**APPENDIX**

In this section, we provide additional details on how we constructed our supply measures using the 2013 Provider Compare National Database (PCND).

The PCND is a repository of U.S.-based medical care providers with a National Provider Identifier (NPI) participating in the Medicare program. Provider characteristics in the PCND include: sex, year of graduation, primary and secondary clinical specialties, provider type (e.g. psychologists, physician, physician assistant [PA], nurse practitioner [NP]), and address of location where delivering care. Because the PCND includes the address of the provider’s practice location, we geocoded each provider within the PCND and determine their distance relative to providers in the Simulated Patient file.

Using the PCND, we develop a measure of the number of primary care providers (PCPs) per capita (i.e. per 10,000 population) within a 10-mile radius of each practice in the Simulated Patient file. Prior to the linkage, we restricted providers in the PCND to the following: 1) primary care physicians (i.e. MDs and DOs) with primary specialties in family practice, internal medicine, geriatrics, obstetrics-gynecology or acting as general practitioners, and 2) non-physician clinical providers (i.e. PAs and NPs) with a NPI. Only physicians graduating after 1975 but before 2009 were included to attempt to capture physicians most likely involved in direct patient care in this wave of the PCND. We use 2009 as a cutoff for inclusion in the provider supply measure to account for the timing of when physicians would have completed a residency program—generally three years for primary care specialties—and potentially an internship year. PAs and NPs were included, even if they had graduated between 1975 and 2012.

**Appendix Table A1. Effect of Medicaid Expansion by Logged Provider Supply Density within: 1) a 5-Mile Radius in Urban Settings and 2) a 10-Mile Radius in Rural Settings of the ZIP Code Centroid where the Practice is Located.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) |
|  | Clinic accepts New Medicaid patients | Wait time for Medicaid audit call [Log Transformed] | Appointment made w/Physician for Medicaid audit call | Appointment made with Non-Physician for Medicaid audit call |
| Baseline Mean of Outcome in Low-Supply Areas | 46.6% | 22.4 Days | 84.8% | 15.2% |
|  |  |  |  |  |
| 4 Months Post × Logged Supply | -0.55 | -0.14\* | 0.60 | -0.77 |
|  | (0.82) | (0.072) | (1.21) | (1.06) |
|  |  |  |  |  |
| 8 Months Post × Logged Supply | -0.41 | -0.13 | 2.00 | -1.92 |
|  | (0.73) | (0.078) | (1.98) | (1.97) |
|  |  |  |  |  |
| 12 Months Post × Logged Supply | -0.44 | -0.095 | 2.25 | -1.84 |
|  | (0.72) | (0.081) | (2.08) | (1.97) |
|  |  |  |  |  |
| Observations | 1176 | 565 | 565 | 560 |

Notes: \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. County-level clustered standard errors in parentheses. Because of the skewness of the wait times for an appointment, the outcome was log-transformed. The outcomes in columns 1, 3, and 4 were estimated using linear probability models, so the coefficients should be interpreted as percentage point changes in the levels of the outcome. These regressions are two-way provider-by-period fixed effects models, so the results should be interpreted as a longitudinal analysis. Each of the regressions presented above include office fixed effects, period fixed effects to control for time, and time-varying county-level controls including: the unemployment rate, median income, and share of the population that is a racial/ethnic minority group.

**In the table above, we allow for different sizes of what we could call a rational service area by allowing for a smaller radius in more urban settings and a larger radius for more rural settings. Rurality was determined at the county-level using the 2013 Rural Urban Continuum codes developed by the U.S. Department of Agriculture’s Economic Research Service, and available within the Area Health Resource File.38,39 In areas with larger population densities (i.e. urban areas), an underserved area can be encompass a smaller area, and factors such as access to public transportation can be a hinder access to care for some low-income patients.40 Also, designated Medically Underserved Areas (MUA) and Health Professional Shortage Areas (HPSA) will encompass a smaller section of a county rather than the entire county itself; conversely many rural counties are wholly designated as either a MUA, HPSA, or both.41 By allowing a different-sized radii in urban and rural settings, we hope this modification to our approach is able to account for the likelihood that providers in urban areas are more likely to be in closer proximity to one another, while in rural settings providers could be more dispersed. Because of this variation in the proximity to other providers in rural and urban settings, there is also likely some different in what providers and patients themselves view as ‘close’ proximity to alternative sources of primary care. In doing this specification check, our main conclusions about the influence of provider density on Medicaid acceptance and wait time is unchanged. The results in Appendix Table A1 are not meaningfully different from the results presented in Table 2 of the manuscript’s main text which impose the 10-mile radius on all practices in Michigan.**

**Appendix Table A2. Effect of Medicaid Expansion on Primary Care Appointment Availability, Wait Times, and Scheduled Provider of Service using Baseline Health Care Supply Measured at the County Level.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) |
|  | Clinic accepts New Medicaid patients | Wait time for Medicaid audit call [Log Transformed] | Appointment made w/Physician for Medicaid audit call | Appointment made with Non-Physician for Medicaid audit call |
|  |  |  |  |  |
| Panel A. Using Only Primary Care Physicians per 10,000 Population in the County |
|  |  |  |  |  |
| 4 Months Post × Logged Supply | -8.53\* | 0.29 | -1.41 | 3.10 |
|  | (4.93) | (0.29) | (4.84) | (4.57) |
|  |  |  |  |  |
| 8 Months Post × Logged Supply | -5.52 | 0.31 | -1.71 | 4.12 |
|  | (5.02) | (0.24) | (8.79) | (8.14) |
|  |  |  |  |  |
| 12 Months Post × Logged Supply | -3.92 | -0.20 | 8.77 | 3.59 |
|  | (5.47) | (0.30) | (6.98) | (8.38) |
|  |  |  |  |  |
| Panel B. Using Primary Care Providers (MD/DO, NP, PA) per 10,000 Population in the County |
|  |  |  |  |  |
| 4 Months Post × Logged Supply | -7.77 | 0.30 | -1.14 | 2.66 |
|  | (5.69) | (0.32) | (4.68) | (4.30) |
|  |  |  |  |  |
| 8 Months Post × Logged Supply | -8.42 | 0.45 | -3.38 | 5.39 |
|  | (5.47) | (0.32) | (8.55) | (7.87) |
|  |  |  |  |  |
| 12 Months Post × Logged Supply | -8.02 | 0.036 | 3.29 | 5.23 |
|  | (5.68) | (0.42) | (8.56) | (8.24) |
|  |  |  |  |  |
| Observations | 1176 | 565 | 565 | 560 |

Notes: \* p<0.1, \*\* p<0.05, \*\*\* p<0.01. The number of primary care providers per capita includes all primary care physicians (i.e. physicians with specialties in Internal Medicine, Family Practice, Pediatric Medicine, Geriatric Medicine, Obstetrics-Gynecology, and General Practice), physician’s assistants, and nurse practitioners. County-level clustered standard errors in parentheses. Because of the skewness of the wait times for an appointment, the outcome was log-transformed. The outcomes in columns 1, 3, and 4 were estimated using linear probability models, so the coefficients should be interpreted as percentage point changes in the levels of the outcome. These regressions are two-way provider-by-period fixed effects models, so the results should be interpreted as a longitudinal analysis. Each of the regressions presented above include office fixed effects, period fixed effects to control for time, and time-varying county-level controls including: the unemployment rate, median income, and share of the population that is a racial/ethnic minority group.

**In the above table (Appendix Table 2), we present our results using supply of primary care physicians (Panel A) and total primary care supply (Panel B) including all primary care physicians, nurse practitioners, and physician assistants in the county during year 2013. One concern with our approach using the supply within a 10-mile radius of the ZIP code of the clinic’s location is that, albeit by design, the radius spans multiple ZIP code. The radii are not independent from one another, so overlapping circles are not unexpected. Our intent was to consider how supply within the immediate vicinity of the office could influence their propensity to accommodate new demand for primary care due to the expansion. Because these areas are not independent from one another, we provide this additional specification using the county where the practice is located to assess the impact of supply density on the clinic’s propensity to accept new Medicaid patients and any potential delays in scheduling their appointments.**

**Physician supply includes the total number of non-federal, primary care physicians in direct patient care, while non-physician supply includes all PAs and NPs with a NPI identifier. Rather than use the PCND as we did in our primary results, we use supply data in the Area Health Resource File (AHRF) to allow each geography being used as the reference point for the supply measure to be independent from one another. In this model specification, which also serves as a sensitivity analysis to the results in panel A of table 2, the idea is that being a provider in a county with a higher concentration of primary care providers could make clinics more apt to accommodate newly insured Medicaid patients relative to offices in more sparsely supplied counties.**

**By using the tallied counts of provider supply from the AHRF, we hope these results address potential concerns about training completion among the primary care physicians we present in our main results. The AHRF allows us to segment active primary care physicians whom are involved in direct patient care from those whom are completing a residency or may be primarily involved in administrative duties, and it is possible the supply counts from the PCND overstate the primary care physician supply, thus biasing our findings. In using the AHRF data, we have more certainty about the relative boundaries where providers are located as well as overall provider availability within that geographic boundary.**