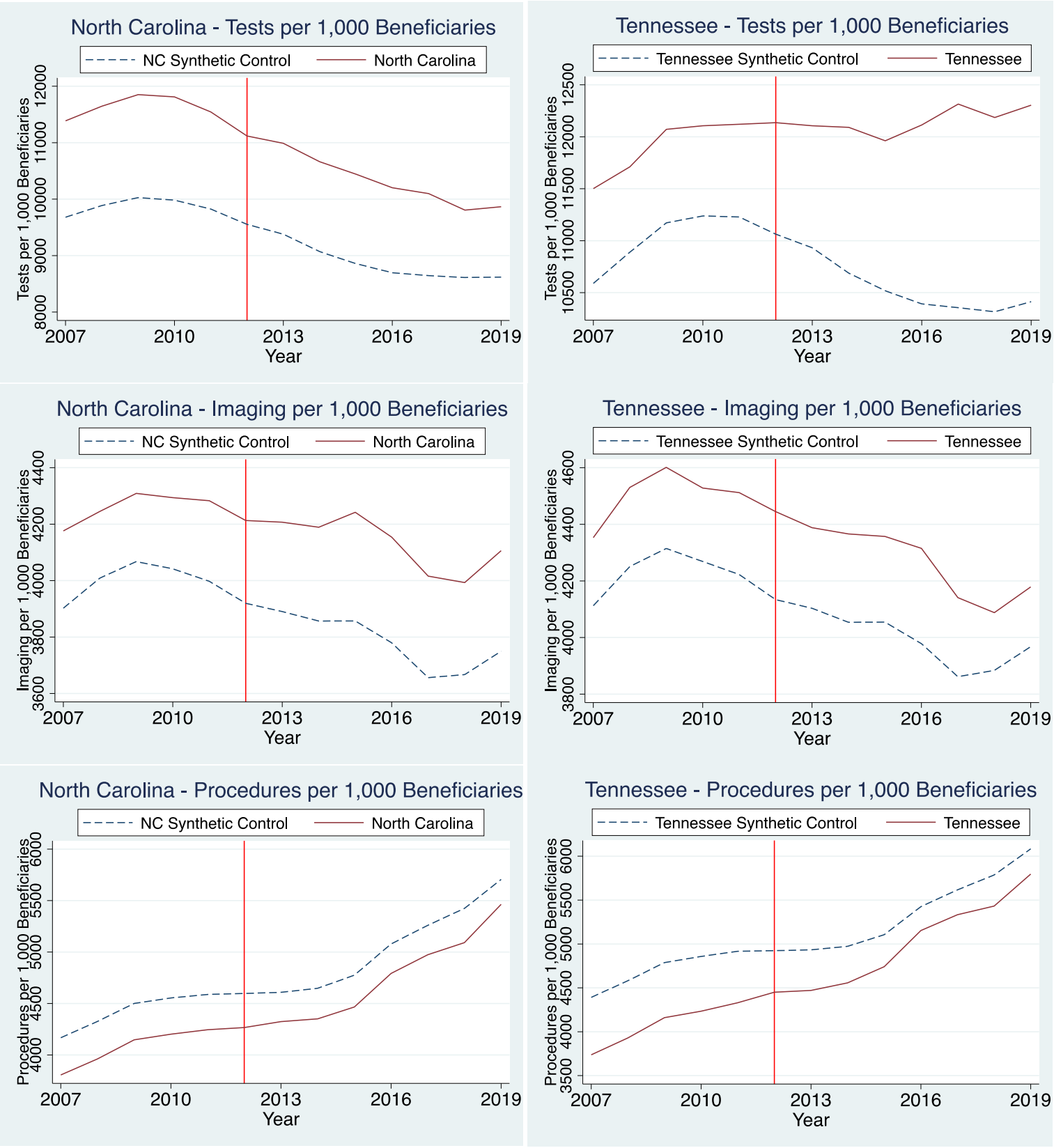
ATT – Average treatment effect on the treated
CI – Confidence interval

This table shows the anticipated average impact of the policy change across the entire treatment period (2012-2019) for each treatment state.

* - Baseline (2011) tests, images, and procedures per 1,000 beneficiaries in North Carolina were 11,544, 4,283, and 4,245, respectively.

- Baseline (2011) tests, images, and procedures per 1,000 beneficiaries in Tennessee were 12,120, 4,512, and 4,330.

Figure 1 – Primary Outcomes for North Carolina and Tennessee and Synthetic Control States



Legend: Figures comparing treatment state (North Carolina and Tennessee) to a synthetic control for primary outcomes (tests, imaging, and procedures per 1,000 fee-for-service Medicare beneficiaries). Intervention (tort law change) occurred in October 2011 for both states. Red vertical line is at 2012.

Appendix Table 1 – Sensitivity Analysis – Average Treatment Effect on the Treated (ATT) for Primary and Secondary Outcomes in North Carolina and Tennessee for Fee-for-service Medicare Beneficiaries Younger than 65

	ATT	Standard error	95% CI	P-value
NORTH CAROLINA				
Primary Outcomes *				
Test events per 1,000 beneficiaries	-217	471	-1,140, +706	0.65
Imaging events per 1,000 beneficiaries	-51	111	-269, +167	0.65
Procedure events per 1,000 beneficiaries	-105	160	-418, +208	0.51
Secondary Outcomes				
Tests per user standardized costs	+4	39	-73, +81	0.92
Imaging per user standardized costs	+8	17	-25, +41	0.63
Procedures per user standardized costs	-7	23	-53, +39	0.76
Percent of beneficiaries receiving tests	-0.74%	1.52%	-3.72%, +2.24%	0.63
Percent of beneficiaries receiving imaging	-0.92%	0.85%	-2.56%, +0.72%	0.28
Percent of beneficiaries receiving a procedure	-1.17%	1.01%	-3.14%, +0.81%	0.25
TENNESSEE				
Primary Outcomes #				
Test events per 1,000 beneficiaries	+334	471	-589, +1,260	0.48
Imaging events per 1,000 beneficiaries	-42	111	-260, +176	0.71
Procedure events per 1,000 beneficiaries	-12	160	-325, +301	0.94
Secondary Outcomes				
Tests per user standardized costs	+50	39	-27, +127	0.20
Imaging per user standardized costs	+3	17	-30, +36	0.84
Procedures per user standardized costs	+37	24	-9, +83	0.12
Percent of beneficiaries receiving tests	+0.52%	1.52%	-2.46%, +3.50%	0.73
Percent of beneficiaries receiving imaging	-0.11%	0.85%	-1.77%, +1.55%	0.89
Percent of beneficiaries receiving a procedure	-0.29%	1.01%	-2.26%, +1.68%	0.78

ATT – Average treatment effect on the treated
CI – Confidence interval

This table shows the anticipated average impact of the policy change across the entire treatment period (2012-2019) for each treatment state.

Appendix Table 2 – Sensitivity Analysis with Shorter Post-Policy Period (2012-2017) - Average Treatment Effect on the Treated (ATT) for Primary and Secondary Outcomes in North Carolina and Tennessee for Fee-for-service Medicare Beneficiaries 65 Years and Older

	ATT	Standard error	95% CI	P-value
NORTH CAROLINA				
Primary Outcomes *				
Test events per 1,000 beneficiaries	-1	345	-676, +675	0.99
Imaging events per 1,000 beneficiaries	+51	94	-134, +235	0.59
Procedure events per 1,000 beneficiaries	+67	172	-269, +403	0.70
Secondary Outcomes				
Tests per user standardized costs	-4	12	-27, +19	0.73
Imaging per user standardized costs	+3	14	-23, +30	0.80
Procedures per user standardized costs	+37	18	+1, +73	**0.04**
Percent of beneficiaries receiving tests	+0.69%	0.97%	-1.22%, +2.60%	0.48
Percent of beneficiaries receiving imaging	-0.15%	0.58%	-1.28%, +0.99%	0.80
Percent of beneficiaries receiving a procedure	-0.37%	0.67%	-1.68%, +0.95%	0.59
TENNESSEE				
Primary Outcomes #				
Test events per 1,000 beneficiaries	+614	344	-61, +1,290	0.07
Imaging events per 1,000 beneficiaries	+18	94	-166, +203	0.85
Procedure events per 1,000 beneficiaries	+194	171	-142, +530	0.26
Secondary Outcomes				
Tests per user standardized costs	+23	12	-0.3, +46	0.05
Imaging per user standardized costs	+11	14	-16, +37	0.42
Procedures per user standardized costs	+37	18	+1, +73	**0.04**
Percent of beneficiaries receiving tests	+1.23%	0.97%	-0.68%, +3.14%	0.21
Percent of beneficiaries receiving imaging	+0.40%	0.58%	-0.74%, +1.54%	0.49
Percent of beneficiaries receiving a procedure	+0.57%	0.67%	-0.74%, +1.89%	0.39

ATT – Average treatment effect on the treated
CI – Confidence interval

This table shows the anticipated average impact of the policy change across the entire treatment period (2012-2019) for each treatment state.

Appendix Document 1 – Components of Berenson-Eggers Type of Service (BETOS) Code Categories for Tests, Imaging, and Procedures

Source: https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/MedicareFeeforSvcPartsAB/downloads/betosdesccodes.pdf

TESTS

1. T1A LAB TESTS - ROUTINE VENIPUNCTURE (NON MEDICARE FEE SCHEDULE)
2. T1B LAB TESTS - AUTOMATED GENERAL PROFILES
3. T1C LAB TESTS - URINALYSIS
4. T1D LAB TESTS - BLOOD COUNTS
5. T1E LAB TESTS - GLUCOSE
6. T1F LAB TESTS - BACTERIAL CULTURES
7. T1G LAB TESTS - OTHER (MEDICARE FEE SCHEDULE)
8. T1H LAB TESTS - OTHER (NON-MEDICARE FEE SCHEDULE)
9. T2A OTHER TESTS - ELECTROCARDIOGRAMS
10. T2B OTHER TESTS - CARDIOVASCULAR STRESS TESTS
11. T2C OTHER TESTS - EKG MONITORING
12. T2D OTHER TESTS - OTHER

IMAGING

1. I1A STANDARD IMAGING - CHEST
2. I1B STANDARD IMAGING - MUSCULOSKELETAL
3. I1C STANDARD IMAGING - BREAST
4. I1D STANDARD IMAGING - CONTRAST GASTROINTESTINAL
5. I1E STANDARD IMAGING - NUCLEAR MEDICINE
6. I1F STANDARD IMAGING - OTHER
7. I2A ADVANCED IMAGING - CAT: HEAD
8. I2B ADVANCED IMAGING - CAT: OTHER
9. I2C ADVANCED IMAGING - MRI: BRAIN
10. I2D ADVANCED IMAGING - MRI: OTHER
11. I3A ECHOGRAPHY - EYE
12. I3B ECHOGRAPHY - ABDOMEN/PELVIS
13. I3C ECHOGRAPHY - HEART
14. I3D ECHOGRAPHY - CAROTID ARTERIES
15. I3E ECHOGRAPHY - PROSTATE, TRANSRECTAL
16. I3F ECHOGRAPHY - OTHER
17. I4A IMAGING/PROCEDURE - HEART,INCLUDING CARDIAC CATHETERIZATION
18. I4B IMAGING/PROCEDURE – OTHER

PROCEDURES

1. P0 ANESTHESIA
2. P1A MAJOR PROCEDURE - BREAST
3. P1B MAJOR PROCEDURE - COLECTOMY

4. P1C MAJOR PROCEDURE - CHOLECYSTECTOMY
5. P1D MAJOR PROCEDURE - TURP
6. P1E MAJOR PROCEDURE - HYSTERECTOMY
7. P1F MAJOR PROCEDURE - EXPLOR/DECOMPR/EXCISDISC
8. P1G MAJOR PROCEDURE - OTHER
9. P2A MAJOR PROCEDURE, CARDIOVASCULAR - CABG
10. P2B MAJOR PROCEDURE, CARDIOVASCULAR - ANEURYSM REPAIR
11. P2C MAJOR PROCEDURE, CARDIOVASCULAR - THROMBOENDARTERECTOMY
12. P2D MAJOR PROCEDURE, CARDIOVASCULAR - CORONARY ANGIOPLASTY(PTCA)
13. P2E MAJOR PROCEDURE, CARDIOVASCULAR - PACEMAKER INSERTION
14. P2F MAJOR PROCEDURE, CARDIOVASCULAR - OTHER
15. P3A MAJOR PROCEDURE, ORTHOPEDIC - HIP FRACTURE REPAIR
16. P3B MAJOR PROCEDURE, ORTHOPEDIC - HIP REPLACEMENT
17. P3C MAJOR PROCEDURE, ORTHOPEDIC - KNEE REPLACEMENT
18. P3D MAJOR PROCEDURE, ORTHOPEDIC - OTHER
19. P4A EYE PROCEDURE - CORNEAL TRANSPLANT
20. P4B EYE PROCEDURE - CATARACT REMOVAL/LENS INSERTION
21. P4C EYE PROCEDURE - RETINAL DETACHMENT
22. P4D EYE PROCEDURE - TREATMENT OF RETINAL LESIONS
23. P4E EYE PROCEDURE - OTHER
24. P5A AMBULATORY PROCEDURES - SKIN
25. P5B AMBULATORY PROCEDURES - MUSCULOSKELETAL
26. P5C AMBULATORY PROCEDURES - INGUINAL HERNIA REPAIR
27. P5D AMBULATORY PROCEDURES - LITHOTRIPSY
28. P5E AMBULATORY PROCEDURES - OTHER
29. P6A MINOR PROCEDURES - SKIN
30. P6B MINOR PROCEDURES - MUSCULOSKELETAL
31. P6C MINOR PROCEDURES - OTHER (MEDICARE FEE SCHEDULE)
32. P6D MINOR PROCEDURES - OTHER (NON-MEDICARE FEE SCHEDULE)
33. P7A ONCOLOGY - RADIATION THERAPY
34. P7B ONCOLOGY - OTHER
35. P8A ENDOSCOPY - ARTHROSCOPY
36. P8B ENDOSCOPY - UPPER GASTROINTESTINAL
37. P8C ENDOSCOPY - SIGMOIDOSCOPY
38. P8D ENDOSCOPY - COLONOSCOPY
39. P8E ENDOSCOPY - CYSTOSCOPY
40. P8F ENDOSCOPY - BRONCHOSCOPY
41. P8G ENDOSCOPY - LAPAROSCOPIC CHOLECYSTECTOMY
42. P8H ENDOSCOPY - LARYNGOSCOPY
43. P8I ENDOSCOPY - OTHER
44. P9A DIALYSIS SERVICES (MEDICARE FEE SCHEDULE)
45. P9B DIALYSIS SERVICES (NON-MEDICARE FEE SCHEDULE)