

Appendix

1. Medicaid Reimbursement Rates

Our data are from 2013, when in principle a temporary ACA legislated increase in Medicaid reimbursement rates was in effect. However, in practice implementation of this was delayed, so that our 2013 data still reflect 2012 (i.e. pre-ACA increases) Medicaid reimbursement rates.

The ACA expanded Medicaid coverage to millions of uninsured Americans. In response to concerns about physician availability for these new Medicaid patients, the health care reform law also increased Medicaid reimbursement rates in 2013 and 2014.¹ Specifically, states were temporarily required to pay certain physicians fees that were at least equal to Medicare levels for primary care services. This federally funded fee increase went into effect on January 1, 2013. However, in practice implementation was considerably delayed. The Center for Medicare and Medicaid Services published a final rule for the implementation of the primary care payment increase in November of 2012. States reported that the late publication of these final regulations made it difficult for them to be ready to make increased payments in January 2013. In addition, states had difficulty identifying eligible providers implementing separate fee schedules, and coordinating with their Medicaid managed care organizations. As a result, many states faced substantial delays in setting up this fee increase.²

Therefore, we expected that transacted prices in our data would be highly correlated with published rates for 2012 Medicaid to Medicare fee ratios. We also expected that reimbursement rates for Medicaid services would not rise dramatically between January and December of 2013. The data corroborated both of these assumptions.

To analyze the Medicaid to Medicare fee ratios in our data, we followed the methods of a prior study.³ The Kaiser Commission on Medicaid on the Uninsured (KCMU) commissioned the Urban Institute to conduct a 50-state survey of Medicaid physician fees in 2012. This study is the benchmark study cited when quoting pre-ACA Medicaid reimbursement. This study collected fee data as of July 2012 from state websites, supplemented with telephone interviews. To compute a Medicaid to Medicare ratio, they first computed the average Medicaid fee for each service in each state. Average Medicare fees were computed using RVUs, geographic adjusters, and conversion factors from the federal registrar. The Medicare to Medicaid ratio is the weighted sum of the ratio of fees for each service, where the weight for each service is its share of Medicaid spending nationally.

We followed this approach. We computed the average Medicaid and Medicare fee for each set of services in each state. The ratio is again the weighted sum of the ratio of fees for each service, where the weight for each service is its share of Medicaid spending nationally. Appendix Exhibit A8 shows the results. We plotted, by state, the Medicaid vs. Medicare ratio in our data and in the Urban Institute report. These results indicate that the data reflected mostly pre-ACA (i.e. 2012) reimbursement rates. Contrary to the post-ACA requirement that the Medicaid reimbursement rates be at least equal to Medicare, our data showed an average Medicaid to Medicare reimbursement rate of 0.88 using all of 2013. The cross state-pattern was highly correlated with the Urban Institute's pre-ACA measures (coefficient of 0.99).

Finally, to explore whether there were important changes in Medicaid rates over the course of our 2013 year as states potentially implemented the ACA requirement, we compared Medicaid payments from January and December of that year. We computed the mean and

median Medicaid payment for each state and each month. Overall, there is little evidence of the type of large increases in Medicaid reimbursement rates that timely implementation of the ACA-legislated fee increase would imply. For example, we considered CPT code 99213, which is for a “Office Visit, Established Patient, 15 minutes” and accounts for about a quarter of all Medicaid spending.³ In our data, mean Medicaid payments for this CPT code increased by an average of 10% between January 2013 and December 2013; median payments increased by 14%. By comparison, implementation of the legislated fee increases was predicted to increase Medicaid fees by, on average, 73% in 2013.³

2. Comparison to national sample

Since our data were limited to outpatient practices that use one national billing service, we compared the characteristics of our study population to comparable statistics, where available, from the 2012 National Ambulatory Medical Care Survey (NAMCS), a national survey of a sample of visits to office-based physicians; information is based on physician self-reports. As of this writing, 2012 was the latest available year of the NAMCS.

Appendix Exhibit A1 suggests that our sample was reasonably representative of all outpatient visits in the country, with the exception that visits at larger clinics were over-represented: about two-thirds of our data came from practices with 11 or more providers, compared to only about 12% nationwide. Our population was nationally representative, although it appeared to be disproportionately drawn from certain regions, such as the South Atlantic (30% vs. 20% nationwide) compared to the Pacific (7% compared to 16% nationwide). Importantly, given our focus on Medicaid, our study population contained roughly the same

proportion of Medicaid visits (10.8%) as the national average (10.9%). It also looked similar on patient age, gender, and physician specialty. Appendix Exhibit A7 shows that stratifying our results by practice size does not qualitatively affect our findings regarding longer wait time for Medicaid patients.

3. Analysis of differential wait time by state

Medicaid payments are set by states. We compared the difference in Medicaid's allowable charges relative to private insurance rates in each state against the difference in wait time for Medicaid relative to privately insured patients in that state (see Exhibit 4). We ran the following regression, for visit i , insurance j , and state s :

$$y_{ijs} = \alpha_{sj} + x_i\beta$$

where insurance status j was either Medicaid or private insurance. Here, α_{sj} represented dummies for each insurance category j for each state s . We included a host of visit level controls $x_i\beta$ such as six patient age bins (0-4 yrs, 5-14 yrs, 15-24 yrs, 25-44 yrs, 45-64 yrs, 65+ years), patient gender, five time of day bins (before 10am, 10am-12pm, 12pm-2pm, 2pm-4pm, 4pm+), seven days of the week, and four arrival binary variables (arrived at least twenty minutes early, arrived at least ten minutes early, arrived on time, and arrived less than ten minutes late). We also controlled for twelve physician specialty groups and the log of total work relative value units associated with the visit.

We ran this regression separately for two different dependent variables y_{ijs} . To construct the horizontal axis of Exhibit 4, y_{ijs} was the log reimbursement rate for visit i , reimbursed by insurance j in state s ; as discussed, we used the allowable charge as our measure

of the reimbursement rate. For each state, the horizontal axis plotted the difference between the coefficient on Medicaid and the coefficient on private insurance in Equation (1). For example, for Alabama we plotted $\alpha_{Medicaid,AL} - \alpha_{Private,AL}$.

The vertical axis was produced analogously, but we changed the outcome variable y_i to a binary indicator for whether the wait time for that visit was greater than twenty minutes.

Notes

1 Kaiser Commission on Medicaid and the Uninsured. Increasing Medicaid Primary care Fees for Certain Physicians in 2013 and 2014: A Primer on the Health Reform Provision and Final Rule; 2012. (Accessed May 30, 2016 at <https://kaiserfamilyfoundation.files.wordpress.com/2013/01/8397.pdf>).

2 Medicaid and CHIP Payment Access Commission. Report to Congress on Medicaid and CHIP; 2015. (Accessed May 30, 2016 at <https://www.macpac.gov/wp-content/uploads/2015/03/An-Update-on-the-Medicaid-Primary-Care-Payment-Increase.pdf>).

3 Zuckerman S, Goin D. How Much Will Medicaid Physician Fees from Primary Care Rise in 2013? Evidence from a 2012 Survey of Medicaid Physician Fees. Kaiser Commission on Medicaid and the Uninsured Issue Paper; 2012.

Appendix Exhibits

Appendix Exhibit A1. Representativeness of the Baseline Sample

	Share of visits (%)			Share of visits (%)	
	NAMCS	Baseline sample		NAMCS	Baseline sample
Age			Practice size ^b		
<5	8.1	8.2	1	34.0	6.1
5-14	7.8	9.1	2	9.5	5.0
15-24	7.7	8.7	3-5	26.3	12.0
25-44	20.1	20.5	6-10	17.4	11.7
45-64	29.6	27.9	>10	12.3	65.3
65+	26.7	25.6			
			Physician specialty		
Gender			General / Family medicine	20.7	21.8
Female	58.2	61.2	Internal medicine	12.7	15.5
Male	41.8	38.8	Pediatrics	14.0	11.0
			OB-GYN	7.7	8.8
Primary insurance ^a			Orthopedic surgery	5.1	7.7
Private	50.7	63.1	General surgery	1.6	2.1
Medicaid	10.9	10.8	Psychiatry / Neurology	4.7	1.3
Medicare	24.9	20.9	Dermatology	4.2	0.7
Self-pay	4.7	3.3	Ophthalmology	2.1	0.4
Other	8.8	1.9	Other	27.3	30.8
Census region					
New England	5.5	8.6			
Mid Atlantic	14.3	7.8			
East North Central	13.0	11.0			
West North Central	5.4	3.8			
South Atlantic	20.2	29.6			
East South Central	6.6	7.8			
West South Central	12.9	17.6			
Mountain	6.6	7.1			
Pacific	15.5	6.6			

SOURCE Author's analysis of data from athenahealth and the 2012 National Ambulatory Medical Care Survey (NAMCS). NOTES Table compares summary statistics from our baseline sample (as shown in Exhibit 2 and Appendix Exhibit A2; N = 21.4 million visits) with the 2012 NAMCS, which is representative of all outpatient visits in the US (estimated at 928.6 million visits). See Exhibit 2 and Appendix Exhibit A2 for more details about the variable definitions.

^a Our baseline sample contains "Primary Insurance" as a variable; in the NAMCS data this variable is computed by applying the NAMCS's insurance hierarchy to the types of payment listed for the visit.

^b Practice size is a restricted variable in the NAMCS; estimates were obtained from Center for Disease Control Summary Reports.

Appendix Exhibit A2. Additional Wait and Arrival Times by Patient and Visit Characteristics

	Share of visits (1)	Wait time ^a		Arrival time ^b	
		Median (2)	% over 20 min (3)	Median (4)	% on time (5)
All	100.0	4.1	17.0	-5.7	67.6
Physician specialty ^c					
General / Family medicine	21.8	4.1	16.4	-6.3	71.1
Internal medicine	15.5	3.6	17.5	-7.6	72.7
Pediatrics	11.0	3.5	12.5	-3.7	63.0
Nurse practitioner	10.0	4.0	14.7	-4.0	63.1
OB-GYN	8.8	5.7	20.2	-4.7	64.9
Orthopedic surgery	7.7	3.9	19.8	-7.2	70.9
Physician assistant	7.7	4.1	15.1	-3.4	60.6
General surgery	2.1	4.9	22.8	-8.3	71.9
Psychiatry / Neurology	1.3	1.9	13.3	-7.7	71.5
Dermatology	0.7	2.9	13.9	-7.9	75.5
Ophthalmology	0.4	7.3	25.4	-8.3	75.2
Other	13.1	4.4	19.5	-5.3	65.9
Census Region ^d					
New England	8.6	2.2	9.5	-6.0	72.1
Mid Atlantic	7.8	2.6	14.4	-4.9	64.8
East North Central	11.0	3.2	14.6	-5.4	68.7
West North Central	3.8	3.7	14.5	-3.9	61.1
South Atlantic	29.6	5.2	19.6	-6.0	68.0
East South Central	7.8	6.8	24.6	-6.0	66.6
West South Central	17.6	4.6	19.2	-5.1	65.3
Mountain	7.1	2.5	12.2	-7.3	73.2
Pacific	6.6	4.2	14.1	-5.1	67.1

SOURCE Author's analysis of data from athenahealth. NOTES Table is based on the baseline sample (N=21.4 million). Each observation represents an outpatient visit.

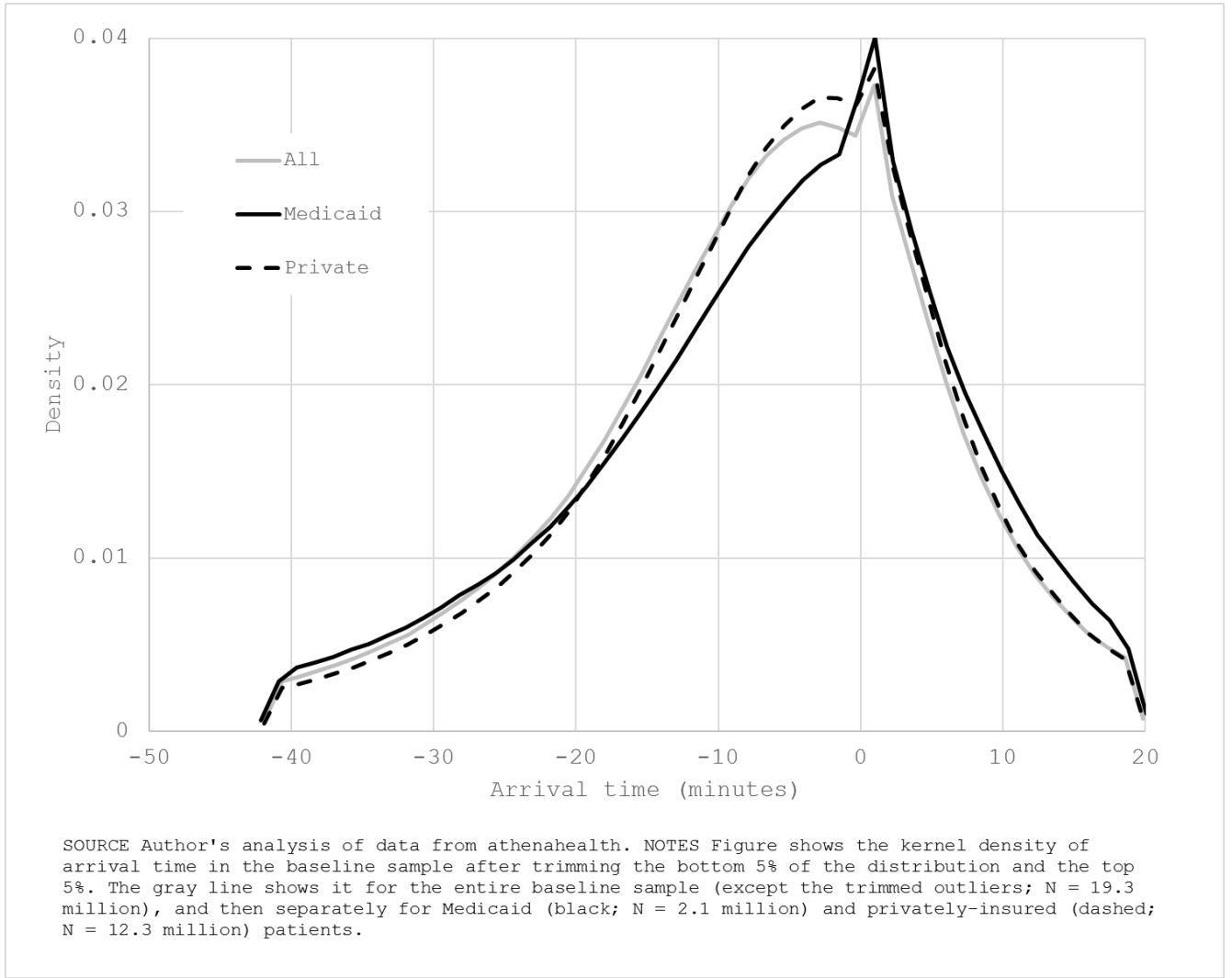
^a Wait time is the time (in minutes) between the patient's check-in time or the appointment's scheduled time (whichever is latest) and the time the patient is seen by a medical practitioner.

^b Arrival time is the difference (in minutes) between the time the patients checks in and the appointment's scheduled time. Negative values imply early arrival; Positive values imply late arrival.

^c We report the union of specialties that make up the top 8 in our baseline sample and the top 8 in the National Ambulatory Care Survey. The "other" category aggregates all other specialties.

^d Census region is based on patient's residential address.

Appendix Exhibit A3. Distribution of Arrival Time



Appendix Exhibit A4. Estimates of Relative Medicaid Wait Times for Different Wait Time Lengths

	No Controls	Controls^a + Census Region Fixed Effects	Controls + Diagnosis^b + Census Region Fixed Effects	Controls + Practice Fixed Effects	Controls + Medical Practioner Fixed Effects
	(1)	(2)	(3)	(4)	(5)
Panel A: Probability of waiting > 15 min					
Medicaid	0.0211 (0.0081)	0.0396 (0.0089)	0.0382 (0.0095)	0.0172 (0.0092)	0.0097 (0.0020)
R ²	0.0003	0.0530	0.0772	0.1401	0.1743
Panel B: Probability of Waiting > 30 min					
Medicaid	0.0103 (0.0048)	0.0226 (0.0047)	0.0209 (0.0048)	0.0113 (0.0046)	0.0068 (0.0012)
R ²	0.0002	0.0268	0.0623	0.1080	0.1519
Panel C: Probability of Waiting > 40 min					
Medicaid	0.0055 (0.0035)	0.0140 (0.0034)	0.0127 (0.0033)	0.0076 (0.0032)	0.0045 (0.0010)
R ²	0.0001	0.0187	0.0632	0.1033	0.1534

SOURCE Author's analysis of data from athenahealth. NOTES Table replicates Exhibit 3 with alternate definitions of wait time. The dependent variable is an indicator for wait time > 15 minutes (Panel A; mean dependent variable 0.224), wait time > 30 minutes (Panel B; mean dependent variable 0.091) and an indicator for wait time > 40 minutes (Panel C; mean dependent variable 0.055). N=15.8 million

^a Controls include six bins for patient age (0-4 yrs, 5-14 yrs, 15-24 yrs, 25-44 yrs, 45-64 yrs, 65+ years), patient gender, five time of day bins (before 10am, 10am-12pm, 12pm-2pm, 2pm-4pm, 4pm and after), seven days of the week, four arrival binary variables (arrived at least twenty minutes early, arrived at least ten minutes early, arrived on time, and arrived less than ten minutes late). We also control for twelve physician specialty groups and total work relative value units associated with the visit which reflects the procedures preformed.

^b Controls for diagnosis consist of indicator variables for each observed combination of (up to eight) ICD-9 diagnosis codes for the visit.

Appendix Exhibit A5. Estimates of Relative Medicaid Wait Times by Arrival Time

	Probability of waiting > 20 min				
	No Controls	Controls ^a + Census Region Fixed Effects	Controls + Diagnosis ^b + Census Region Fixed Effects	Controls + Practice Fixed Effects	Controls + Medical Practioner Fixed Effects
	(1)	(2)	(3)	(4)	(5)
Panel A: Patients who arrived on time					
Medicaid	0.0004 (0.0050)	0.0215 (0.0047)	0.0210 (0.0053)	0.0105 (0.0042)	0.0066 (0.0013)
R ²	0.0000	0.0312	0.0611	0.1075	0.1527
Panel B: Patients who arrived late					
Medicaid	0.0370 (0.0112)	0.0542 (0.0117)	0.0499 (0.0122)	0.0233 (0.0125)	0.0117 (0.0024)
R ²	0.0011	0.0276	0.0628	0.1314	0.1656

SOURCE Author's analysis of data from athenahealth. NOTES Table replicates Exhibit 3, splitting the sample to patients who arrived on time (Panel A; N = 10.4 million outpatient visits, mean dependent variable 0.1352) and patients who arrived late (Panel B; N = 5.4 million, mean dependent variable 0.2169).

^a Controls include six bins for patient age (0-4 yrs, 5-14 yrs, 15-24 yrs, 25-44 yrs, 45-64 yrs, 65+ years), patient gender, five time of day bins (before 10am, 10am-12pm, 12pm-2pm, 2pm-4pm, 4pm and after), seven days of the week, four arrival binary variables (arrived at least twenty minutes early, arrived at least ten minutes early, arrived on time, and arrived less than ten minutes late). We also control for twelve physician specialty groups and total work relative value units associated with the visit which reflects the procedures preformed.

^b Controls for diagnosis consist of indicator variables for each observed combination of (up to eight) ICD-9 diagnosis codes for the visit.

Appendix Exhibit A6. Estimates of Relative Medicaid Wait Time, Excluding non-M.D. Practitioners

	Probability of waiting > 20 min				
	No Controls	Controls ^a + Census Region Fixed Effects	Controls + Diagnosis ^b + Census Region Fixed Effects	Controls + Practice Fixed Effects	Controls + Medical Practitioner Fixed Effects
	(1)	(2)	(3)	(4)	(5)
Medicaid	0.0161 (0.0067)	0.0309 (0.0069)	0.0314 (0.0078)	0.0162 (0.0071)	0.0069 (0.0018)
R ²	0.0002	0.0422	0.0719	0.1306	0.1735

SOURCE: Author's analysis of data from athenahealth NOTES Table replicates Exhibit 3, but excludes visits associated with a nurse practitioner or a physician assistant (N=12.9 millions). The mean of the dependent variable for privately insured is 0.1675.

^a Controls include six bins for patient age (0-4 yrs, 5-14 yrs, 15-24 yrs, 25-44 yrs, 45-64 yrs, 65+ years), patient gender, five time of day bins (before 10am, 10am-12pm, 12pm-2pm, 2pm-4pm, 4pm and after), seven days of the week, four arrival binary variables (arrived at least twenty minutes early, arrived at least ten minutes early, arrived on time, and arrived less than ten minutes late). We also control for twelve physician specialty groups and total work relative value units associated with the visit which reflects the procedures performed.

^b Controls for diagnosis consist of indicator variables for each observed combination of (up to eight) ICD-9 diagnosis codes for the visit.

Appendix Exhibit A7. Estimates of Relative Medicaid Wait Times by Size of Practice

	Probability of waiting > 20 min				
	No Controls	Controls ^a + Census Region Fixed Effects	Controls + Diagnosis ^b + Census Region Fixed Effects	Controls + Practice Fixed Effects	Controls + Medical Practitioner Fixed Effects
	(1)	(2)	(3)	(4)	(5)
Panel A: Practices with 1-2 physicians					
Medicaid	0.0273 (0.0126)	0.0391 (0.0118)	0.0361 (0.0120)	0.0056 (0.0017)	0.0013 (0.0028)
R ²	0.0005	0.0396	0.1059	0.2308	0.2293
Panel B: Practices with 3-10 physicians					
Medicaid	0.0054 (0.0105)	0.0207 (0.0091)	0.0187 (0.0088)	0.0043 (0.0015)	0.0040 (0.0016)
R ²	0.0000	0.0409	0.0941	0.1562	0.1817
Panel C: Practices with greater than ten physicians					
Medicaid	0.0197 (0.0092)	0.0375 (0.0092)	0.0346 (0.0098)	0.0194 (0.0094)	0.0076 (0.0019)
R ²	0.0004	0.0436	0.0619	0.0884	0.1688

Table replicates Exhibit 3, splitting the sample to practices with 1-2 physicians (Panel A; N = 1.7 million outpatient visits, mean dependent variable 0.206), practices with 3-10 physicians (Panel B; N = 3.9 million outpatient visits, mean dependent variable 0.156) and practices with greater than ten physicians (Panel C; N = 10.2 million, mean dependent variable 0.158).

^a Controls include six bins for patient age (0-4 yrs, 5-14 yrs, 15-24 yrs, 25-44 yrs, 45-64 yrs, 65+ years), patient gender, five time of day bins (before 10am, 10am-12pm, 12pm-2pm, 2pm-4pm, 4pm and after), seven days of the week, four arrival binary variables (arrived at least twenty minutes early, arrived at least ten minutes early, arrived on time, and arrived less than ten minutes late). We also control for twelve physician specialty groups and total work relative value units associated with the visit which reflects the procedures preformed.

^b Controls for diagnosis consist of indicator variables for each observed combination of (up to eight) ICD-9 diagnosis codes for the visit.

Appendix Exhibit A8. External Validation of Medicaid-to-Medicare Reimbursement Ratios in the Baseline Sample

