Appendix A1. Identification of Buprenorphine Formulations for Medication-Assisted Treatment of Opioid Use Disorder

We used the National Drug Code (NDC) numbers linking to the FDA Orange Book to identify the following sets of Buprenorphine Hydrochloride formulations (including Buprenorphine-Naloxone Hydrochloride formulations) for medication-assisted treatment (MAT) of opioid use disorder: (i) Suboxone® sublingual tablets and films, (ii) Subutex® sublingual tablets, (iii) Bunavail® buccal films, and (iv) the generic equivalents of (i), (ii) and (iii). These medications are only FDA-approved for MAT. Any use of them for the treatment of pain or depression is considered an off-label, unapproved use.

We excluded the following sets of Buprenorphine Hydrochloride formulations generally prescribed for pain management: (i) Buprenex® injectable, (ii) Butrans® transdermal patches, (iii) Belbuca™ buccal films, and (iv) the generic equivalents of (i), (ii) and (iii). These medications cannot be prescribed for MAT, even by a buprenorphine-waived physician.

We also excluded methadone and naltrexone, the other two FDA-approved medications for MAT, due to their unique funding streams and multiple purposes in treatment: first, methadone and naltrexone are prescribed exclusively in opioid treatment programs and mostly funded by state and local substance abuse treatment agencies, which cannot be fully captured by the MDU files and may not be directly affected by Medicaid expansions; second, the small segment of the methadone and naltrexone that the MDU files do capture may not be relevant to opioid use treatment, since a considerable proportion of methadone is prescribed for pain management and the majority of naltrexone is for alcohol use disorder treatment.

*Sources:*

Drug Enforcement Administration (DEA) Office of Diversion Control. Drug and chemical evaluation section: drug use concern-buprenorphine. [Internet]. Washington, DC: U.S. Department of Justice; 2013 Jul. [Accessed 2016 Mar 29].

<http://www.deadiversion.usdoj.gov/drugs_concern/buprenorphine.pdf>

Gordon AJ. The off-label use of sublingual buprenorphine and buprenorphine/naloxone for pain. [Internet]. Providence, RI: PCSS-MAT; 2013 Nov 29. [Accessed 2016 Mar 29].

<http://pcssmat.org/wp-content/uploads/2014/02/PCSS-MATGuidanceOff-label-bup-for-pain.Gordon.pdf>

National Alliance of Advocates for Buprenorphine Treatment (NAABT). Education section FAQ: are there other uses for buprenorphine? [Internet]. Farmington, CT: NAABT; 2015. [Accessed 2016 Mar 29]. <http://www.naabt.org/faq_answers.cfm?ID=10>

U.S. Food and Drug Administration (FDA) Guidance on buprenorphine hydrochloride; naloxone hydrochloride: label. [Internet]. Silver Spring, MD. 2015. [Accessed 2016 Mar 29].

<http://www.accessdata.fda.gov/drugsatfda_docs/label/2015/207932s000lbl.pdf>.

Woodcock J. A difficult balance—pain management, drug safety, and the FDA. *New England Journal of Medicine*. 2009 Nov 26;361(22):2105-7.

Anton RF. Naltrexone for the management of alcohol dependence. *New England Journal of Medicine*. 2008 Aug 14;359(7):715-21.

Appendix A2. Summary of Medicaid Expansions between 2011 & 2014

|  |  |  |
| --- | --- | --- |
| **2014 Medicaid Expansions** | | |
| *Expansion State* | *Effective Date* |
| AZ, AR, CA, CO, CT, DE, HI, IL, IA, KY, MD, MA, MN, NV, NJ, NM, NY, ND, OH, OR, RI, VT, WA, WV, and DC | Jan 01, 2014 |
| MI | Apr 01, 2014 |
| NH | Aug 15, 2014 |
| 2011-2013 Early Partial Expansions | | |
| *Partial Expansion State* | *Effective Date* |
| CA | Jul 01, 2011 |
| MN | Mar 14, 2011 |
| NJ | Apr 14, 2011 |

*Sources:*

Henry J. Kaiser Family Foundation (KFF). Status of State Action on the Medicaid Expansion Decision. [Internet]. Menlo Park (CA): KFF; [cited 2015 Oct 26]. Available from: <http://kff.org/health-reform/state-indicator/state-activity-around-expanding-medicaid-under-the-affordable-care-act/>

Data based on Kaiser Commission on Medicaid and the Uninsured (KCMU) tracking and analysis of state legislative and executive activity.

Appendix A3. Data Sources & Measurement of Study Variables, & Model Specifications of Main Analysis & Sensitivity Analyses

Main Analysis (Manuscript Tables 1 & 2):

BupUse s,t = *β1* **+ *β2* ACAExp s× ACAExp t +** ***β3* 100PWDoc s,t + *β4* 30PWDoc s,t** + *β5* Unemp s,t + *β6* Pov s,t + *β7* EarAdp s × EarAdp t + *ρs* + *τt* + *εs,t*

Sensitivity Analysis I (Appendix Tables A5 & A6):

BupUse s,t = *β1* + *β2* ACAExp s× ACAExp t + *β3* 100PWDoc s,t + *β4* 30PWDoc s,t + *β5* Unemp s,t + *β6* Pov s,t + *β7* EarAdp s × EarAdp t + *ρs* + *τt* + *εs,t*

***t* = [2013Q1, 2014Q4]**

Sensitivity Analysis II (Appendix Tables A5 & A6):

BupUse s,t = *β1* + *β2* ACAExp s× ACAExp t + *β3* 100PWDoc s,t + *β4* 30PWDoc s,t + *β5* Unemp s,t + *β6* Pov s,t + *β7* EarAdp s× EarAdp t + *ρs* + *τt* + ***ρs* × *t*** + *εs,t*

*Notes:*

Sensitivity Analysis I narrows the time window down to one year immediately before and after the implementation of Medicaid expansions; Sensitivity Analysis II includes the group-specific linear trends in the covariates to account for the unobserved state-level differences between the expansion states and the non-expansion and late-expansion states that evolve over time at a constant rate (e.g., public sentiment towards Medicaid, addiction and treatment).

*s*: State, *t*: Year-Quarter;

BupUse s,t: Medicaid-covered buprenorphine utilization is measured by quarterly Medicaid prescriptions for, and spending on, buprenorphine both on a per 1,000-state resident basis and on a per 1,000-Medicaid enrollee basis; the spending data in the MDU files represent post-rebate amounts reimbursed by Medicaid only, which is a mandatory component of state reporting and consistently reported since the beginning of the Medicaid Drug Rebate Program in 1991. The nominal spending values between 2011 and 2014 were converted to real values as of December 2014, based on national monthly Consumer Price Index (CPI);

Data Source: Centers for Medicare and Medicaid Services (CMS)’s Medicaid Drug Utilization (MDU) files;

ACAExp s× ACAExp t: the ACA Medicaid expansion indicator is a difference-in-differences (DD) measure of state implementation of Medicaid expansions under the ACA either in compliance with the Medicaid State Plan Amendment (SPA) provision of the ACA or through the Section §1115 waiver (please see Appendix Exhibit A2 for a summary of the ACA Medicaid expansions), which was assigned a value of 1 for each full quarter subsequent to the effective date of the expansion, and a value of 0 for the pre-expansion periods and for the remaining non-expansion states and five late-expansion states (i.e., PA, IN, AK, MT, and LA) that began or decided to implement Medicaid expansions on or after January 1, 2015;

Data Source: Kaiser Commission on Medicaid and the Uninsured (KCMU)’s documentation of state legislative and executive activities;

100PWDoc s,t & 30PWDoc s,t: the physician prescribing capacity is captured by the time-varying continuous numbers of the 100-patient-waived physicians and 30-patient-waived physicians per 1,000,000-state resident; we also tested the interaction terms 100PWDoc s,t× ACAExp s× ACAExp t and 30PWDoc s,t× ACAExp s× ACAExp t, but only found small positive interaction effects in some cases (i.e., some marginally stronger effects of the ACA Medicaid expansions on buprenorphine utilization among higher capacity states). Nonetheless, the main estimates for the ACA Medicaid expansions and the physician prescribing capacity were not meaningfully changed. We therefore did not include the interaction terms in our analyses;

Data Source: Drug Enforcement Agency (DEA)’s Controlled Substances Act (CSA) Registrants Database;

*ρs*: State fixed effects, *τt*: Year-Quarter fixed effects; the two-way fixed effects account for the time-invariant state heterogeneity and the national secular trend in buprenorphine utilization that may systematically be correlated with Medicaid expansions;

*ρs* × *t*: group-specific linear trends account for the potential heterogonous trajectory in buprenorphine utilization between the expansion and non-expansion states that may have emerged before the expansions;

Unemp s,t: unemployment rate is calculated as the number of unemployed persons (aged 16 and above) divided by the number of persons in the labor force (aged 16 and above). The numerator and denominator do not include institutionalized persons or those without employment who are not seeking employment;

Data Source: Health Resources and Services Administration (HRSA)’s Area Health Resources Files (AHRF);

Pov s,t: poverty rate is calculated for the civilian noninstitutionalized population based on household income, household size, and household composition, relative to a set of dollar value thresholds called the federal poverty level (FPL). Institutionalized persons, those in military group quarters, and those living in college dormitories, and unrelated children under the age of 15 are excluded from the numerator and denominator when calculating the poverty rate;

Data Source: Health Resources and Services Administration (HRSA)’s Area Health Resources Files (AHRF);

EarAdps × EarAdpt: the early-adopter indicator is a difference-in-differences (DD) measure of the partial implementation of Medicaid expansions in CA (2011/07), MN (2011/03), and NJ (2011/04), which was assigned a value of 1 for each full quarter subsequent to the effective date of the early expansion, and a value of 0 for the pre-early expansion periods and for the remaining states;

Data Source: Sommers BD, Kenney GM, Epstein AM. New evidence on the Affordable Care Act: coverage impacts of early Medicaid expansions. *Health Affairs (Millwood)*. 2014 Jan 1;33(1):78-87.

Appendix A4. Tests for Parallel-Trend Assumption

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **# Buprenorphine Prescriptions**  **Per Quarter Per 1,000** | | **$Buprenorphine Prescriptions**  **Per Quarter Per 1,000**¶ | |
| Year 2011-2014 | M.E. | 95% CI | M.E. | 95% CI |
| 2011 Q2 | 0.02 | [-0.16, 0.20] | -5.9 | [-167.8, 156.0] |
| 2011 Q3 | -0.008 | [-0.38, 0.36] | 6.2 | [-136.5, 148.9] |
| 2011 Q4 | 0.09 | [-0.32, 0.50] | 13.3 | [-118.0, 144.6] |
| 2012 Q1 | 0.006 | [-0.32, 0.33] | 17.3 | [ -92.6, 127.2] |
| 2012 Q2 | 0.15 | [-0.27, 0.57] | 14.6 | [-113.0, 142.2] |
| 2012 Q3 | 0.13 | [-0.23, 0.50] | 23.9 | [ -82.0, 129.9] |
| 2012 Q4 | 0.23 | [-0.34, 0.80] | 45.7 | [ -62.1, 153.5] |
| 2013 Q1 | 0.47 | [-0.25, 1.18] | 71.6 | [ -49.4, 192.6] |
| 2013 Q2 | 0.29 | [-0.22, 0.81] | 78.3 | [ -31.4, 188.0] |
| 2013 Q3 | **0.56†** | [-0.04, 1.15] | **94.6†** | [ -17.5, 206.8] |
| 2013 Q4 | **0.87\*** | [0.02, 1.72] | **92.5\*** | [ 10.2, 174.7] |
| 2014 Q1 | **1.21\*** | [0.28, 2.14] | **152.4\*** | [ 16.1, 288.7] |
| 2014 Q2 | **1.37\*** | [0.32, 2.42] | **186.4\*** | [ 23.9, 349.0] |
| 2014 Q3 | **1.50\*\*** | [0.59, 2.41] | **233.9\*\*** | [ 42.4, 425.4] |
| 2014 Q4 | **1.48\*\*** | [0.52, 2.43] | **236.7\*\*** | [ 50.5, 422.9] |
| Year 2013-2014 | M.E. | 95% CI | M.E. | 95% CI |
| 2013 Q2 | 0.34 | [-0.14, 0.81] | 39.0 | [ -47.7, 125.7] |
| 2013 Q3 | 0.26 | [-0.21, 0.73] | 56.9 | [ -49.7, 163.6] |
| 2013 Q4 | 0.63 | [-0.17, 1.44] | 78.9 | [ -28.5, 186.3] |
| 2014 Q1 | **1.03\*** | [0.12, 1.92] | **138.4†** | [ -5.3, 282.1] |
| 2014 Q2 | **1.25\*** | [0.23, 2.26] | **187.1\*** | [ 7.2, 367.0] |
| 2014 Q3 | **1.37\*** | [0.20, 2.54] | **198.7\*** | [ 10.6, 386.7] |
| 2014 Q4 | **1.35\*** | [0.24, 2.46] | **203.6\*** | [ 27.8, 379.5] |

*Notes:*

**†** *p*<0.10; **\****p*<0.05; **\*\****p*<0.01; **\*\*\****p*<0.001;

95% Confidence intervals in square brackets calculated based on state-clustered standard errors;

§ Adjusted for state and quarter two-way fixed effects, state unemployment rate, state poverty rate, state Medicaid managed care penetration rate, and “early adopter” indicator for partial implementation of Medicaid expansions;

¶ Real $ values as of December 2014 based on national monthly Consumer Price Index (CPI).

Appendix A5. Effects of Medicaid Expansion & Physician Prescribing Capacity on Medicaid Prescriptions for Buprenorphine: Full Results from Main Analysis & Analysis Excluding Physician Prescribing Capacity

|  |  |  |
| --- | --- | --- |
| **# Buprenorphine Prescriptions Per Quarter Per 1,000 Residents** | | |
|  | *Main Analysis* | *Excluding Physician Prescribing Capacity* |
| No Medicaid Expansion | Ref. | Ref. |
| (24 States) |  |  |
| Medicaid Expansion | **0.69\*** | **1.13\*** |
| (26 States) | [0.14, 1.24] | [0.20, 2.06] |
| #100-Patient-Waived | **0.20\*\*\*** |  |
| Physicians (per 1,000,000) | [0.15, 0.26] |  |
| #30-Patient-Waived | 0.05 |  |
| Physicians (per 1,000,000) | [-0.01,0.10] |  |
| % Poverty Rate | -0.11 | -0.08 |
|  | [-0.40,0.18] | [-0.67,0.51] |
| % Unemployment Rate | **0.18\*** | **0.33\*** |
|  | [0.04, 0.30] | [0.11, 0.55] |
| Early Partial Expansion | **0.36**† | **0.64\*** |
|  | [-0.07,0.80] | [0.11, 1.16] |
| State & Quarter Fixed Effects | Yes | Yes |
| Group-Specific Trends | No | No |

*Notes:*

**†** *p*<0.10; **\****p*<0.05; **\*\****p*<0.01; **\*\*\****p*<0.001;

95% Confidence intervals in square brackets calculated based on state-clustered standard errors.

Appendix A6. Effects of Medicaid Expansion & Physician Prescribing Capacity on Medicaid Spending on Buprenorphine: Full Results from Main Analysis & Analysis Excluding Physician Prescribing Capacity

|  |  |  |
| --- | --- | --- |
| **$ Buprenorphine Prescriptions Per Quarter Per 1,000 Residents**¶ | | |
|  | *Main Analysis* | *Excluding Physician Prescribing Capacity* |
| No Medicaid Expansion | Ref. | Ref. |
| (24 States) |  |  |
| Medicaid Expansion | **117.5\*** | **167.5\*** |
| (26 States) | [23.1, 211.9] | [23.1, 312.0] |
| #100-Patient-Waived | **33.1\*\*\*** |  |
| Physicians (per 1,000,000) | [22.6, 43.7] |  |
| #30-Patient-Waived | **12.2†** |  |
| Physicians (per 1,000,000) | [-0.8,25.2] |  |
| % Poverty Rate | -21.4 | -10.8 |
|  | [-72.7,29.7] | [-121.2,99.7] |
| % Unemployment Rate | **45.1\*\*** | **93.3\*** |
|  | [13.6, 76.6] | [22.6, 163.9] |
| Early Partial Expansion | **57.8**† | **82.0\*** |
|  | [-9.2,124.8] | [14.4,149.6] |
| State & Quarter Fixed Effects | Yes | Yes |
| Group-Specific Trends | No | No |

*Notes:*

**†** *p*<0.10; **\****p*<0.05; **\*\****p*<0.01; **\*\*\****p*<0.001;

95% Confidence intervals in square brackets calculated based on state-clustered standard errors;

¶ Real $ values as of December 2014 based on national monthly Consumer Price Index (CPI).

Appendix A7. Effects of Medicaid Expansion & Physician Prescribing Capacity on Medicaid Prescriptions for Buprenorphine: Full Results from Main Analysis & Sensitivity Analyses I & II

|  |  |  |  |
| --- | --- | --- | --- |
| **# Buprenorphine Prescriptions Per Quarter Per 1,000 Residents** | | | |
|  | *Main Analysis* | *Sensitivity Analysis I:*  *Limiting to 2013-2014 Sample* | *Sensitivity Analysis II:*  *Including Group-Specific Trends* |
| No Medicaid Expansion | Ref. | Ref. | Ref. |
| (24 States) |  |  |  |
| Medicaid Expansion | **0.69\*** | **0.51\*** | **0.67\*** |
| (26 States) | [0.14, 1.24] | [0.01, 1.02] | [0.15, 1.19] |
| #100-Patient-Waived | **0.20\*\*\*** | **0.17\*** | **0.21\*\*\*** |
| Physicians (per 1,000,000) | [0.15, 0.26] | [0.05, 0.29] | [0.15, 0.26] |
| #30-Patient-Waived | 0.05 | 0.04 | 0.04 |
| Physicians (per 1,000,000) | [-0.01,0.10] | [-0.04,0.12] | [-0.01,0.10] |
| % Poverty Rate | -0.11 | -0.16 | -0.13 |
|  | [-0.40,0.18] | [-0.92,0.60] | [-0.43,0.17] |
| % Unemployment Rate | **0.18\*** | 0.14 | **0.17\*** |
|  | [0.04, 0.30] | [-0.08,0.36] | [0.04, 0.30] |
| Early Partial Expansion | **0.36**† | -- | **0.30**† |
|  | [-0.07,0.80] |  | [-0.06,0.66] |
| State & Quarter Fixed Effects | Yes | Yes | Yes |
| Group-Specific Trends | No | No | Yes |

*Notes:*

**†** *p*<0.10; **\****p*<0.05; **\*\****p*<0.01; **\*\*\****p*<0.001;

95% Confidence intervals in square brackets calculated based on state-clustered standard errors.

Appendix A8. Effects of Medicaid Expansion & Physician Prescribing Capacity on Medicaid Spending on Buprenorphine: Full Results from Main Analysis & Sensitivity Analyses I & II

|  |  |  |  |
| --- | --- | --- | --- |
| **$ Buprenorphine Prescriptions Per Quarter Per 1,000 Residents**¶ | | | |
|  | *Main Analysis* | *Sensitivity Analysis I:*  *Limiting to 2013-2014 Sample* | *Sensitivity Analysis II:*  *Including Group-Specific Trends* |
| No Medicaid Expansion | Ref. | Ref. | Ref. |
| (24 States) |  |  |  |
| Medicaid Expansion | **117.5\*** | **99.3\*** | **105.1\*** |
| (26 States) | [23.1, 211.9] | [14.5, 184.1] | [19.2, 191.1] |
| #100-Patient-Waived | **33.1\*\*\*** | **21.5\*\*\*** | **29.0\*\*** |
| Physicians (per 1,000,000) | [22.6, 43.7] | [20.3, 22.6] | [10.3, 47.7] |
| #30-Patient-Waived | **12.2†** | **-4.3\*** | 11.1 |
| Physicians (per 1,000,000) | [-0.8,25.2] | [-7.9, -0.8] | [-1.4,23.6] |
| % Poverty Rate | -21.4 | -11.5 | -26.3 |
|  | [-72.7,29.7] | [-32.4, 9.3] | [-81.5,28.8] |
| % Unemployment Rate | **45.1\*\*** | 25.7 | **44.0\*** |
|  | [13.6, 76.6] | [-22.3, 73.6] | [12.6, 75.4] |
| Early Partial Expansion | **57.8**† | -- | 43.5 |
|  | [-9.2,124.8] |  | [-12.2,99.2] |
| State & Quarter Fixed Effects | Yes | Yes | Yes |
| Group-Specific Trends | No | No | Yes |

*Notes:*

**†** *p*<0.10; **\****p*<0.05; **\*\****p*<0.01; **\*\*\****p*<0.001;

95% Confidence intervals in square brackets calculated based on state-clustered standard errors;

¶ Real $ values as of December 2014 based on national monthly Consumer Price Index (CPI).

Appendix A9. Effects of Medicaid Expansion & Physician Prescribing Capacity on Medicaid Buprenorphine Prescriptions & Spending: Sensitivity Analysis III State-Specific Policy Effects

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **# Buprenorphine Prescriptions**  **Per Quarter Per 1,000** | | | **$Buprenorphine Spending**  **Per Quarter Per 1,000**¶ | |
| Excluded State | | M.E. | 95% CI | M.E. | 95% CI |
| *Excl.Arizona* | | **1.20\*** | [0.23, 2.18] | **177.0\*** | [ 28.9, 325.1] |
| *Arkansas* | | **1.14\*** | [0.19, 2.10] | **166.5\*** | [ 20.7, 312.3] |
| *California* | | **1.25\*** | [0.27, 2.23] | **189.0\*** | [ 38.1, 340.0] |
| *Colorado* | | **1.18\*** | [0.21, 2.15] | **167.4\*** | [ 19.1, 315.7] |
| *Connecticut* | | **1.11\*** | [0.15, 2.06] | **153.3\*** | [ 10.6, 296.0] |
| *Delaware* | | **1.14\*** | [0.20, 2.07] | **163.7\*** | [ 20.9, 306.4] |
| *Hawaii* | | **1.15\*** | [0.21, 2.09] | **162.8\*** | [ 19.0, 306.6] |
| *Illinois* | | **1.24\*** | [0.28, 2.20] | **185.1\*** | [ 31.2, 339.0] |
| *Iowa* | | **1.11\*** | [0.17, 2.05] | **160.7\*** | [ 14.4, 307.0] |
| *Kentucky* | | **1.03\*** | [0.10, 1.96] | **137.9\*** | [ 10.4, 265.4] |
| *Maryland* | | **1.13\*** | [0.15, 2.11] | **162.4\*** | [ 22.1, 302.8] |
| *Massachusetts* | | **1.05\*** | [0.11, 2.00] | **132.0†** | [ -0.2, 264.2] |
| *Michigan* | | **1.22\*** | [0.23, 2.20] | **174.7\*** | [ 22.9, 326.5] |
| *Minnesota* | | **1.15\*** | [0.21, 2.09] | **163.8\*** | [ 19.2, 308.4] |
| *Nevada* | | **1.15\*** | [0.20, 2.09] | **164.0\*** | [ 19.8, 308.2] |
| *New Hampshire* | | **1.13\*** | [0.20, 2.06] | **162.4\*** | [ 19.5, 305.3] |
| *New Jersey* | | **1.15\*** | [0.21, 2.08] | **164.7\*** | [ 20.5, 308.8] |
| *New Mexico* | | **1.12\*** | [0.18, 2.06] | **157.8\*** | [ 13.2, 302.4] |
| *New York* | | **1.21\*** | [0.15, 2.28] | **162.7\*** | [ 18.6, 306.7] |
| *North Dakota* | | **1.15\*** | [0.21, 2.08] | **164.6\*** | [ 19.1, 310.1] |
| *Ohio* | | **1.06\*** | [0.09, 2.03] | **158.2\*** | [ 7.2, 309.2] |
| *Oregon* | | **1.16\*** | [0.21, 2.12] | **167.5\*** | [ 20.7, 314.2] |
| *Rhode Island* | | **1.15\*** | [0.21, 2.09] | **166.2\*** | [ 23.3, 309.0] |
| *Vermont* | | **1.09\*** | [0.14, 2.04] | **155.6\*** | [ 13.8, 297.5] |
| *Washington* | | **1.18\*** | [0.21, 2.15] | **171.5\*** | [ 22.5, 320.5] |
| *West Virginia* | | **1.11\*** | [0.15, 2.08] | **156.2\*** | [ 12.6, 299.7] |
| *California &* | | **1.24\*** | [0.19, 2.29] | **173.3\*** | [ 27.8, 318.8] |
| *New York* | |
| *Unweighted (All Incl.)* | | **1.26\*** | [0.17, 2.35] | **185.3\*** | [ 33.5, 337.1] |

*Notes:*

Sensitivity Analysis III is a set of 26 analyses, each excluding one expansion state from the sample at a time; an additional analysis excludes both California and New York, the two largest expansion states, at the same time; by doing so, we further account for the potential heterogonous policy effects on buprenorphine utilization among the expansion states.

**†** *p*<0.10; **\****p*<0.05; **\*\****p*<0.01; **\*\*\****p*<0.001;

95% Confidence intervals in square brackets calculated based on state-clustered standard errors;

§ Adjusted for state and quarter two-way fixed effects, state unemployment rate, state poverty rate, state Medicaid managed care penetration rate, and “early adopter” indicator for partial implementation of Medicaid expansions;

¶ Real $ values as of December 2014 based on national monthly Consumer Price Index (CPI).