Supplemental Online Content

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This supplemental material has been provided by the authors to give readers additional information about their work.

eMethods

Data Source and Study Population

Milliman MedInsight provides data warehousing, analytics, and benchmarks to health care organizations for 132 million patients, approximately 40% of the U.S. population, or 44% of those with health insurance coverage in 2019.[1] Health care organizations enter into business arrangements with Milliman MedInsight whereby they purchase services to clean, organize and/or facilitate analysis of their health care claims data. Some health care organizations' data use agreements (DUAs) allowed for claims data contributions to research while others prohibited it. Health care organizations whose DUAs allow for claims data contributions to research include a subset of participating health insurance companies and health systems, the latter comprising hospitals, physician practice groups, and other care delivery entities. Generally, the health care organizations included in the MedInsight research claims database include insurance companies and health systems. Due to the risk of breaching the confidentiality of these health care organizations, Milliman MedInsight is unable to provide any detailed or potentially identifying information regarding these health care organizations. However, we are able to provide more recognizable and commonly accepted designations of health care organizations reflected by national provider identification (NPI) codes, which represent unique health care providers and health care organizations. The Centers for Medicare and Medicaid Services (CMS) defines NPI types as follows:

1. Type 1 — Health care providers who are individuals, including physicians, dentists, and all sole proprietors. An individual is eligible for only one NPI.
2. Type 2 — Health care providers who are organizations, including physician groups, hospitals, nursing homes, and the corporation formed when an individual incorporates him/herself.[2]

We then compared distributions of the various NPI counts among patients included in our primary analysis cohort with the other non-included groups (defined below). To better understand this comparison, the following section outlines our primary analysis cohort design within the context of a larger cohort tree (detailed in eFigure 1 below).

Milliman MedInsight claims data represent approximately 132 million unique U.S. persons. Note that Milliman MedInsight uses the term "persons" instead of the term "patients" to more reflect that while *all* persons in the claims databases are enrolled in health insurance policies, not all persons utilize health services during the requisite time period. According to recommendations by *JAMA* editors, we have used the term patients throughout the manuscript and Supplement to reflect that each person is a potential patient.

The data use agreements of some health care organizations prohibit claims data contributions to research. Specifically, among the 132 million patients whose claims are processed by Milliman MedInsight, data for 12 million patients are automatically excluded from the research database (and thus also our primary analysis cohort). While these latter health care organizations provide Milliman MedInsight with monthly refreshes of all available claims data ideal for studying the recent COVID-19 pandemic, we do not have access to and cannot provide any information on these health care organizations or their claims data as this would violate their DUAs.

The remaining health care organizations whose DUAs allow for claims data contributions to research, representing 120 million patients, can be subdivided based on how frequently they refresh their claims data:

- *Once yearly data refreshes* – we have named this database the "Lagged Milliman Claims Database" because it represents health services that were incurred 18 months in the past when it refreshes each year. We used the term "lagged" to reflect that this database is less up to date and cannot be used at this time to analyze trends during the recent COVID-19 pandemic. This database includes approximately 100 million patients.
- *Monthly data refreshes* – this database is called "The Near-Time MedInsight Emerging Experience Research Database" or "Milliman MedInsight research database" for short. The new title reflects the fact that this database receives monthly claims data refreshes,

making it near-time. This database includes claims data for approximately 20 million patients in 2019.

In eFigure 1, we provide a cohort tree, including documentation of NPI characteristics and the number of patients within the Milliman MedInsight databases along with publicly available data sources as a reference. While the other Milliman MedInsight databases have no restrictions on inclusion or exclusion criteria, our primary analysis cohort does have restrictions as noted below. As anticipated, these restrictions are associated with reductions in the number of providers, facilities, and patients in the primary analysis cohort (n=10 million patients) compared with the Milliman MedInsight research database (n=20 million patients) in 2019.

Our *primary analysis cohort* draws directly from the Near-Time MedInsight Emerging Experience Database and is further defined by the following inclusion and exclusion criteria: (1) restricting to adults aged 18 years and older, (2) restricting to professional claims and excluding facility-level claims (e.g., excluding nursing homes), and (3) restricting to care in the ambulatory setting (e.g., excluding inpatient hospitalization claims). After applying these restrictions, our primary analysis cohort represents approximately 10 million adult patients in 2019 (eFigure 1).

As of November 2021, the Milliman MedInsight Research database included 30,847,972 total unique patients from 71 health care organizations, which included 23,864,413 total unique patients aged 18 years and older. When the Milliman MedInsight team performed the study analysis, 10 health care organizations did not meet inclusion criteria and were therefore excluded from our analysis. Specifically, the 10 health care organizations were not included for the following reasons: (1) 3 organizations lacked data during 2017, which is a requirement to create a continuously enrolled cohort in 2018 for use of parallel trends testing; (2) 3 organizations lacked updates on paid claims through July 2021, which is a requirement to allow analysts sufficient time to process claims associated with services delivered through February 2021; (3) 2 organizations had business changes during the 2017-2021 period disrupting their ability to continue to contribute claims data, and (4) 2 organizations were not able to report fully due to a prolonged state of emergency declarations in their geography.

The final total sample size of the database, therefore, was 21,356,226 total unique adult patients (~90% of the adult sample) from the 61 health care organizations with data for the entire analytic period between 2017-2021. When restricting to the primary analysis cohort to the study timeframe of January 1, 2019 through February 28, 2021, the sample size included 14,505,945 unique adult patients.

Data Representativeness and Data Quality

To address the representativeness of this sample, we compared our primary analysis cohort (n=10 million patients) with two other distinct datasets regarding demographic (gender, age) and regional characteristics in the baseline time frame in 2019. The first comparator is the Lagged Milliman Claims Database (n=100 million patients) in 2019. Despite the differences in cohort size and timing of data feeds (monthly vs annual data refreshes), the primary analysis cohort demonstrates similarities with the Lagged Milliman Claims Database with respect to age, gender, and U.S. census region distribution (see eFigures 3-5 below). While this is reassuring, these comparisons do not address whether either of these samples are nationally representative.

To address this latter concern, we provided comparisons of demographics and regional characteristics among patients from the primary analysis cohort and Lagged Milliman Claims Database with patients from the 2019 American Community Survey for U.S. adults aged 18 and older with Medicare, Medicaid, or commercial insurance (n=224 million patients). Overall, we found that patients included in the primary analysis cohort appear to be reasonably well-represented compared with the Lagged Milliman Claims Database cohort and a nationally representative population of insured adults from the 2019 American Community Survey. See eFigures 3-5 below.

To determine whether claims processing was mature enough for analysis through February 2021, we performed a sensitivity analysis to assess whether our analyses would accurately reflect utilization patterns as recent as February 2021. We systematically evaluated the extent to which

claims are adjudicated across all payers and services 5 months from the time the service was rendered. Claims adjudication is the process of an insurer determining whether a particular request for compensation falls within the coverage of a patient's insurance policy, processing the contractually allowed amount for the services described, and approving payment of the claim to the health care provider. While February 2021 was 8 months prior to the time of an earlier version of this analysis performed in October 2021, we chose 5 months' duration in order to allow for an additional 2-3 months of data cleaning and processing time required to incorporate the updated claims data during each monthly refresh of new data.

Our empirical analysis of the Milliman MedInsight Database demonstrated that in 2019, 97.9% of claims were completely adjudicated across all payers and services at 5 months from the time the service was rendered. These stratified results remain consistently above 96% across all services and insurance types included in our study after 5-months' time (see eTables 1 and 2 below). We performed an additional analysis in 2021 and found similar results (data not shown).

Outcome Measures
Across all 26 study months, we measured outpatient utilization rates per 100 beneficiaries for six major service types: (1) emergency, (2) office and urgent care visits, (3) behavioral health services, (4) screening colonoscopies, (5) screening mammograms, and (6) contraception counseling/HIV screening services.

Overall Ambulatory Care Measures
We measured overall ambulatory care utilization across these 6 major service types by stratifying utilization using HCPCS codes and/or provider specialty, with refinements for certain categories, such as place of service (POS) codes, principal diagnosis, and specific HCPCS codes for behavioral health services. We included all emergency department (ED) visits (POS code "23") and all urgent care visits (POS code "20"). The office visits category included 85% office visits (POS "11"), 6% off-campus outpatient hospital visits (POS "22"), 3% on-campus outpatient hospital visits (POS "19"), and <1% home visits (POS "12"). In our analysis, we combined urgent care visits with office visits. In addition to measuring ambulatory care utilization, we also included measures of evidenced-based preventive care and telemedicine as described below.

Preventive Care
To study evidenced-based preventive care, we highlighted two high-prevalence 2020 US Preventive Services Taskforce (USPSTF) Grade A/B recommended screening modalities: screening colonoscopies for adults aged 50-75 years and mammograms for women aged 50-74 years.[3] We also highlighted contraception counseling among premenopausal women because it is recommended by the U.S. Health and Resources Services and Administration (HRSA) Women's Preventive Services Guidelines, as well as HIV screening among adults aged 18-65 years because it is an evidenced-based test recommended by both HRSA and USPSTF.[4] According to the Affordable Care Act, all of these services except contraception counseling are required to be covered by U.S. health insurance plans.[3,4]

Telemedicine
We assessed telemedicine use by measuring ambulatory visits reported with all telemedicine codes. We specifically included current procedural terminology (CPT) codes for outpatient visits consistent with with guidelines published by CMS, Medicaid (each U.S. state published its own guideline5), and multiple private payers.[5-8] CPT codes for telephonic visits include the following six codes: 99441, 99442, 99443, 98966, 98967, 98968; Virtual Check-In visits included two codes: G2012, G2010; Online E-visits included nine codes: 99421, 99422, 99423, G2061, G2062, G2063, 98970, 98971, 98972; Remote Physiologic Monitoring visits include three codes: 99453, 99457, 99458). Telephonic or video visits are also reflected by use of the following visit modifiers: 95, G1, GT, or G0; or the following POS code: "02."

Analysis

A priori, we chose to present our analysis in two-month time segments because generally the widespread shutdowns associated with the first waves of COVID-19 occurred during March and April, and reopenings generally occurred in May and June 2020 in the United States.
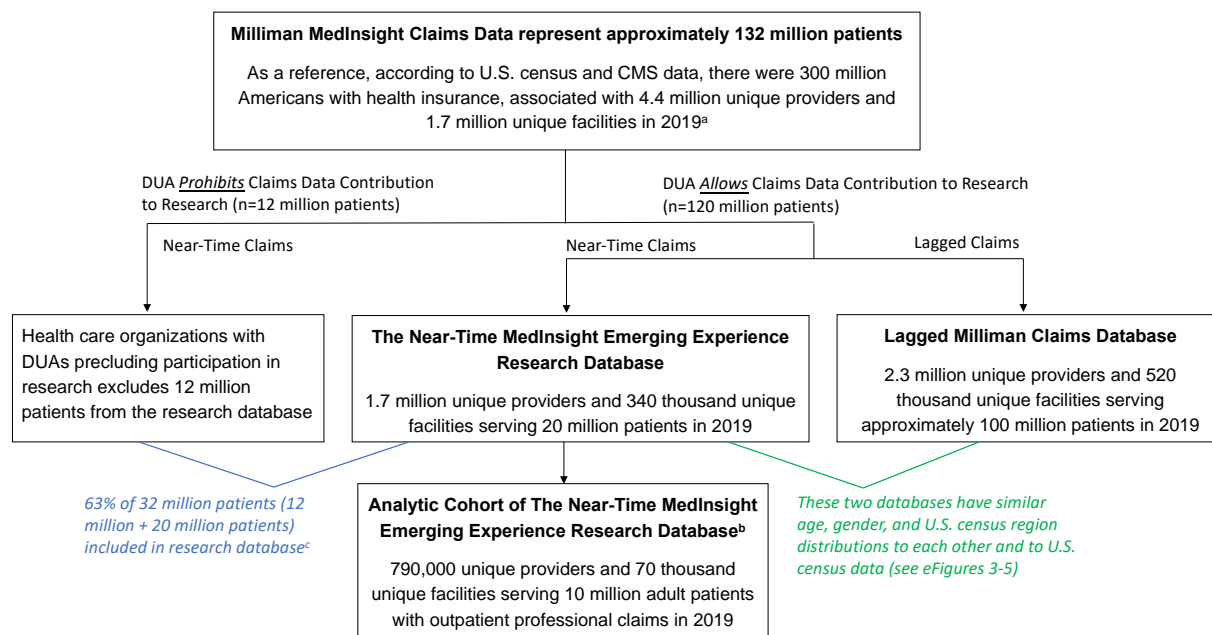
To address multiple testing, the Benjamini-Hochberg step-up procedure was applied a priori to control the false-discovery rate in each set of stratified analyses at the 5% level. In our analysis we define significance as p < 0.05 after the Benjamini-Hochberg adjustment. Applying this procedure to control for the false-discovery rate in overall utilization did not change our results (i.e. all significant results remained highly significant).

To provide additional detail for readers about our study cohort, eFigure 1 provides a cohort tree defining our primary study analysis cohort. This is followed by eFigure 2 that illustrates the characteristics of the primary analysis cohort and two additional cohorts: a non-continuously enrolled cohort, and a fully enrolled cohort. The latter two cohorts are the basis for sensitivity analyses.

Supplemental Results

Analyses stratifying patient-insurance groups by all 6 individual services continued to demonstrate lower recovery among patients with Medicaid and Medicare-Medicaid dual eligibility compared with those with other insurance groups after the pandemic's initial onset in March-April 2020. The majority of pairwise comparisons (27 of 36) of the ratio of rate ratios comparing patients with Medicaid or Medicare-Medicaid dual eligibility to those with each other insurance type during the final study timeframe (January-February 2021), were highly statistically significant ($P < .001$). For example, differences by insurance type were particularly pronounced for behavioral health services in January-February 2021: Medicaid 72.0% [95% CI 71.5%-72.4%], Medicare-Medicaid dual-eligibility 69.4% [95% CI 68.6%-70.3%], commercial 102.5% [95% CI 101.8%-103.1%], Medicare Advantage 89.5% [95% CI 87.8%-91.4%], and Medicare fee-for-service 92.4% [95% CI 91.0%-93.8%] (see eTable 4 below). Two comparisons showed less strongly significant findings: patients with Medicaid vs Medicare Advantage for office visits ($P = .028$) and patients with Medicare-Medicaid dual eligibility vs Medicare fee-for-service for colonoscopies ($P = .014$). The following comparisons for Medicaid vs Medicare Advantage for colonoscopy ($P = .09$) and mammography ($P = .57$), and for Medicaid vs Medicare fee-for-service for colonoscopy, mammography, and HIV/contraception counseling ($P = .99$, $P = .85$, $P = .31$, respectively) were not statistically significant (see eTable 4 and Figure 5 regarding screening services).

eFigure 1. Cohort Tree of Primary Analysis Cohort

Milliman MedInsight Claims Data represent approximately 132 million patients

As a reference, according to U.S. census and CMS data, there were 300 million Americans with health insurance, associated with 4.4 million unique providers and 1.7 million unique facilities in 2019[a]

DUA *Prohibits* Claims Data Contribution to Research (n=12 million patients)

DUA *Allows* Claims Data Contribution to Research (n=120 million patients)

Near-Time Claims

Near-Time Claims

Lagged Claims

Health care organizations with DUAs precluding participation in research excludes 12 million patients from the research database

The Near-Time MedInsight Emerging Experience Research Database

1.7 million unique providers and 340 thousand unique facilities serving 20 million patients in 2019

Lagged Milliman Claims Database

2.3 million unique providers and 520 thousand unique facilities serving approximately 100 million patients in 2019

63% of 32 million patients (12 million + 20 million patients) included in research database[c]

Analytic Cohort of The Near-Time MedInsight Emerging Experience Research Database[b]

790,000 unique providers and 70 thousand unique facilities serving 10 million adult patients with outpatient professional claims in 2019

These two databases have similar age, gender, and U.S. census region distributions to each other and to U.S. census data (see eFigures 3-5)

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[a] Publicly available data sources from the American Community Survey (ACS) estimated that there were 300 million Americans with health insurance in the United States in 2019. Using 2019 data from the NPPES (National Plan & Provider Enumeration System, source: https://nppes.cms.hhs.gov/), Milliman MedInsight provided us with the estimated number of providers by calculating a count of unique Type 1 (provider) National Provider Identifier (NPI) codes. Milliman MedInsight also provided us with the estimated number of facilities by calculating a count of unique Type 2 (facility) NPI codes.

[b] Note that our primary analysis cohort size of 10 million patients is less than 20 million patients included in The Near-Time MedInsight Emerging Experience Research Database for three reasons. First, our primary analysis cohort restricted to adults aged 18 years and older. Second, our primary analysis cohort included only professional claims and did not include other claims such as facility-level claims. Third, we only included care in the ambulatory and outpatient ED settings, rather than inpatient hospitalization claims.

[c] In summary, we conclude that 20 million patients (63% of 32 million patients [i.e., 20 million + 12 million = 32 million]) with near-time (monthly) claims data feeds are currently available for analysis in 2019 in The Near-Time MedInsight Emerging Experience Research Database.

Abbreviations: DUAs = data use agreements; NPPES = National Plan and Provider Enumeration System; Near-Time Claims Data = claims data refreshed monthly to obtain all available claims data; Lagged Claims Data = claims data updated once each year, representing health services that were rendered 18 months in the past.

eFigure 2. Primary Analysis Cohort, Non-Continuously Enrolled Cohort, and Fully Enrolled Cohort Design

Primary analysis cohort plus two sensitivity cohorts

| 2018 | 2019 | 2020 | 2021 |
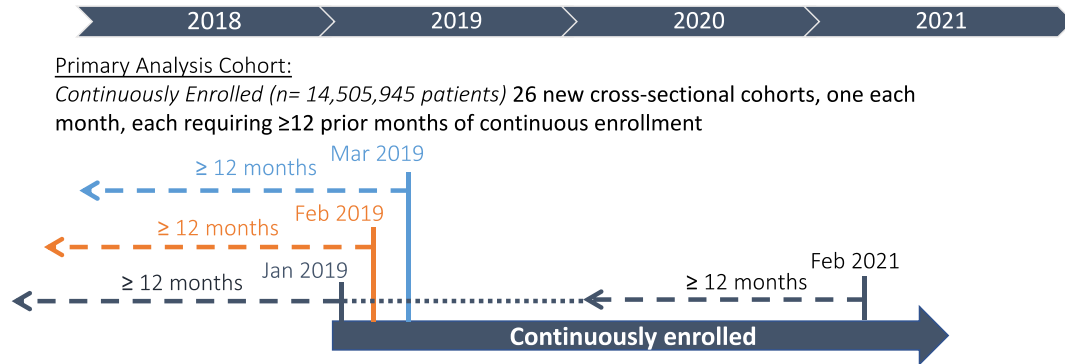
Primary Analysis Cohort:

Continuously Enrolled (n= 14,505,945 patients) 26 new cross-sectional cohorts, one each month, each requiring ≥12 prior months of continuous enrollment

Mar 2019
≥ 12 months
Feb 2019
≥ 12 months
Jan 2019
≥ 12 months
Feb 2021
≥ 12 months

Continuously enrolled
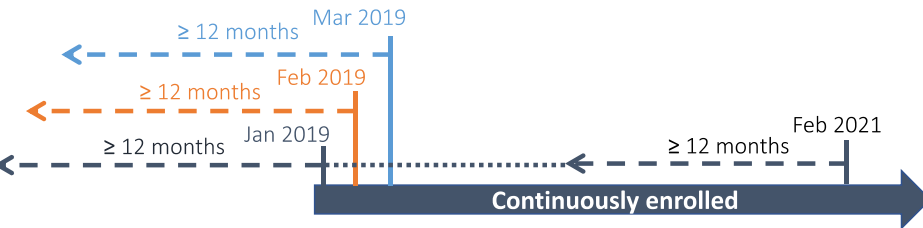
Sensitivity analyses

To address the problem of job losses leading to disruptions in coverage

*Non-Continuously Enrolled (*n=8,996,535*):* 26 new cross-sectional cohorts, one each month, who did not meet criteria for continuous enrollment in the previous 12-month period due to disruptions in coverage

**To address the problem of new members over time**

*"Fully" Enrolled (*n=7,275,267*):* single cohort with all patients continuously enrolled starting Jan 2019 through Feb 2021. These patients were required to have continuous enrollment for at least 26 consecutive months moving forward from Jan 2019. No patients could join this cohort after Jan 2019.

eFigure 3. Patient Age Distribution in 2019: Comparison of the Primary Analysis Cohort of The Near-Time MedInsight Emerging Experience Research Database (n=10 million patients), the Lagged Milliman Claims Database (n=100 million patients), and the American Community Survey (ACS) Survey (n=224 million patients)
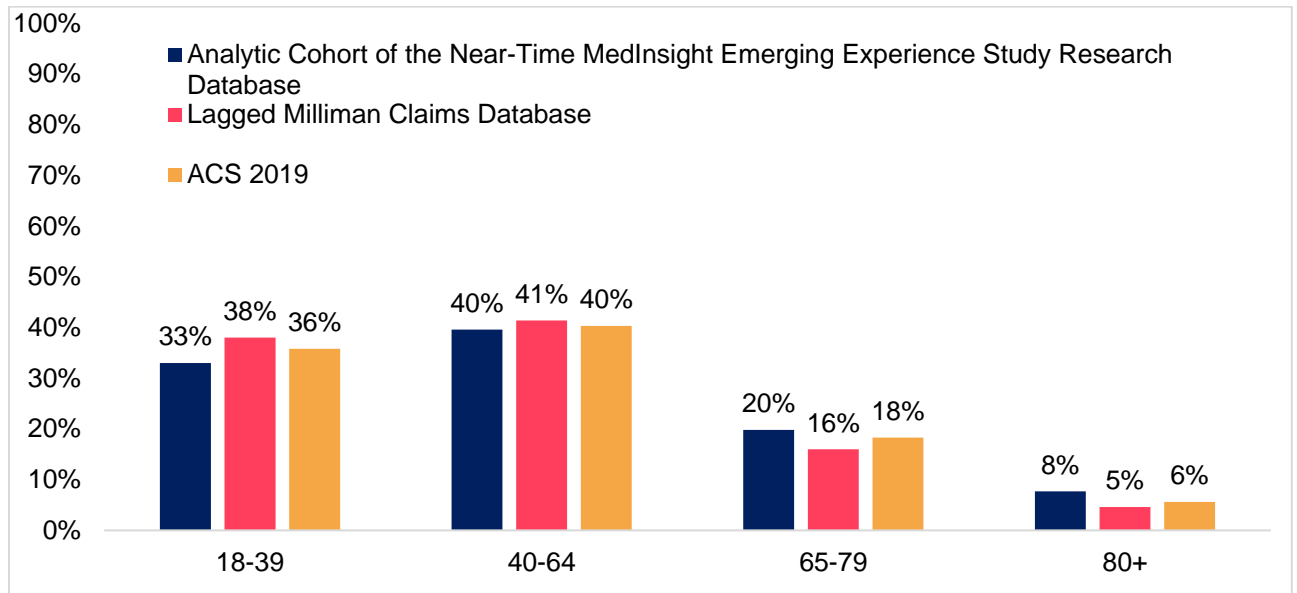
eFigure 4. Patient Gender Distribution in 2019: Comparison of the Primary Analysis Cohort of The Near-Time MedInsight Emerging Experience Research Database (n=10 million patients), the Lagged Milliman Claims Database (n=100 million patients), and the American Community Survey (ACS) Survey (n=224 million patients)
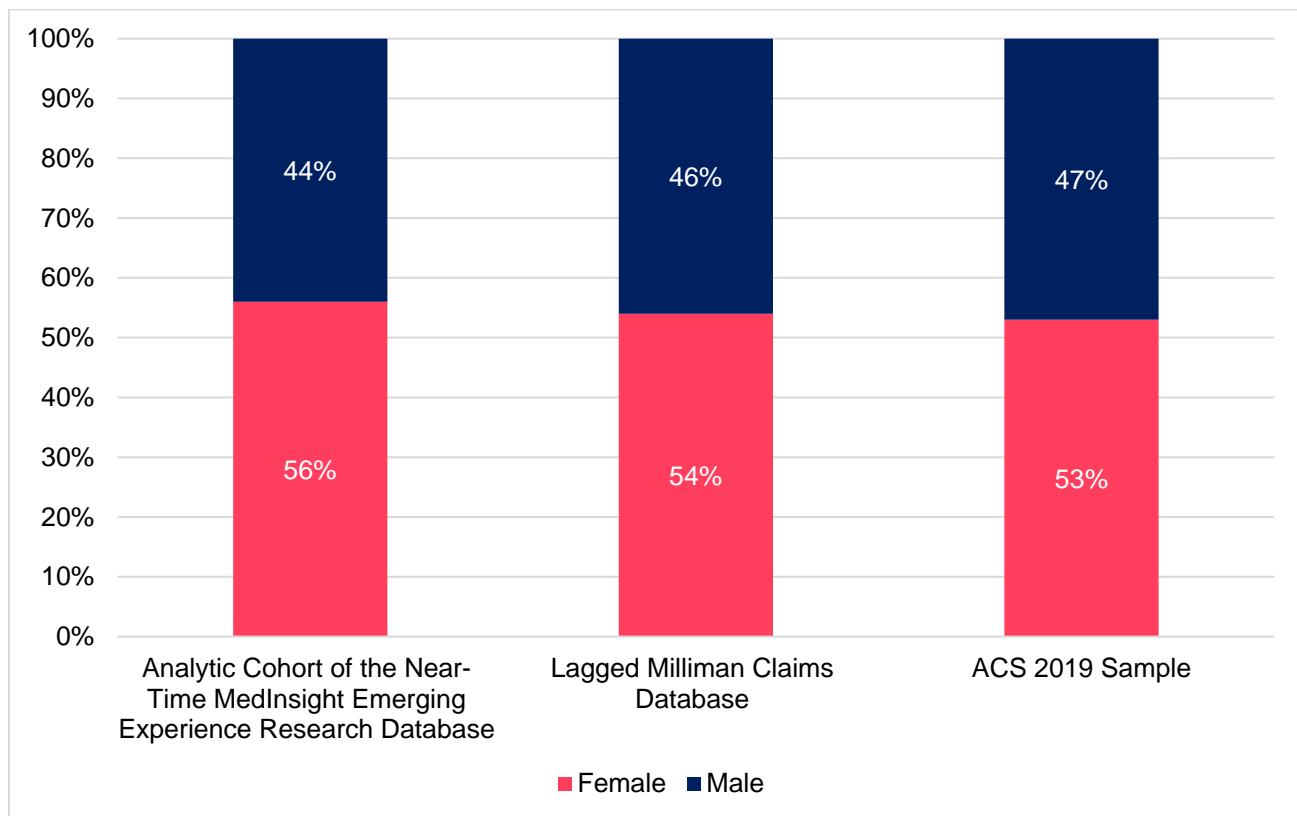
eFigure 5. Patient Regional Distribution in 2019: Comparison of the Primary Analysis Cohort of The Near-Time MedInsight Emerging Experience Research Database (n=10 million patients), the Lagged Milliman Claims Database (n=100 million patients), and the American Community Survey (ACS) Survey (n=224 million patients)
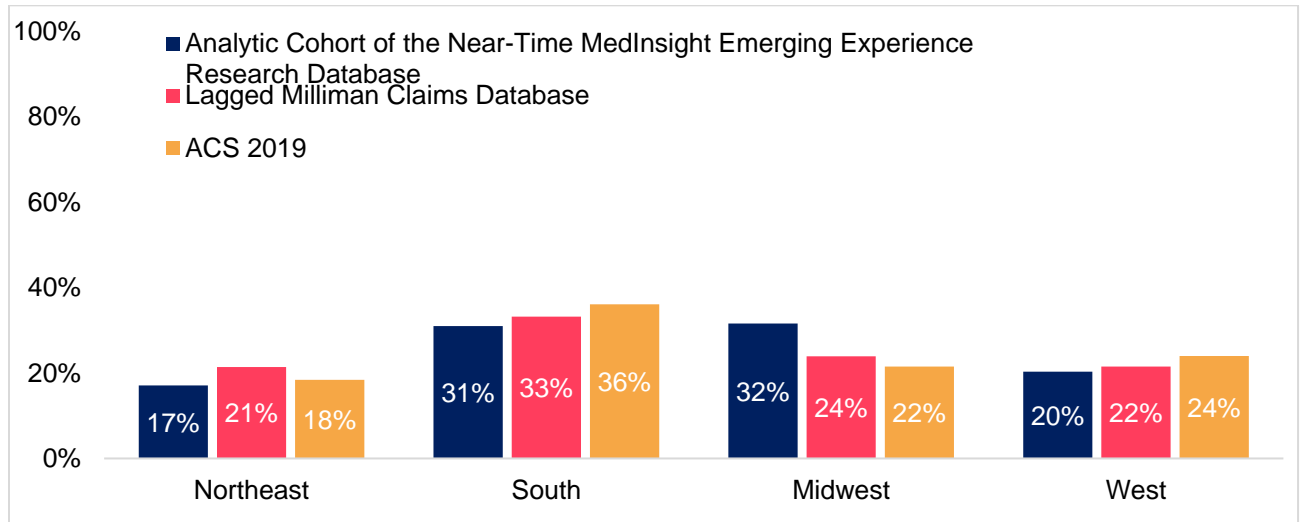
eFigure 6. Unadjusted Overall Utilization per 100 Patients Stratified by Insurance Type, 2018-2021 (n=14.5 million patients)
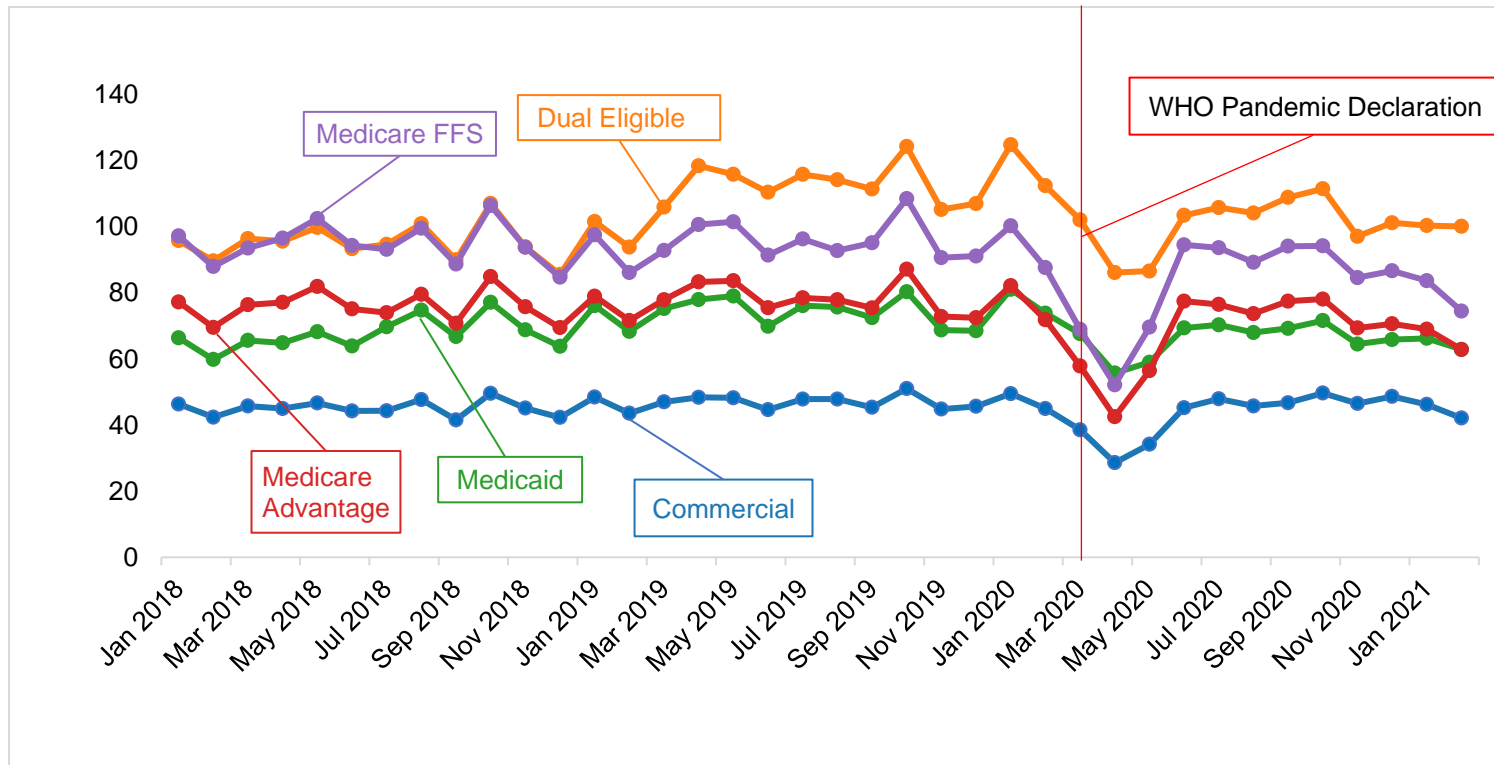
Dual Eligible = Patients with Medicare-Medicaid dual eligibility, WHO = World Health Organization; Medicare FFS = Medicare fee-for-service

Overall utilization includes an aggregate of 6 ambulatory care services, including ED visits, office and urgent care visits, behavioral health services, screening colonoscopies, screening mammograms, and contraceptive counseling/HIV screening

eFigure 7. Unadjusted Overall Utilization Rates per 100 Patients in the Primary Analysis Cohort Stratified by U.S. Census Region (n=14.5 million patients)
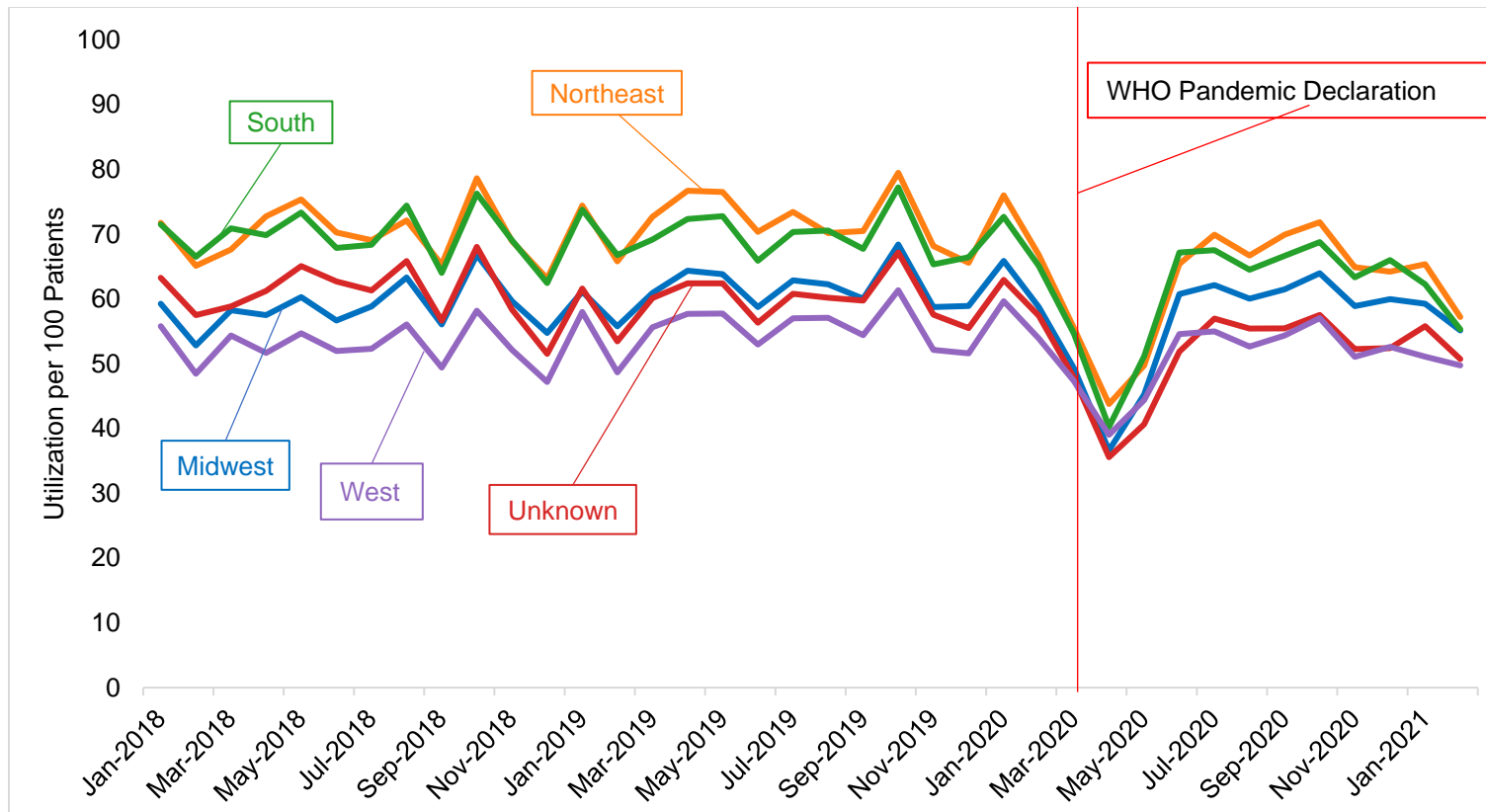
Note, overall utilization includes an aggregate of 6 ambulatory care services including, ED visits, office and urgent care visits, behavioral health services, screening colonoscopies, screening mammograms, and contraceptive counseling/HIV screening. Also, patients with unknown region comprised <1% of the sample. WHO = World Health Organization.

eTable 1. Percentage of Claims Completely Adjudicated After 5-Months' Time Across Patient Insurance Types in 2019

Patient-Insurance Type	Percent of Claims Adjudicated 5 Months after Service Rendered (%)
Commercial	97.8
Dual	96.8
Medicaid	96.6
Medicare Advantage	98.2
Medicare Fee-for-Service	98.6

Dual = Patients with Medicare-Medicaid dual eligibility

eTable 2. Percentage of Claims Completely Adjudicated After 5-Months' Time Across Health Service Types in 2019

Service Type	Percent of Claims Adjudicated 5 months after service rendered (%)
Colonoscopy Preventative	98.0
Emergency Department Visits	97.3
Mammography Preventative	99.0
Office/Home Visits	98.2
HIV Testing/STI Counseling	96.3
Outpatient Behavioral Health	95.6
Physical Exams	98.6
Urgent Care Visits	97.5

Note, in the main analysis, we combined office/home visits with urgent care visits and physical exam visits, into a combined variable called "office and urgent care visits"

eTable 3. **Placebo Test of RoRRs by Insurance Type in the Primary Analysis Cohort (n=14.5 million patients)**

Insurance	Period	March-April	May-June	July-August	September-October	November-December	January-February
Commercial	2020-2021 v. 2019-2020	0.679 (0.678, 0.681)	0.829 (0.827, 0.830)	0.951 (0.949, 0.952)	0.966 (0.964, 0.967)	1.018 (1.016, 1.020)	0.907 (0.905, 0.909)
Dual		0.738 (0.734, 0.742)	0.762 (0.757, 0.766)	0.827 (0.822, 0.831)	0.844 (0.840, 0.849)	0.827 (0.822, 0.831)	0.733 (0.728, 0.738)
Medicaid		0.750 (0.748, 0.752)	0.817 (0.815, 0.819)	0.856 (0.854, 0.858)	0.857 (0.855, 0.860)	0.888 (0.885, 0.890)	0.784 (0.782, 0.787)
Medicare Advantage		0.609 (0.608, 0.611)	0.822 (0.820, 0.824)	0.935 (0.933, 0.938)	0.931 (0.929, 0.934)	0.936 (0.934, 0.939)	0.832 (0.830, 0.835)
Medicare FFS		0.615 (0.614, 0.617)	0.830 (0.828, 0.832)	0.943 (0.940, 0.945)	0.909 (0.906, 0.911)	0.934 (0.931, 0.936)	0.820 (0.817, 0.822)
Overall		0.670 (0.669, 0.671)	0.825 (0.824, 0.825)	0.929 (0.928, 0.930)	0.931 (0.930, 0.932)	0.967 (0.966, 0.968)	0.862 (0.861, 0.863)
Commercial	2019-2020 v. 2018-2019	1.016 (1.014, 1.017)	0.984 (0.982, 0.986)	1.001 (0.999, 1.002)	1.023 (1.021, 1.025)	1.001 (0.999, 1.002)	0.989 (0.987, 0.991)
Dual		1.056 (1.050, 1.062)	1.033 (1.027, 1.039)	1.010 (1.004, 1.015)	1.038 (1.032, 1.044)	1.070 (1.064, 1.076)	1.150 (1.143, 1.158)
Medicaid		1.041 (1.038, 1.044)	1.003 (1.000, 1.006)	0.938 (0.935, 0.940)	0.969 (0.966, 0.972)	0.950 (0.947, 0.952)	0.970 (0.967, 0.974)
Medicare Advantage		1.025 (1.022, 1.028)	0.993 (0.990, 0.995)	1.001 (0.998, 1.003)	1.027 (1.024, 1.030)	0.987 (0.984, 0.990)	1.010 (1.006, 1.013)
Medicare FFS		1.033 (1.030, 1.035)	0.995 (0.993, 0.998)	0.995 (0.992, 0.997)	1.060 (1.058, 1.063)	1.035 (1.033, 1.037)	1.041 (1.038, 1.044)
Overall		1.027 (1.026, 1.028)	0.993 (0.992, 0.994)	0.991 (0.990, 0.992)	1.021 (1.020, 1.023)	1.000 (0.998, 1.001)	1.007 (1.006, 1.008)

Dual = Patients with Medicare-Medicaid dual eligibility, Medicare FFS = Medicare fee-for-service

eTable 4. RoRRs of Ambulatory Care Stratified by Service Type and Patient Insurance Subgroups

Coverage Type	Service Type	Mar-Apr 2020	May-Jun 2020	Jul-Aug 2020	Sep-Oct 2020	Nov-Dec 2020	Jan-Feb 2021
Overall	ED Visits	0.69 (0.69, 0.69)	0.75 (0.75, 0.76)	0.85 (0.84, 0.85)	0.88 (0.87, 0.88)	0.91 (0.90, 0.91)	0.79 (0.79, 0.80)
Medicaid	ED Visits	0.68 (0.67, 0.69)	0.72 (0.71, 0.72)	0.80 (0.79, 0.81)	0.79 (0.78, 0.80)	0.77 (0.76, 0.78)	0.71 (0.70, 0.72)
Dual	ED Visits	0.68 (0.66, 0.69)	0.71 (0.70, 0.72)	0.77 (0.75, 0.78)	0.78 (0.77, 0.80)	0.79 (0.77, 0.80)	0.65 (0.65, 0.67)
Commercial	ED Visits	0.72 (0.71, 0.73)	0.78 (0.77, 0.78)	0.88 (0.87, 0.89)	0.86 (0.85, 0.87)	0.92 (0.91, 0.93)	0.83 (0.82,0.84)
Medicare Advantage	ED Visits	0.70 (0.68, 0.70)	0.76 (0.75, 0.77)	0.84 (0.84, 0.85)	0.88 (0.87, 0.88)	0.87 (0.86,0.88)	0.79 (0.78, 0.79)
Medicare FFS	ED Visits	0.66 (0.65, 0.66)	0.74 (0.73, 0.75)	0.84 (0.83, 0.85	0.95 (0.94, 0.96)	1.03 (1.02, 1.04)	0.78 (0.77, 0.79)
Overall	Office and Urgent Care Visits	0.67 (0.67, 0.67)	0.84 (0.84, 0.84)	0.94 (0.94, 0.94)	0.93 (0.93, 0.93)	0.98 (0.98, 0.98)	0.86 (0.86, 0.86)
Medicaid	Office and Urgent Care Visits	0.75 (0.75, 0.75)	0.84 (0.83, 0.84)	0.90 (0.89, 0.90)	0.89 (0.88, 0.89)	0.94 (0.94, 0.95)	0.82 (0.82, 0.83)
Dual	Office and Urgent Care Visits	0.72 (0.71, 0.72)	0.83 (0.83, 0.84)	0.89 (0.88, 0.90)	0.89 (0.89, 0.89)	0.92 (0.91, 0.92)	0.81 (0.80, 0.81)
Commercial	Office and Urgent Care Visits	0.69 (0.69, 0.69)	0.83 (0.83, 0.84)	0.95 (0.94, 0.95)	0.96 (0.96, 0.96)	1.03 (1.03, 1.03)	0.91 (0.90, 0.91)
Medicare Advantage	Office and Urgent Care Visits	0.62 (0.62, 0.63)	0.84 (0.84, 0.85)	0.94 (0.94, 0.95)	0.93 (0.93, 0.93)	0.95 (0.94, 0.95)	0.84 (0.84, 0.84)
Medicare FFS	Office and Urgent Care Visits	0.63 (0.62, 0.63)	0.85 (0.84, 0.85)	0.95 (0.94, 0.95)	0.90 (0.90, 0.90)	0.92 (0.92, 0.93)	0.83 (0.82, 0.83)
Overall	Screening Colonoscopy	0.31 (0.30, 0.31)	0.47 (0.46, 0.47)	0.78 (0.77, 0.79)	0.84 (0.83, 0.85)	0.80 (0.79, 0.80)	0.65 (0.64, 0.66)
Medicaid	Screening Colonoscopy	0.27 (0.25, 0.29)	0.39 (0.37, 0.41)	0.70 (0.67, 0.74)	0.71 (0.68, 0.75)	0.70 (0.67, 0.74)	0.58 (0.54, 0.62)
Dual	Screening Colonoscopy	0.26 (0.23, 0.29)	0.40 (0.36, 0.44)	0.60 (0.55, 0.66)	0.63 (0.58, 0.69)	0.71 (0.65, 0.78)	0.55 (0.50, 0.62)
Commercial	Screening Colonoscopy	0.30 (0.30, 0.31)	0.47 (0.46, 0.48)	0.77 (0.76, 0.78)	0.86 (0.84, 0.87)	0.81 (0.80, 0.82)	0.70 (0.68, 0.71)
Medicare Advantage	Screening Colonoscopy	0.31 (0.30, 0.32)	0.46 (0.45, 0.48)	0.83 (0.81, 0.85)	0.87 (0.85, 0.90)	0.81 (0.79, 0.83)	0.66 (0.64, 0.69)
Medicare FFS	Screening Colonoscopy	0.32 (0.32, 0.33)	0.51 (0.50, 0.52)	0.85 (0.83, 0.87)	0.86 (0.84, 0.88)	0.85 (0.83, 0.87)	0.63 (0.61, 0.64)
Overall	Screening Mammograms	0.29 (0.29, 0.29)	0.65 (0.65, 0.66)	0.90 (0.90, 0.91)	0.92 (0.91, 0.92)	0.88 (0.87, 0.88)	0.79 (0.79, 0.80)
Medicaid	Screening Mammograms	0.29 (0.28, 0.29)	0.45 (0.44, 0.47)	0.69 (0.69, 0.70)	0.80 (0.77, 0.82)	0.81 (0.79, 0.84)	0.72 (0.69, 0.74)

Coverage Type	Service Type	Mar-Apr 2020	May-Jun 2020	Jul-Aug 2020	Sep-Oct 2020	Nov-Dec 2020	Jan-Feb 2021
Dual	Screening Mammograms	0.27 (0.25, 0.29)	0.46 (0.43, 0.48)	0.75 (0.71, 0.80)	0.78 (0.74, 0.82)	0.78 (0.74, 0.82)	0.67 (0.62, 0.72)
Commercial	Screening Mammograms	0.30 (0.30, 0.30)	0.66 (0.65, 0.66)	0.90 (0.89, 0.91)	0.93 (0.93, 0.94)	0.90 (0.90, 0.91)	0.85 (0.84, 0.86)
Medicare Advantage	Screening Mammograms	0.28 (0.27, 0.28)	0.68 (0.67, 0.69)	0.93 (0.92, 0.95)	0.95 (0.94, 0.97)	0.88 (0.87, 0.90)	0.77 (0.75, 0.78)
Medicare FFS	Screening Mammograms	0.27 (0.26, 0.27)	0.71 (0.70, 0.72)	1.00 (0.99, 1.02)	0.96 (0.94, 0.97)	0.90 (0.89, 0.91)	0.78 (0.76, 0.79)
Overall	Contraception Counseling/HIV Screening	0.54 (0.53, 0.54)	0.74 (0.74, 0.74)	0.91 (0.91, 0.91)	0.96 (0.96, 0.96)	0.94 (0.93, 0.94)	0.85 (0.84, 0.85)
Medicaid	Contraceptive Counseling/HIV Screening	0.61 (0.61, 0.62)	0.72 (0.71, 0.72)	0.81 (0.80, 0.81)	0.87 (0.86, 0.87)	0.89 (0.88, 0.89)	0.79 (0.78, 0.79)
Dual	Contraception Counseling/HIV Screening	0.46 (0.45, 0.47)	0.55 (0.53, 0.56)	0.77 (0.76, 0.79)	0.99 (0.97, 1.02)	0.77 (0.75, 0.79)	0.55 (0.53, 0.56)
Commercial	Contraception Counseling/HIV Screening	0.53 (0.53, 0.54)	0.74 (0.74, 0.75)	0.92 (0.91, 0.92)	0.98 (0.97, 0.98)	0.96 (0.95, 0.96)	0.88 (0.87, 0.88)
Medicare Advantage	Contraception Counseling/HIV Screening	0.47 (0.47, 0.48)	0.79 (0.78, 0.80)	1.02 (1.01, 1.03)	1.03 (1.02, 1.04)	0.97 (0.96, 0.98)	0.83 (0.82, 0.84)
Medicare FFS	Contraception Counseling/HIV Screening	0.46 (0.45, 0.46)	0.77 (0.76, 0.78)	0.97 (0.96, 0.98)	0.93 (0.92, 0.94)	0.89 (0.88, 0.90)	0.78 (0.77, 0.80)
Overall	Behavioral Health Services	0.90 (0.90, 0.91)	0.94 (0.94, 0.94)	0.95 (0.94, 0.95)	0.95 (0.94, 0.95)	0.99 (0.99, 1.00)	0.91 (0.91, 0.91)
Medicaid	Behavioral Health Services	0.87 (0.86, 0.87)	0.88 (0.87, 0.88)	0.82 (0.82, 0.83)	0.80 (0.80, 0.80)	0.81 (0.81, 0.82)	0.72 (0.72, 0.72)
Dual	Behavioral Health Services	0.85 (0.84, 0.86)	0.73 (0.72, 0.74)	0.77 (0.76, 0.78)	0.76 (0.76, 0.77)	0.73 (0.72, 0.73)	0.69 (0.69, 0.70)
Commercial	Behavioral Health Services	0.97 (0.96, 0.97)	1.05 (1.05, 1.06)	1.06 (1.06, 1.07)	1.07 (1.06, 1.07)	1.14 (1.13, 1.14)	1.03 (1.02, 1.03)
Medicare Advantage	Behavioral Health Services	0.78 (0.77, 0.80)	0.78 (0.77, 0.80)	0.84 (0.83, 0.85)	0.87 (0.86, 0.89)	0.96 (0.94, 0.97)	0.90 (0.88, 0.91)
Medicare FFS	Behavioral Health Services	0.89 (0.88, 0.90)	0.95 (0.94, 0.96)	0.98 (0.97, 0.99)	0.98 (0.97, 0.99)	1.04 (1.03, 1.06)	0.92 (0.91, 0.94)

a RoRR: We use the term ratios-of-rate ratios (RoRRs), to describe our application of difference-in-differences analyses using the log-utilization rate scale that allows us to accurately represent changes in utilization rates. Specifically, our RoRR metric described percentages of observed 2020 utilization rates compared with expected utilization rates that would have been occurred if 2020 trends had paralleled 2019 trends.

ED = emergency department, Dual = Patients with Medicare-Medicaid dual-eligibility Medicare FFS = Medicare fee-for-service

eTable 5. Age-Sex Adjusted Ratio of Rate Ratios of Overall Ambulatory Care Utilization Across the Three Cohorts[a]

Continuously Enrolled (Primary Analysis Cohort)						
	Mar-Apr 2020	May-Jun 2020	Jul-Aug 2020	Sep-Oct 2020	Nov-Dec 2020	Jan-Feb 2021
Overall	0.670 (0.669, 0.671)	0.825 (0.824, 0.825)	0.929 (0.928, 0.930)	0.931 (0.930, 0.932)	0.967 (0.966, 0.968)	0.862 (0.861, 0.863)
Medicaid	0.750 (0.748, 0.752)	0.817 (0.815, 0.819)	0.856 (0.854, 0.858)	0.857 (0.855, 0.860)	0.888 (0.885, 0.890)	0.784 (0.782, 0.787)
Dual	0.738 (0.734, 0.742)	0.762 (0.757, 0.766)	0.827 (0.822, 0.831)	0.844 (0.840, 0.849)	0.827 (0.822, 0.831)	0.733 (0.728, 0.738)
Commercial	0.679 (0.678, 0.681)	0.829 (0.827, 0.830)	0.951 (0.949, 0.952)	0.966 (0.964, 0.967)	1.018 (1.016, 1.020)	0.907 (0.905, 0.909)
Medicare Advantage	0.609 (0.608, 0.611)	0.822 (0.820, 0.824)	0.935 (0.933, 0.938)	0.931 (0.929, 0.934)	0.936 (0.934, 0.939)	0.832 (0.830, 0.835)
Medicare Fee-for-Service	0.615 (0.614, 0.617)	0.830 (0.828, 0.832)	0.943 (0.940, 0.945)	0.909 (0.906, 0.911)	0.934 (0.931, 0.936)	0.820 (0.817, 0.822)
Non-Continuously Enrolled						
	Mar-Apr 2020	May-Jun 2020	Jul-Aug 2020	Sep-Oct 2020	Nov-Dec 2020	Jan-Feb 2021
Overall	0.716 (0.714, 0.718)	0.814 (0.812, 0.816)	0.915 (0.912, 0.917)	0.948 (0.945, 0.950)	0.974 (0.972, 0.977)	0.849 (0.846, 0.851)
Medicaid	0.754 (0.750, 0.757)	0.785 (0.782, 0.788)	0.837 (0.833, 0.840)	0.864 (0.860, 0.867)	0.875 (0.871, 0.878)	0.761 (0.757, 0.765)
Dual	0.565 (0.560, 0.571)	0.519 (0.514, 0.525)	0.584 (0.578, 0.590)	0.619 (0.613, 0.625)	0.650 (0.643, 0.656)	0.620 (0.613, 0.628)
Commercial	0.713 (0.710, 0.715)	0.852 (0.849, 0.856)	0.971 (0.968, 0.975)	1.006 (1.002, 1.009)	1.049 (1.045, 1.053)	0.900 (0.896, 0.904)
Medicare Advantage	0.644 (0.639, 0.649)	0.830 (0.823, 0.836)	0.951 (0.944, 0.959)	0.966 (0.959, 0.973)	0.979 (0.971, 0.987)	0.859 (0.850, 0.867)
Medicare Fee-for-Service	0.633 (0.625, 0.640)	0.849 (0.840, 0.859)	0.967 (0.956, 0.978)	0.944 (0.934, 0.955)	0.947 (0.935, 0.959)	0.831 (0.819, 0.844)
Fully Enrolled						
	Mar-Apr 2020	May-Jun 2020	Jul-Aug 2020	Sep-Oct 2020	Nov-Dec 2020	Jan-Feb 2021
Overall	0.660 (0.659, 0.661)	0.819 (0.818, 0.820)	0.921 (0.920, 0.922)	0.934 (0.932, 0.935)	0.965 (0.964, 0.966)	0.849 (0.847, 0.850)
Medicaid	0.758 (0.755, 0.760)	0.833 (0.830, 0.835)	0.893 (0.890, 0.896)	0.881 (0.875, 0.887)	0.881 (0.875, 0.887)	0.769 (0.763, 0.775)
Dual	0.707 (0.702, 0.712)	0.782 (0.777, 0.788)	0.844 (0.838, 0.850)	0.881 (0.875, 0.887)	0.881 (0.875, 0.887)	0.769 (0.763, 0.775)
Commercial	0.670 (0.669, 0.672)	0.815 (0.813, 0.817)	0.937 (0.935, 0.939)	0.957 (0.955, 0.959)	1.001 (0.999, 1.003)	0.887 (0.885, 0.889)
Medicare Advantage	0.590 (0.588, 0.592)	0.808 (0.806, 0.811)	0.920 (0.917, 0.923)	0.915 (0.912, 0.918)	0.925 (0.922, 0.927)	0.839 (0.836, 0.842)
Medicare Fee-for-Service	0.605 (0.603, 0.607)	0.825 (0.823, 0.827)	0.918 (0.916, 0.921)	0.915 (0.912, 0.917)	0.936 (0.933, 0.938)	0.781 (0.778, 0.784)

[a] RoRR: We use the term ratios-of-rate ratios (RoRRs), to describe our application of difference-in-differences analyses using the log-utilization rate scale that allows us to accurately represent changes in utilization rates. Specifically, our RoRR metric described percentages of observed 2020 utilization rates compared with expected utilization rates that would have been occurred if 2020 trends had paralleled 2019 trends.

eTable 6. Age-Sex Adjusted Ratio of Rate Ratios of Overall Ambulatory Care Utilization Among Patients in the Analytic with and without Adjusting for U.S. Census Region[a]

Primary Analysis Cohort						
	Mar-Apr 2020	**May-Jun 2020**	**Jul-Aug 2020**	**Sep-Oct 2020**	**Nov-Dec 2020**	**Jan-Feb 2021**
Overall	0.670 (0.669, 0.671)	0.825 (0.824, 0.825)	0.929 (0.928, 0.930)	0.931 (0.930, 0.932)	0.967 (0.966, 0.968)	0.862 (0.861, 0.863)
Medicaid	0.750 (0.748, 0.752)	0.817 (0.815, 0.819)	0.856 (0.854, 0.858)	0.857 (0.855, 0.860)	0.888 (0.885, 0.890)	0.784 (0.782, 0.787)
Dual	0.738 (0.734, 0.742)	0.762 (0.757, 0.766)	0.827 (0.822, 0.831)	0.844 (0.840, 0.849)	0.827 (0.822, 0.831)	0.733 (0.728, 0.738)
Commercial	0.679 (0.678, 0.681)	0.829 (0.827, 0.830)	0.951 (0.949, 0.952)	0.966 (0.964, 0.967)	1.018 (1.016, 1.020)	0.907 (0.905, 0.909)
Medicare Advantage	0.609 (0.608, 0.611)	0.822 (0.820, 0.824)	0.935 (0.933, 0.938)	0.931 (0.929, 0.934)	0.936 (0.934, 0.939)	0.832 (0.830, 0.835)
Medicare FFS	0.615 (0.614, 0.617)	0.830 (0.828, 0.832)	0.943 (0.940, 0.945)	0.909 (0.906, 0.911)	0.934 (0.931, 0.936)	0.820 (0.817, 0.822)
Primary Analysis Cohort, Adjusting for U.S. Region						
	Mar-Apr 2020	**May-Jun 2020**	**Jul-Aug 2020**	**Sep-Oct 2020**	**Nov-Dec 2020**	**Jan-Feb 2021**
Overall	0.670 (0.669, 0.671)	0.825 (0.824, 0.826)	0.929 (0.928, 0.930)	0.931 (0.930, 0.932)	0.967 (0.966, 0.968)	0.862 (0.860, 0.863)
Medicaid	0.750 (0.748, 0.753)	0.817 (0.815, 0.819)	0.855 (0.852, 0.857)	0.855 (0.852, 0.857)	0.884 (0.881, 0.886)	0.781 (0.778, 0.784)
Dual	0.740 (0.736, 0.744)	0.763 (0.758, 0.767)	0.827 (0.822, 0.831)	0.840 (0.836, 0.845)	0.823 (0.818, 0.827)	0.723 (0.718, 0.728)
Commercial	0.679 (0.678, 0.681)	0.829 (0.827, 0.830)	0.951 (0.949, 0.952)	0.965 (0.964, 0.967)	1.017 (1.016, 1.019)	0.906 (0.904, 0.908)
Medicare Advantage	0.609 (0.608, 0.611)	0.822 (0.820, 0.824)	0.935 (0.933, 0.938)	0.930 (0.928, 0.933)	0.935 (0.932, 0.937)	0.833 (0.830, 0.835)
Medicare FFS	0.615 (0.613, 0.616)	0.830 (0.827, 0.832)	0.943 (0.940, 0.945)	0.906 (0.904, 0.908)	0.932 (0.929, 0.934)	0.817 (0.815, 0.820)

[a] As above, we use the term ratios-of-rate ratios (RoRRs), to describe our application of difference-in-differences analyses using the log-utilization rate scale that allows us to accurately represent changes in utilization rates. Specifically, our RoRR metric described percentages of observed 2020 utilization rates compared with expected utilization rates that would have been occurred if 2020 trends had paralleled 2019 trends. In the second table, our sensitivity analysis incorporated the four U.S. census regions into the model (Northeast, Midwest, South, and West) and we found that inclusion of this variable did not substantively alter our main results (first table).

Dual = Patients with Medicare-Medicaid dual eligibility, Medicare FFS = Medicare fee-for-service

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