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Outpatient Office Wait Times And Quality Of Care For Medicaid Patients

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ABSTRACT The time patients spend in a doctor's waiting room prior to a scheduled appointment is an important component of the quality of the overall health care experience. We analyzed data on twenty-one million outpatient visits obtained from electronic health record systems, which allowed us to measure time spent in the waiting room beyond the scheduled appointment time. Median wait time was a little more than four minutes. Almost one-fifth of visits had waits longer than twenty minutes, and 10 percent were more than thirty minutes. Waits were shorter for early-morning appointments, for younger patients, and at larger practices. Median wait time was 4.1 minutes for privately insured patients and 4.6 minutes for Medicaid patients. After adjustment for patient and appointment characteristics, Medicaid patients were 20 percent more likely than the privately insured patients to wait longer than twenty minutes, with most of this disparity explained by differences in practices and providers they saw. Wait times for Medicaid patients relative to privately insured patients were longer in states with relatively lower Medicaid reimbursement rates. The study complements other work that suggests that Medicaid patients face some additional barriers in the receipt of care.

Anyone who has ever spent time sitting in a doctor's office waiting for an appointment to begin must have wondered whether the experience was typical. Wait times to see physicians are a source of potential frustration and dissatisfaction with care quality, as well as lost productivity for individual patients. This study examined the time spent waiting in the doctor's office beyond the scheduled appointment time, using detailed administrative data on more than twenty-one million outpatient visits. We quantified how wait times varied across patient, visit, and provider characteristics.

We then specifically examined the experience of Medicaid patients relative to privately insured patients. Differences in wait times between Medicaid and privately insured patients could cap-

ture an important aspect of differences in the quality of the health care experience that do not pertain directly to health. The results may therefore shed light on issues of timely and equitable care—two of the six aims for improvement in the Institute of Medicine's *Crossing the Quality Chasm* report.¹

Existing studies comparing quality of care by public versus private insurance status typically examined differences in health outcomes from specific treatments^{2,3} or rates of receipt of appropriate care.^{4,5} Such comparisons may be contaminated by underlying health differences in the different populations;⁶ these health differences or characteristics are less likely to be a concern with a wait-time measure. The few existing studies of wait time in an outpatient setting have been based on survey responses regarding

“perceived time in the waiting room”⁷ or total clinic time.⁸ A larger literature on wait times in the emergency department is also based on such survey measures, which may suffer from systematic response or recall biases,^{9–11} issues that are less likely to arise with our administrative data.

Our analysis of wait-time differentials for Medicaid patients complements work documenting other disparities in health care faced by Medicaid patients. Physician self-reports and audit studies have found that Medicaid patients have to wait longer to schedule outpatient appointments^{12–24} and that they were more likely than privately insured patients to face barriers to care.²⁵

Study Data And Methods

DATA The deidentified data were provided by athenahealth, a large national provider of electronic health records, electronic medical billing, and practice management software. The data covered all outpatient visits during calendar year 2013 that were associated with medical practices that have the company’s software installed.

The software captured the timing of key stages of every medical appointment. Our primary outcome variable was an estimate of the length of time a patient waited before the appointment began. We measured waiting as beginning when the patient arrived at the practice and checked in at the front desk, or at the time for which the appointment was scheduled, whichever was later; this was done so that we did not attribute long wait times to early arrivals. Waiting ended when the patient saw a medical practitioner. This was measured by the first keystroke or mouse click in the “intake” phase of the software; the measure therefore assumed that user activity occurred promptly at the start of intake. Wait time was negative if the patient arrived early and was seen prior to the originally scheduled time of the appointment. We also analyzed the patient’s arrival time relative to the originally scheduled time of the appointment.

From linked billing information, the data also contained rich information on patients and their care. For each visit, we observed the specialty of the primary medical professional seen, and (masked) identifiers of the medical practice and the primary medical professional. We also observed the patient’s age, sex, census region of residence, the primary payer (insurer) of the medical bill, up to eight diagnosis codes (*International Classification of Diseases*, Ninth Revision, Clinical Modification), the procedures that were performed (Current Procedure Terminology [CPT] codes), allowable charges, and transacted payments. We grouped the primary payer type into five categories: private, Medicaid,

Medicare, self-pay, or other. We used the CPT codes to construct total work relative value units (RVUs) by summing the work component of RVUs for each CPT code billed during the visit. RVUs are a standard summary measure of the intensity of the visit and form the basis for Medicare reimbursement.²⁶ We used “allowable charges”—which are extremely similar to “transacted payments”—to measure reimbursement rates. Because of delays in implementing planned 2013 and 2014 Medicaid rate increases under the Affordable Care Act (ACA),²⁷ our 2013 data primarily reflected Medicaid payment rates for 2012 (that is, prior to the temporary ACA rate increase); see online Appendix Section 1 for details.²⁸ The Massachusetts Institute of Technology’s Institutional Review Board reviewed this study and granted exempt status (Protocol No. 1509231371).

STATISTICAL ANALYSIS We summarized the median wait time for all patients and stratified by patient age, sex, region of residence, primary insurance, the time of day of the visit, practice size, and physician specialty.

To compare wait times for Medicaid patients to wait times for privately insured patients, we analyzed a linear probability model in which the dependent variable was an indicator variable for whether wait time was longer than twenty minutes. The key explanatory variable was an indicator variable for whether the patient was covered by Medicaid, as opposed to privately insured. Results were similar for other lengths of wait times (for example, longer than fifteen, thirty, or forty minutes).

We first reported results from a univariate model and then adjusted for available confounders using various characteristics of the patient and the visit. We also quantified the extent to which longer wait times of Medicaid patients could be explained by differences in the types of practices or physicians they visited by adding indicator variables for the particular practice and the particular medical professional within the practice. Finally, we allowed the difference in wait times between Medicaid and privately insured patients to vary with the patient’s state of residence, and we examined the correlation between the relative generosity by which physicians are compensated for seeing Medicaid patients compared to privately insured patients and the relative wait times of Medicaid patients; Appendix Section 3 provides more detail on this specification.²⁸

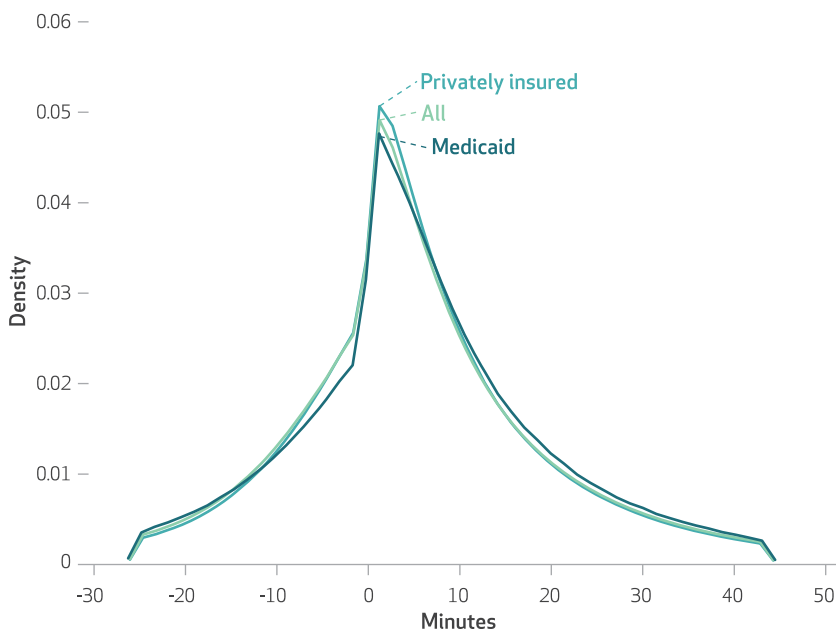
LIMITATIONS This study had several potential limitations. First, we analyzed a convenience sample of ambulatory practices that used a particular billing software. However, visits included in our data appeared similar along most patient

and physician characteristics to data from the 2012 National Ambulatory Medical Care Survey (NAMCS),²⁹ which was designed to be representative of all outpatient visits in the United States (Appendix Exhibit A1).²⁸ A notable exception was that larger physician groups were overrepresented and solo practices were underrepresented in our sample, presumably because of the greater propensity of larger practices to adopt information technology products such as this particular billing software. In addition, certain census regions—such as the Atlantic South—appear overrepresented. Our sample had a higher share of patients covered by private insurance compared to the NAMCS data, while the share of patients covered by Medicaid was similar; see Appendix Section 2 for details.²⁸ Although we controlled for these observable differences across providers, there could be unobservable differences in provider objectives or key attributes of the physicians that we were unable to account for in this analysis.

Second, our measure of wait time was based on time stamps, which might not have always been accurately recorded. However, as long as the measurement error was similar across types of patients and visits, it should not bias comparisons of wait time across groups such as patients of different insurance status.

EXHIBIT 1

Distribution of patients' wait times in the office to see a physician



SOURCE Author's analysis of data from athenahealth, 2013. **NOTES** Figure shows the kernel density of wait time in the baseline sample after trimming the bottom 5 percent and top 5 percent of the distribution. For the entire baseline sample (except the trimmed outliers), $N = 19.3$ million patients; for Medicaid only, $n = 2.1$ million patients; and for privately insured only, $n = 12.3$ million patients.

Finally, we measured only one aspect of wait time. We could not measure any additional wait time inside the physician's examination room; prior work has measured the combined time spent waiting for and obtaining outpatient medical care from self-reports but has been unable to distinguish between the two.⁸ We also could not measure wait time to schedule an appointment. This has been the focus of other studies that found, based on physician self-reports and audit studies, that Medicaid patients had to wait longer to schedule outpatient appointments than privately insured patients did.^{12–16,23,24}

Study Results

WAIT AND ARRIVAL TIMES We observed claims, billing, demographic, and wait-time data for 21.4 million visits from 2,581 unique practices. Exhibit 1 shows the distribution of wait times for the entire baseline sample and separately for Medicaid and for privately insured patients. Across all patients, 32.8 percent of patients had negative wait times, which meant that they arrived and began their appointment before its originally scheduled time. The median wait time was 4.1 minutes. Among patients who had a positive wait time, the median was 9.5 minutes. Across all patient visits, 17 percent had a wait time longer than twenty minutes, 10 percent longer than thirty minutes, and 5 percent longer than forty-five minutes.

Exhibit 2 contains descriptive statistics on how wait times and arrival times varied across patient and provider characteristics. Looking at the share of visits with wait times longer than twenty minutes, we found that wait times were lower for early-morning appointments, for younger patients, and at larger practices. Wait times were longer for female patients; this could partially be explained by differences in wait times across specialties. Appendix Exhibit A2 documents that across physician specialties, wait times were longest for visits with obstetrics/gynecology, general surgery, and ophthalmology and shortest for psychiatry, dermatology, and pediatrics.²⁸ It also shows variation in wait times by geography: Wait times were shortest in New England and longest in the East South Central region, where they were three times higher than in New England.²⁸ This is in contrast to the literature on appointment wait times, which found that scheduling lead times were higher in Massachusetts than in other states.^{23,24}

Medicaid patients had longer wait times than privately insured patients. The median wait time for Medicaid patients was 4.6 minutes, compared to 4.1 minutes for privately insured patients. In addition, 18.0 percent of visits for

Medicaid patients had a wait time of more than twenty minutes, compared to 16.3 percent for privately insured patients. In contrast, Medicare patients had shorter median wait times but a greater share of visits with long wait times, again compared to the privately insured. Most of these differences are explained by the age distribution of Medicare patients. Visits by self-paying patients had the longest wait times.

Median arrival time was approximately six minutes prior to the start of the appointment. About two-thirds of patients arrived on time—that is, before the start of the appointment—with the elderly being the most punctual age group; young children arrived late for more than 40 percent of their visits. Patients were least likely to arrive on time to morning appointments and to practices with a single physician. Across specialties, dermatology was associated with the most punctual patients, while physician assistants were most likely to experience late arrivals; see Appendix Exhibit A2.²⁸

LONGER WAIT TIME FOR MEDICAID PATIENTS

Exhibit 1 shows that Medicaid patients had more visits with long wait times compared to all other patients. They also fewer visits with negative wait times compared to all other patients, reflecting the fact that Medicaid patients were more likely to arrive late for their appointments (Exhibit 2 and Appendix Exhibit A3).²⁸

Exhibit 3 compares wait times for Medicaid and privately insured patients. Column 1 shows the raw differences in wait times. Compared to the 16.3 percent of privately insured patients who waited longer than twenty minutes, 18.0 percent of Medicaid patients waited as long. Therefore, as shown in column 1, Medicaid patients were 1.7 percentage points more likely than privately insured patients to wait twenty minutes or longer, a relative increase of 10 percent over the privately insured baseline. Some of this could reflect differences between Medicaid and privately insured patients in arrival times, or other patient and appointment characteristics. Column 2 therefore controls flexibly for the arrival time of the patient relative to his or her scheduled appointment time, as well as for a rich set of available confounders about the patient (age, sex, and census region) and the appointment (the visit's log RVUs, the physician's specialty, the day of the week of the appointment, and the time of day of the appointment). Controlling for these characteristics doubled the difference in wait times between Medicaid and privately insured patients, with Medicaid patients now 3.4 percentage points more likely than privately insured patients to wait twenty minutes or longer, or 21 percent more likely to wait twenty minutes or longer. Column 3 controls for the

EXHIBIT 2

Wait and arrival times, by patient and visit characteristics, 2013

Characteristic	Percent of visits	Wait time ^a		Arrival time ^b	
		Median	% longer than 20 minutes	Median	% on time
All	100.0	4.1	17.0	-5.7	67.6
AGE (YEARS)					
<5	8.2	4.0	13.4	-2.8	59.9
5-14	9.1	3.7	14.3	-3.8	62.4
15-24	8.7	4.6	16.7	-3.3	61.0
25-44	20.5	4.8	17.7	-3.8	62.4
45-64	27.9	4.1	17.8	-6.3	69.8
65 and older	25.6	3.2	17.8	-8.7	76.0
SEX					
Female	61.2	4.3	17.5	-5.3	66.8
Male	38.8	3.6	16.2	-6.2	69.0
PRIMARY INSURANCE					
Private	63.1	4.1	16.3	-5.0	66.5
Medicaid	10.8	4.6	18.0	-4.5	62.9
Medicare	20.9	3.3	18.1	-8.5	75.0
Self-pay	3.3	5.2	19.5	-3.6	60.6
Other	1.9	4.1	19.2	-5.3	64.8
TIME OF DAY					
Before 10 a.m.	25.5	3.8	14.4	-4.6	65.3
10 a.m.-11:59 a.m.	27.2	4.6	19.5	-6.2	69.0
12 p.m.-1:59 p.m.	14.6	3.8	15.2	-5.3	66.8
2 p.m.-3:59 p.m.	24.6	4.3	18.3	-6.4	69.3
4 p.m. or later	8.1	3.2	15.9	-5.6	66.8
PRACTICE SIZE^c					
1	6.1	5.1	23.4	-3.9	60.9
2	5.0	4.1	17.7	-4.7	64.9
3-5	12.0	4.0	16.8	-5.4	67.7
6-10	11.7	4.0	15.9	-5.3	67.7
>10	65.3	4.0	16.6	-6.0	68.5

SOURCE Authors' analysis of data from athenahealth, 2013. **NOTES** Baseline sample, $N = 21.4$ million. Each observation represents an outpatient visit. ^aTime (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. ^bDifference (in minutes) between the time the patient checks in and the appointment's scheduled time. Negative values imply early arrival; positive values imply late arrival. ^cNumber of medical practitioners filing claims at the practice.

diagnosis codes associated with the visit, which did little to affect the results reported in column 2. This supports our hypothesis that differences in wait times are not contaminated by differences in health characteristics between Medicaid and privately insured patients.

About half of the difference in wait times between Medicaid and privately insured patients in column 2 can be explained by differences in the practices that Medicaid patients visit. The difference in wait time falls to 1.5 percentage points, a relative increase of 9 percent, once we control for which practice the patient attended in column 4. This is particularly striking given that variation across practices explains only 10 percent of the overall variation in wait times across all visits (data not shown).

EXHIBIT 3

Estimates of relative wait time of Medicaid patients, compared to privately insured patients, 2013

	Probability of waiting longer than twenty minutes				
	No controls	Controls ^a + census region fixed effects	Controls + diagnosis ^b + census region fixed effects	Controls + practice fixed effects	Controls + medical practitioner fixed effects
Medicaid patient	0.0170	0.0338	0.0318	0.0153	0.0090
Standard error	(0.0068)	(0.0071)	(0.0075)	(0.0071)	(0.0017)
R ²	0.0003	0.0406	0.0679	0.1242	0.1620

SOURCE Authors' analysis of data from athenahealth, 2013. **NOTES** Table is based on the baseline sample, restricted to patients with either Medicaid or private insurance ($n = 15.8$ million outpatient visits). The mean of the dependent variable for privately insured is 0.1626. ^aControls included six bins for patient age, in years (0–4, 5–14, 15–24, 25–44, 45–64, and 65 and older), patient's sex, five time-of-day bins (before 10 a.m., 10 a.m.–11:59 a.m., 12 p.m.–1:59 p.m., 2 p.m.–3:59 p.m., and 4 p.m. or later), 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 controlled for twelve physician specialty groups and total work relative value units associated with the visit, which reflects the procedures performed. ^bControls for diagnosis consisted of indicator variables for each observed combination of (up to eight) *International Classification of Diseases*, Ninth Revision, diagnosis codes for the visit.

Another quarter of the difference in wait times between Medicaid and privately insured patients from column 2 can be explained by differences in the identity of the medical practitioners whom patients saw within the practice. Column 5 shows that even among visits to the same practice and physician, Medicaid patients were associated with a 0.9-percentage-point ($p < 0.001$) greater propensity to wait twenty minutes or longer (a relative increase of 6 percent).

These results are robust to a number of sensitivity analyses. These include analyzing wait times of longer than fifteen minutes, thirty minutes, or forty minutes (Appendix Exhibit A4); analyzing wait times separately by arrival time (Appendix Exhibit A5); excluding visits to nurse practitioners and physician assistants from the analysis (Appendix Exhibit A6); and analyzing wait times separately by practice size (Appendix Exhibit A7).²⁸

PRIVATE-MEDICAID WAIT TIME DIFFERENCES BY STATE Medicaid payment rates are set at the state level; the relative generosity of Medicaid reimbursement therefore varies across states. Exhibit 4 examines how the relative wait time of Medicaid patients compared to that of privately insured patients varied across states with different relative reimbursement rates for Medicaid compared to private insurance. Both the differences in wait times by state (vertical axis) and the differences in reimbursement rates by state (horizontal axis) controlled for all patient and visit characteristics included in Exhibit 3, column 2, except census region. Exhibit 4 shows a negative relationship between relative wait time and reimbursement rates; states with higher Medicaid reimbursement rates had (relatively) shorter Medicaid wait time.

Discussion

Patient wait time is an important component of the quality of the overall health care experience. We provided a large-scale study of wait times for ambulatory care in the United States, which used data on more than twenty-one million outpatient visits. Median wait time was less than five minutes, but almost one-fifth of patients waited longer than twenty minutes, and 5 percent waited longer than forty-five minutes. Wait times were lower for early-morning appointments, for younger patients, and in larger practices.

Medicaid patients experienced significantly longer wait times than privately insured patients. After adjustment for patient and appointment characteristics, Medicaid patients were 20 percent more likely than privately insured patients to wait twenty minutes or longer. A key driver of this discrepancy was differences in the practices and providers whom Medicaid patients visit. This supports previous research suggesting that practices and physicians that disproportionately serve Medicaid patients differ in other aspects of the care environment. These differences include differences in practice location such as per capita income and urban status^{30–33} and physician characteristics such as medical school attended, years in practice, and probability of being board certified.^{31,33,34}

However, even when they saw the same physician in the same practice, Medicaid patients waited 5 percent longer than privately insured patients. This is somewhat harder to interpret. It is possible that this reflects triaging of patients by insurance status within an office. Alternately, it could reflect assortative scheduling. Since the data showed that Medicaid patients were more likely than others to be late to their appointments, days with many Medicaid patients could

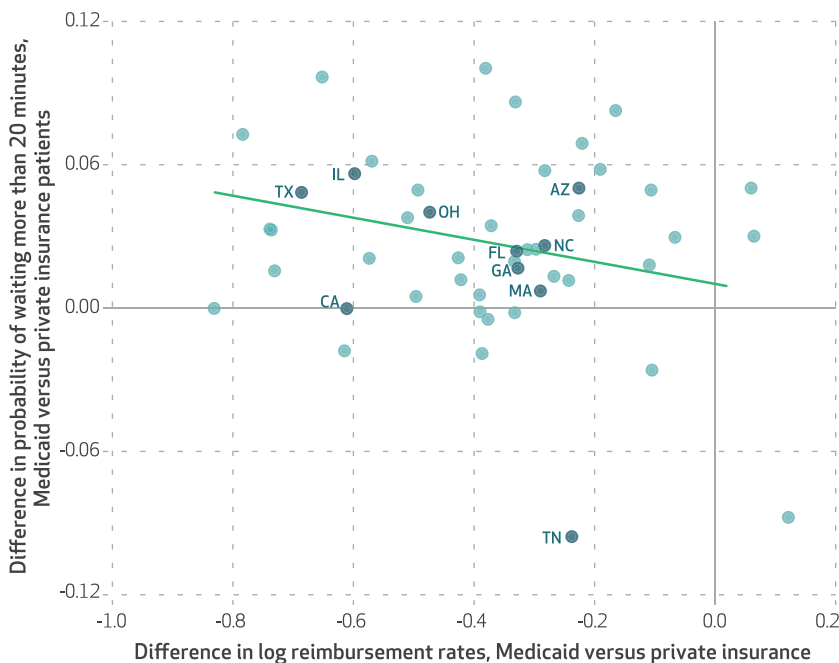
put practices behind schedule.

We also found that Medicaid patients were especially likely to wait longer than privately insured patients in states with less generous Medicaid reimbursement rates. One potential explanation for this correlation is that in higher-reimbursement states, Medicaid patients have more access to high-quality practices and providers. Physician surveys suggest that higher reimbursement is positively correlated with physicians' willingness to accept Medicaid patients.^{30,32-34} These results are intriguing in the context of the ongoing policy debate around Medicaid reimbursement rates. Concerns about whether Medicaid patients face barriers to accessing high-quality care are widespread, particularly in light of historically low reimbursement rates for Medicaid patients.^{23,35-38}

This work is, to our knowledge, the first large-scale administrative study of wait times in an ambulatory setting, which allowed us to document the distribution of wait times, patterns of wait times across patient and provider characteristics, and decomposition of wait-time differences. Our analysis complements other studies that, from examining health outcomes from specific treatments^{2,3} or rates of receipt of appropriate care,^{4,5} found lower quality of care received by Medicaid patients. Our nonhealth quality measure captured a different aspect of the care experience for Medicaid patients. It avoided some of the challenges in measuring care quality and its differences across populations, including biases from self-reports; classification errors in determining appropriate care; and, most important, health differences between Medicaid and privately insured patients.⁶ In particular, wait-time differences between Medicaid and privately insured patients are not affected by differences in the observable health of these populations, as reflected by diagnosis codes. However, differences in wait times for Medicaid and privately insured patients potentially reflect other differences between such patients, such as income, rather than insurance per se. This could have implications for the efficiency of differential wait times, as higher-income patients forgo higher potential wages when they wait in physicians' offices.

EXHIBIT 4

Relationship of differences in wait times of patients and reimbursement rates between Medicaid and private insurance, by state, 2013



SOURCE Author's analysis of data from athenahealth, 2013. **NOTES** Figure plots the difference in relative Medicaid patients' wait times against relative Medicaid log reimbursement rates. The former was computed by regressing an indicator variable for waiting more than twenty minutes on state identifiers interacted with insurance type, controlling for age bins, sex, (natural) log relative value units, day of the week, time of day, arrival time, and physician specialty. The difference was then calculated by subtracting the coefficient on private insurance for a given state from the coefficient on Medicaid insurance for that state. The latter was computed in an analogous way, using (natural) log "allowable charges" as the dependent variable. Each point represents a state. The number of Medicaid visits by state ranged from 4,570 (Alaska) to 2,214,899 (Texas). The ten states with the most Medicaid visits are labeled. The solid green line is the best-fit line, weighted by the number of Medicaid visits, and its estimated slope is -0.041 ($p < 0.001$).

Conclusion

Our results provide new evidence about how long patients wait to see their doctors and how much longer Medicaid patients wait. Wait time is one component of quality of care and may proxy for other aspects of the health care experience. Medicaid patients wait even longer relative to privately insured patients in states with lower Medicaid reimbursement rates. ■

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NOTES

1 Institute of Medicine. Crossing the quality chasm: a new health system for the 21st century. First edition. Washington (DC): National Academies Press; 2001.

2 Gaglia MA Jr, Torguson R, Xue Z, Gonzalez MA, Ben-Dor I, Maluenda G, et al. Effect of insurance type on adverse cardiac events after percutaneous coronary intervention. *Am J*

Cardiol. 2011;107(5):675-80.

3 Kwok J, Langevin SM, Argiris A, Grandis JR, Gooding WE, Taioli E. The impact of health insurance status on the survival of patients with

- head and neck cancer. *Cancer*. 2010;116(2):476–85.
- 4 Weissman JS, Vogeli C, Levy DE. The quality of hospital care for Medicaid and private pay patients. *Med Care*. 2013;51(5):389–95.
 - 5 McMorrow S, Long SK, Fogel A. Primary care providers ordered fewer preventive services for women with Medicaid than for women with private coverage. *Health Aff (Millwood)*. 2015;34(6):1001–9.
 - 6 Frakt A, Carroll AE, Pollack HA, Reinhardt U. Our flawed but beneficial Medicaid program. *N Engl J Med*. 2011;364(16):e31.
 - 7 Leddy KM, Kaldenberg DO, Becker BW. Timeliness in ambulatory care treatment. An examination of patient satisfaction and wait times in medical practices and outpatient test and treatment facilities. *J Ambul Care Manage*. 2003;26(2):138–49.
 - 8 Ray KN, Chari AV, Engberg J, Bertolet M, Mehrotra A. Disparities in time spent seeking medical care in the United States. *JAMA Intern Med*. 2015;175(12):1983–6.
 - 9 Park CY, Lee MA, Epstein AJ. Variation in emergency department wait times for children by race/ethnicity and payment source. *Health Serv Res*. 2009;44(6):2022–39.
 - 10 Horwitz LI, Green J, Bradley EH. US emergency department performance on wait time and length of visit. *Ann Emerg Med*. 2010;55(2):133–41.
 - 11 Wilper AP, Woolhandler S, Lasser KE, McCormick D, Cutrona SL, Bor DH, et al. Waits to see an emergency department physician: U.S. trends and predictors, 1997–2004. *Health Aff (Millwood)*. 2008;27(2):w84–95. DOI: 10.1377/hlthaff.27.2.w84.
 - 12 Medicaid Access Study Group. Access of Medicaid recipients to outpatient care. *N Engl J Med*. 1994;330(20):1426–30.
 - 13 Asplin BR, Rhodes KV, Levy H, Lurie N, Crain AL, Carlin BP, et al. Insurance status and access to urgent ambulatory care follow-up appointments. *JAMA*. 2005;294(10):1248–54.
 - 14 Richards MR, Saloner B, Kenney GM, Rhodes K, Polsky D. Access points for the underserved: primary care appointment availability at federally qualified health centers in 10 states. *Med Care*. 2014;52(9):818–25.
 - 15 Government Accountability Office. Medicaid and CHIP: most physicians serve covered children but have difficulty referring them to specialty care [Internet]. Washington (DC): GAO; 2011Jun [cited 2017 Mar 6]. (Report No. GAO-11-624). Available from: <http://www.gao.gov/new.items/d11624.pdf>
 - 16 Bisgaier J, Rhodes KV. Auditing access to specialty care for children with public insurance. *N Engl J Med*. 2011;364(24):2324–33.
 - 17 Skaggs DL, Clemens SM, Vitale MG, Femino JD, Kay RM. Access to orthopedic care for children with Medicaid versus private insurance in California. *Pediatrics*. 2001;107(6):1405–8.
 - 18 Resneck J Jr, Pletcher MJ, Lozano N. Medicare, Medicaid, and access to dermatologists: the effect of patient insurance on appointment access and wait times. *J Am Acad Dermatol*. 2004;50(1):85–92.
 - 19 Galbraith AA, Grossman DC, Koepsell TD, Heagerty PJ, Christakis DA. Medicaid acceptance and availability of timely follow-up for newborns with Medicaid. *Pediatrics*. 2005;116(5):1148–54.
 - 20 Blanchard J, Ogle K, Thomas O, Lung D, Asplin B, Lurie N. Access to appointments based on insurance status in Washington, D.C. *J Health Care Poor Underserved*. 2008;19(3):687–96.
 - 21 Chaudhry SB, Armbricht ES, Shin Y, Matula S, Caffrey C, Varade R, et al. Pediatric access to dermatologists: Medicaid versus private insurance. *J Am Acad Dermatol*. 2013;68(5):738–48.
 - 22 Tipirneni R, Rhodes KV, Hayward RA, Lichtenstein RL, Reamer EN, Davis MM. Primary care appointment availability for new Medicaid patients increased after Medicaid expansion in Michigan. *Health Aff (Millwood)*. 2015;34(8):1399–406.
 - 23 Polsky D, Richards M, Bassey S, Wissoker D, Kenney GM, Zuckerman S, et al. Appointment availability after increases in Medicaid payments for primary care. *N Engl J Med*. 2015;372(6):537–45.
 - 24 Rhodes KV, Kenney GM, Friedman AB, Saloner B, Lawson CC, Chearo D, et al. Primary care access for new patients on the eve of health care reform. *JAMA Intern Med*. 2014;174(6):861–9.
 - 25 Cheung PT, Wiler JL, Lowe RA, Ginde AA. National study of barriers to timely primary care and emergency department utilization among Medicaid beneficiaries. *Ann Emerg Med*. 2012;60(1):4–10.e2.
 - 26 Coberly S. The basics: relative value units (RVUs) [Internet]. Washington (DC): National Health Policy Forum; 2015 Jan 12 [cited 2017 Mar 6]. Available from: https://www.nhpf.org/library/the-basics/basics_rvus_01-12-15.pdf
 - 27 Medicaid and CHIP Payment and Access Commission. Report to Congress on Medicaid and CHIP: chapter 8: an update on the Medicaid primary care payment increase [Internet]. Washington (DC): MACPAC; 2015 Mar [cited 2017 Mar 6]. Available from: <https://macpac.gov/wp-content/uploads/2015/03/An-Update-on-the-Medicaid-Primary-Care-Payment-Increase.pdf>
 - 28 To access the Appendix, click on the Appendix link in the box to the right of the article online.
 - 29 Centers for Disease Control and Prevention. National Ambulatory Medical Care Survey: 2012 state and national summary tables [Internet]. Atlanta (GA): CDC; 2012 [cited 2017 Mar 6]. Available from: https://www.cdc.gov/nchs/data/ahcd/namcs_summary/2012_namcs_web_tables.pdf
 - 30 Komaromy M, Lurie N, Bindman AB. California physicians' willingness to care for the poor. *West J Med*. 1995;162(2):127–32.
 - 31 Geissler KH, Lubin B, Marzilli Ericson KM. Access is not enough: characteristics of physicians who treat Medicaid patients. *Med Care*. 2016;54(4):350–8.
 - 32 Perloff JD, Kletke P, Fossett JW. Which physicians limit their Medicaid participation, and why. *Health Serv Res*. 1995;30(1):7–26.
 - 33 Perloff JD, Kletke PR, Neckerman KM. Physicians' decisions to limit Medicaid participation: determinants and policy implications. *J Health Polit Policy Law*. 1987;12(2):221–35.
 - 34 Cunningham P, May J. Medicaid patients increasingly concentrated among physicians [Internet]. Washington (DC): Center for Studying Health System Change; 2006 Aug [cited 2017 Mar 6]. (Tracking Report No. 16). Available from: <http://hschange.org/CONTENT/866/866.pdf>
 - 35 Decker SL. In 2011 nearly one-third of physicians said they would not accept new Medicaid patients, but rising fees may help. *Health Aff (Millwood)*. 2012;31(8):1673–9.
 - 36 Cunningham PJ, Nichols LM. The effects of Medicaid reimbursement on the access to care of Medicaid enrollees: a community perspective. *Med Care Res Rev*. 2005;62(6):676–96.
 - 37 Berman S, Dolins J, Tang SF, Yudkowsky B. Factors that influence the willingness of private primary care pediatricians to accept more Medicaid patients. *Pediatrics*. 2002;110(2 Pt 1):239–48.
 - 38 Davidson SM. Physician participation in Medicaid: background and issues. *J Health Polit Policy Law*. 1982;6(4):703–17.