

Appendix 1: Regression Models and Sensitivity Analyses [posted as supplied by the author]

Baseline Analysis and Model

Our difference-in-differences analysis used a generalized linear count regression (Poisson) model (baseline model). Regression covariates included indicators for age, sex, race/ethnicity, Health Professional Shortage Area designation, median county income (tertiles), median county unemployment (tertiles), quarter, time period (pre-reform/post-reform), state (MA vs. controls) and a term of interaction between the time period (pre-post reform) and state (Massachusetts vs. controls) to estimate the net change. We adjusted for persistent (time invariant) differences by geography with county level fixed effects, and for secular temporal fluctuations with a dummy indicator variable for quarter. To correct for the downward bias in standard errors due to serial correlation arising from clustering of observational units at the county level, we estimated clustering-adjusted (i.e., panel-robust) standard errors.

For comparative analysis, we also estimated this model with (county) random effects specification instead of fixed effects; our purpose is to demonstrate the relative size of confidence intervals in the two specifications.

Analyses were conducted for overall composite, acute composite and chronic composite outcomes separately. In addition, to estimate changes in pre-existing black-white and Hispanic-white disparities in these outcomes, regressions were re-estimated with a 3-way interaction term (time period X intervention state X race/ethnicity group).

Model with Standard Errors Calculated using bootstrap method

We re-estimated our baseline model using bootstrap methods to obtain alternate clustering-adjusted standard errors; this was also performed for random effects specification.

Model Using Negative Binomial Regression

We re-estimated our baseline models using a negative binomial regression specification keeping all other model elements same (including clustering-adjusted standard errors).

Model Including Longer Post-reform Time Period

We re-estimated our baseline models using an additional 12 months in the post reform period.

Linear Probability Model

We re-estimated our baseline models using linear probability models. While the results of all other models used are on a relative scale, results from these linear probability models are on the absolute scale.

Model Using Propensity Score Matched Controls

Demographic characteristics (such as income and race/ethnicity) of patients admitted to hospitals in control states differed from patients admitted to hospitals in Massachusetts, in our study. In order to assess whether results from our baseline models were influenced by these differences, we conducted a sensitivity analysis using propensity scores to define an alternate control cohort of counties in control states that were most similar to pre-reform Massachusetts counties in terms of key variables. We estimated propensity scores with a logistic regression model using income and race/ethnicity as predictors. Counties in the highest quartile of propensity scores—those with the closest match to the population of Massachusetts' 14 counties—were used as the control group. This method resulted in the inclusion of 63 out of the control states' 150 counties and provided an adequate sample size for analyses. We repeated our baseline model regression using only these propensity score matched counties as controls.

Model Using Interrupted Time Series

We estimated an interrupted time series model specified to capture both level and trend effects of reform. We estimated an extension of the linear probability model including two more covariates for time (one counter to indicate quarter from beginning in the pre-reform period and another beginning in the post-reform period) and their interaction with intervention state (MA/controls).

Pre-Reform Trend Analysis

An underlying assumption of our difference-in-differences analysis is that pre-reform trends in ACSC admission rates in Massachusetts and control states were not different. In order to test the validity of this assumption, we conducted an interrupted times series analysis using linear regression (as described above) to compare the pre-reform slope of the regression adjusted ACSC admission rates for MA and control states in the pre-reform time period. See table C in Appendix 2.