COMMONWEALTH OF MASSACHUSETTS
HEALTH POLICY COMMISSION

TECHNICAL APPENDIX 7
PROVIDER ORGANIZATION PERFORMANCE VARIATION

ADDENDUM TO 2022 COST TRENDS REPORT

Contents

1 Summary

This appendix describes the Health Policy Commission's (HPC) approach to examining **Provider Organization Performance Variation** in the 2022 Cost Trends Report Chartpack.

2 Unadjusted total medical expenditures (TME) per member per month in 2019 and average annual TME growth from 2016 to 2019

2.1 Data

For the exhibit **Unadjusted total medical expenditures (TME) per member per month in 2019 and average annual TME growth from 2016 to 2019, by provider organization,** the HPC used the Center for Health Information and Analysis' (CHIA) 2019 Annual Report Alternative Payment Methods (APM) Databook (for calendar years 2016-2018) and the CHIA 2021 Annual Report APM Databook (for calendar years 2017-2019)

2.2 Analysis

CHIA's 2019 Annual Report APM Databook and 2021 Annual Report APM Databook report unadjusted total medical expenditures (TME). To calculate unadjusted TME per member per month, the HPC examined Blue Cross Blue Shield of Massachusetts, Harvard Pilgrim Health Plan, and Tufts Health Plan. HPC restricted this analysis to provider organizations reporting at least 100,000 commercial member months each year 2016-2019. HPC summed unadjusted TME for each provider group and divided by total member months.

To standardize across CHIA Annual Report Databook years, HPC divided 2016 unadjusted TME per member per month by 2017 unadjusted TME per member per month as calculated from the CHIA 2019 Annual Report APM Databook, and multiplied the resultant percentage by 2017 unadjusted TME per member per month as calculated from the CHIA 2021 Annual Report APM Databook, for a standardized 2016 amount.

3 Patient Attribution Methodology

3.1 Data

The HPC used the 2019 Registration of Provider Organizations (RPO) and the 2019 IQVIA, Inc Office Based and Hospital Based Providers (IQVIA, Inc) dataset to identify providers and create a "Provider File." The HPC then used the CHIA All-Payer Claims Database v10.0 (APCD) to attribute patients observed in the APCD to provider organizations in Massachusetts in 2019 and 2020. The HPC's APCD has data from five commercial payers in the state: Blue Cross Blue Shield of Massachusetts, Tufts Health Plan, Harvard Pilgrim Health Care, AllWays (formerly Neighborhood Health Plan), and Anthem (including Unicare, a GIC offering).

3.2 Provider File

These steps describe the creation of the provider file used in the provider attribution methodology. As described below, the member attribution process requires a file of all providers and their National Provider Identifiers (NPIs), as well as a list of only the primary care providers (PCPs) and their NPIs.

Overall provider file:

To create the overall provider file, the HPC combined 2019 RPO data with December 2019 IQVIA, Inc data. After excluding any providers missing NPIs and removing duplicate entries of providers who may appear in both files, the final provider file includes 46,585 providers, 23,084 from RPO and 23,501 from IQVIA, Inc.

Primary care provider file:

The HPC defined primary care providers from this list as follows. For the providers in RPO, the HPC included all providers who self-report that they practice as a primary care provider, a pediatrician, or both. The HPC identified PCPs from the IQVIA, Inc file by using these self-reported specialties: Family practitioner, General practitioner, Internal medicine, Pediatrician, IMP. The PCP file also includes Nurse Practitioners from IQVIA, Inc (NPs are not included in the RPO data) who self-reported a primary care specialty.

The final PCP file includes 8,827 PCPs, 6,468 from RPO and 2,359 from IQVIA, Inc.

3.3 Attribution Methodology

These steps describe the attribution methodology that relies on the primary care provider file created in 2.2 above.

Individuals with a payer-reported PCP in the member eligibility file:

There are 1,724,885 unique members in the HPC's 2019 commercial analytic file of the APCD. The member eligibility file enables assignment of 80% (1,377,536) of members who have an identifiable PCP in their record.

There are 1,600,106 unique members in the HPC's 2020 commercial analytic file of the APCD. The member eligibility file enables assignment of 79% (1,263,976) of members who have an identifiable PCP in their record.

Step-wise PCP assignment using the medical claim file and pharmacy claim file:

The remaining unassigned members were then linked to their medical claims to identify primary providers of well visits, sick visits, and most frequent prescriber in the pharmacy claim file. Well visits are defined as any claims with the following procedure codes: G0438, G0439, V2020, V2030, V7000, V7030, V7050, V7060, V7080, V7090, 99381-99387, 99391-99397, 99401-99404, 99411-99412, 99420, 99429, 99432, 99461. Sick visits are defined as any claims with the following procedure codes: 99201-99205, 99211-99215. Claims that were identified as either well or sick visits were limited to sites of service where

patients would be expected to see a PCP [excluding 01 (pharmacy), 17 (retail clinic), 20 (urgent care), 21 (inpatient hospital), 23 (emergency department), 41 (ambulance), 42 (air ambulance), 51 (inpatient psychiatric facility), 52 (psychiatric facility, partial hospitalization), 53 (community mental health), 55 (residential SUD treatment), 56 (psychiatric residential treatment), 57 (non-residential SUD facility), 62 (outpatient rehab facility), 65 (end stage renal disease facility), 81 (independent lab)]. If a member was not linked to a PCP through a well visit, or sick visit, we then reviewed their pharmacy claims to determine if there was a primary prescriber.

In total, there are 1,583,856 individuals attributed to a provider organization in 2019 (92%), and 1,455,400 (91%) in 2020. For the chartpack, the HPC then restricted analyses to the 14 (non-specialty) provider organizations with at least 11,000 attributed commercial members. This resulted in a patient population of1,306,178 attributed members in 2019 and 1,180,135 members in 2020.

4 Study population

For the subsequent analyses, the study population is broadly defined as commercial members who were attributed to a provider organization with at least 11,000 attributed members. The HPC reports on the 14 largest provider organizations as they exist in the most current data years available, 2019 and 2020. The study population is further limited to adults who are at least 18 years old with continuous enrollment (12 months of insurance coverage). Additional study population inclusion and exclusion criteria apply for analyses on categorical spending (4.2), CT and MRI imaging (4.3), breast cancer screening (4.4), HOPD (4.6), and low value care (4.7) and are detailed below.

For all analyses reported as a rate of an event per 1,000 attributed commercial members (ED utilization and inpatient utilization), the underlying data on the commercial member population reflection by provider organization is below.

Provider organization	2019 Attributed commercial adults	2020 Attributed commercial adults
Acton	7,977	7,296
Atrius	111,096	96,971
Baystate	30,521	25,899
BILH	147,437	140,786
BMC	32,083	28,896
MACIPA	22,162	18,151
MGB	191,666	175,995
Reliant	26,863	25,854
Signature	9,760	8,506
South Shore	14,194	13,199
South Coast	13,632	12,443

Steward	109,614	101,323
UMass	51,067	47.973
Wellforce	84,704	77,865
Total	852,776	781,157

5 Analyses

5.1 Emergency Department Utilization

Emergency department (ED) visits were identified in the 2019 and 2020 commercial medical claims using procedure codes (CPT) that indicate a professional service was delivered in the emergency department (99281-99285), and any outpatient facility claim lines using the Health Care Cost Institute's methodology, indicating that a claim line is from a facility claim originating from an emergency department.[1]

An ED encounter was established as an ED visit for the same member on the same date of service. Claims with a populated admitting diagnosis, indicating that an ED visit turned into a hospital admission, were excluded from subsequent analyses.

A predominant diagnosis across all relevant claim lines for each ED encounter was established by using the diagnosis code that was most commonly populated for each ED encounter. If there was a tie, a diagnosis that matched the "patched" Billings algorithm (see details below) to identify potentially avoidable ED visits was prioritized to ensure classification of the visit. If all or no diagnosis codes had a match with this algorithm, then a random selection was done to identify a single diagnosis code to represent all claim lines of the encounter.

Overall Emergency Department Utilization

Overall ED utilization is defined as the sum of all ED visits for all attributed members of a particular provider organization that are included in the study population defined in Section 3. The rate of overall ED utilization is reported as an adjusted rate of ED visits per 1,000 attributed patients for comparability across different provider organizations that vary in the size of their attributed patient populations and to control for patient characteristics that may vary across provider organizations. The adjusted rate is established through a multivariable regression analysis controlling for patient-level and community-level variables (see more below).

Potentially Avoidable Emergency Department Utilization

The Billings algorithm is based on work by the NYU Center for Health and Public Service Research. In Billings et al. (1993),[i] the researchers, along with a panel of ED and primary care physicians, develop the following classification for ED visits:

[1] For more information on Health Care Cost Institute's methodology to identify types of outpatient facility claims please see: https://healthcostinstitute.org/images/pdfs/HCCI_2018_Methodology_public_v1.pdf.

- Non-emergent—The patient's initial complaint, presenting symptoms, vital signs, medical history, and age indicated that immediate medical care was not required within 12 hours;
- Emergent/Primary Care Treatable—Based on information in the record, treatment was required within 12 hours, but care could have been provided effectively and safely in a primary care setting. The complaint did not require continuous observation, and no procedures were performed or resources used that are not available in a primary care setting (e.g., CAT scan or certain lab tests);
- Emergent - ED Care Needed - Preventable/Avoidable—Emergency department care was required based on the complaint or procedures performed/resources used, but the emergent nature of the condition was potentially preventable/avoidable if timely and effective ambulatory care had been received during the episode of illness (e.g., the flare-ups of asthma, diabetes, congestive heart failure, etc.); and
- Emergent - ED Care Needed - Not Preventable/Avoidable—Emergency department care was required and ambulatory care treatment could not have prevented the condition (e.g., trauma, appendicitis, myocardial infarction, etc.).

Potentially avoidable ED visits are based on the "patched" Billings algorithm, which updates the original crosswalk (ICD-9) to ICD-10 and accounts for any periodic coding changes. See Johnston et al. (2017) for more information.[2] To improve classification rate, diagnosis codes unclassified by the "patched" Billings algorithm were sequentially truncated and shortened codes were re-classified using the same algorithm.

For the purposes of reporting, the rate of potentially avoidable emergency department utilization is a weighted sum of the non-emergent and emergent/primary care treatable category values reported as a rate per 1,000 attributed patients adjusted for patient-level and community-level variables.

Mental Health-Related Emergency Department Utilization

Mental health-related ED utilization is defined as the sum of all mental health-related ED visits for all attributed members of a particular provider organization that are included in the study population defined in Section 3. Mental health-related ED utilization is reported as an adjusted rate of ED visits per 1,000 attributed patients for comparability across different provider organizations that vary in the size of their attributed patient populations and to control for patient characteristics that may vary across provider organizations. The adjusted rate is established through a multivariable regression analysis controlling for patient-level and community-level variables (see more below).

[2] For more information on the patched Billing's algorithm please see: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5517669/.

Mental health-related ED visits are identified using Clinical Classifications Software (CCS) diagnostic classifications for mental health based on the most frequently used primary diagnosis for an ED encounter.[3]

5.2 Unadjusted Medical Spending Per Member Per Year By Category And Provider Organization

In addition to restricting the patient population of analysis to commercially-insured adults who are at least 18 years old with continuous enrollment (12 months of insurance coverage) in the 14 largest provider organizations, a further exclusion was added for categorical spending analysis to ensure individuals had continuous prescription enrollment (12 months of prescription insurance coverage). This patient population distribution by provider organization is listed below. This was done to ensure that only those who were eligible and covered for prescription insurance were included in the calculations for categorical per member per year spending. By restricting the analysis in this way, bias was also limited if some providers had proportionally more individuals with Anthem than other providers did, as Anthem prescription coverage is not available in the APCD v10.0.

Provider organization	2019 Attributed commercial adults	2020 Attributed commercial adults
Acton	6,662	6,286
Atrius	81,976	75,214
Baystate	21,208	18,034
BILH	116,140	107,384
BMC	25,971	23,336
MACIPA	15,938	14,734
MGB	155,017	145,476
Reliant	23,390	22,490
Signature	7,485	6,415
South Shore	11,579	10,693
South Coast	10,147	9,152
Steward	80,481	73,945
UMass	40,896	38,404
Wellforce	63,307	58,326
Total	660,197	609,889

To calculate per member per year spending for each of the five categories (inpatient, outpatient, professional, other, and prescription spending), total spending by provider organization was calculated for each category. Then the provider total for each category was divided by the number of individuals in each provider patient population.

3 Clinical Classifications Software Refined (CCSR)for ICD-10-CM Diagnoses. Healthcare Cost and Utilization Project (HCUP). February 2022. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/toolssoftware/ccsr/dxccsr.jsp

5.3 CT and MRI Utilization Measures

For an analysis of adjusted CT and MRI rates by provider organization attributed member groups, the HPC first restricted medical claims where the patient population of analysis was commercially-insured adults who are at least 18 years old with continuous enrollment (12 months of insurance coverage) at one of the fourteen largest provider organizations in the state. Then on a claim line level, all CT and MRI services were identified using the following codes.

CT: 70480 70481 70482 70486 70487 70488 70490 70491 70492 70480 73200 73201 73202 73700 73701 73702 70450 70460 70470 72125 72126 72127 71250 71260 71270 72128 72129 72130 74176 74177 74178 72131 72132 72133

MRI: 70540 70543 70336 73221 73222 73223 73218 73220 73721 73722 73723 73718 73720 70551 70553 72141 72156 70550 70552 77059 72146 72157 74181 74183 72148 72158 72195 72197

After identifying the claim line numbers, the HPC collapsed the analysis level from the claim line level to the encounter level, collapsing on the same unique member identifier, same date, and same procedure code. Then the results were collapsed to an individual level with the attributed members and adjusted for patient-level and community-level variables.

These CT and MRI codes were taken from the Mountain Medical Imaging Center's website at https://www.mtnmedical.com/pdf/CPT-Codes.pdf and crossed referenced with the Rhode Island state government's Executive Office of Health and Human Services Radiology Procedure Codes at https://eohhs.ri.gov/sites/g/files/xkgbur226/files/2021-03/radiology_procedure_codes.pdf.

5.4 Breast Cancer Screenings

The HPC conducted an analysis of mammography services for female members 45 years of age or older to better understand how the COVID-19 pandemic affected breast cancer screenings between 2019 and 2020. For age restrictions, 45 was chosen as the cutoff for mammogram and colon cancer screenings based on American Cancer Society guidelines.[4] The table below displays the population size of commercially-insured female members 45 years of age or older with continuous enrollment (12 months of insurance coverage) in the 14 largest provider organizations.

Provider organization	2019 Attributed commercial adults	2020 Attributed commercial adults

[4] American Cancer Society. Guidelines for the early detection of cancer: https://www.cancer.org/healthy/find-cancer-early/american-cancer-society-guidelines-for-the-early-detection-of-cancer.html

Acton	2,147	1,900
Atrius	25,981	22,237
Baystate	7,676	6,697
BILH	34,805	31,722
BMC	6,479	5,737
MACIPA	5,591	4,408
MGB	52,092	46,938
Reliant	6,314	6,021
Signature	2,399	2,094
South Shore	3,198	2,973
South Coast	3,582	3,318
Steward	26,945	24,555
UMass	12,911	12,192
Wellforce	18,532	16,672
Total	208,652	187,464

Explicit breast cancer screening mammogram codes 77067 and 77063 were used to first identify procedure codes that were unambiguously for preventive screening and not breast cancer diagnostic services. Because other mammogram screening codes can be ambiguous if they are for screening or diagnostic purposes, the HPC used an algorithm to separate diagnostic services from ambiguous procedure codes that would otherwise be screening services developed by Wernli et al., 2020.

The ambiguous mammography codes were 76641 76642 78800 77048 77049 77046 77047 77053 77054 C8903 C8905 C8906 C8908.

We excluded mammogram encounters where the member had a diagnosis for a complication of a breast implant up to 9 months previously (any diagnosis code starting with T854), if the member had a breast cancer diagnostic service up to 3 months previously (procedure codes 77065 77066 77061 77062 G0279), and if the member had a previous diagnosis for breast cancer during the year-long lookback period (any diagnosis code starting with C50).

The unit of analysis in this exhibit is the number of unique female patients over 45 per 100 individuals that have received any breast cancer screenings in 2019 and 2020.

Procedure codes for this analysis were taken from the Centers for Medicare & Medicaid Services Billing and Coding: Breast Imaging Mammography/Breast Echography (sonography)/Breast MRI/Ductography.[5]

[5] Centers for Medicare & Medicaid Services. Billing and Coding: Breast Imaging Mammography/Breast Echography (Sonography)/Breast MRI/Ductography. https://www.cms.gov/medicare-coverage-database/view/article.aspx?articleid=56448&ver=13&.

5.5 HOPD

The HPC conducted an analysis of Hospital Outpatient Department (HOPD) utilization by provider organization attributed patient groups. This analysis used a smaller patient population based on services received. The HPC selected 451 common professional and outpatient laboratory procedure codes that often took place at HOPD service locations. To avoid extreme outliers, the procedure codes were restricted to a range of 20% to 80% of encounters (same memberlinkeid, same date, and same procedure code) by each procedure code taking place at a HOPD service location. The 451 codes are the final numbers of relevant procedure codes.

HOPD procedure codes: 0296T 0298T 10120 10160 11042 11043 11403 11406 11420 11421 11422 11423 11441 11442 11982 12001 12011 12034 12042 12051 12052 13101 14040 14060 16020 17250 17311 17312 17313 20552 20553 26055 27093 27096 29065 29075 29125 29405 29515 29580 29581 29705 31231 31237 31575 31579 36415 36475 45330 46221 46600 51600 51700 51701 51720 51728 51741 51784 51797 52310 54235 55700 57455 57456 57522 58555 58558 59025 59200 59820 59841 62321 62323 64405 64450 64483 64484 64490 64491 64492 64493 64494 64495 64612 64615 64616 64635 64636 64642 65855 66761 66821 67028 67145 67228 69220 69801 70160 70220 70360 71046 71100 71101 72020 72040 72050 72052 72070 72072 72100 72110 72114 72141 72146 72148 72156 72157 72158 72170 72195 72202 72220 73000 73010 73030 73060 73070 73080 73090 73100 73110 73120 73130 73140 73221 73222 73501 73502 73503 73521 73522 73523 73552 73560 73562 73564 73565 73590 73600 73610 73620 73630 73650 73660 73718 73720 73721 73722 74018 74019 74170 74176 74183 74455 74740 76377 76512 76536 76641 76700 76705 76706 76770 76775 76801 76802 76805 76811 76813 76815 76816 76817 76818 76819 76820 76821 76830 76856 76857 76870 76872 76881 77002 77066 77067 77080 77081 77085 77417 78452 80048 80050 80061 80074 80307 81001 81002 81003 81015 81025 82042 82043 82274 82306 82465 82550 82565 82570 82607 82670 82747 82947 82948 82962 83001 83002 83013 83014 83036 83718 83721 83921 84132 84144 84146 84153 84154 84270 84295 84403 84436 84443 84466 84481 84681 84702 84703 85007 85014 85025 85379 85610 85651 86003 86308 86431 86593 86663 86666 86703 86705 86708 86780 86803 87081 87086 87101 87102 87106 87177 87209 87255 87324 87329 87338 87400 87449 87480 87491 87510 87591 87625 87660 87661 87808 87905 88112 88175 88305 88312 88344 89055 89261 89310 89320 89321 89322 90473 90648 90675 90716 91065 91110 91200 92025 92060 92134 92235 92285 92504 92522 92523 92524 92537 92540 92550 92553 92555 92556 92557 92567 92579 92582 92585 92588 93225 93227 93228 93270 93272 93280 93282 93283 93284 93294 93295 93296 93298 93303

After establishing the 451 procedure codes, only encounters with those codes were kept for the analysis, and all other codes and individuals without any of those specific 451 procedure code encounters were removed from the analysis. The patient population size remaining for this analysis is listed in the table below.

Provider organization	2019 Attributed commercial adults	2020 Attributed commercial adults
Acton	6,274	5,233
Atrius	87,944	66,895
Baystate	24,058	19,041
BILH	118,376	96,448

BMC	23,949	19,435
MACIPA	17,885	12,956
MGB	157,435	131,777
Reliant	20,999	18,779
Signature	7,824	6,283
South Shore	11,331	9,648
South Coast	11,208	9,373
Steward	87,398	74,947
UMass	39,742	35,020
Wellforce	67,324	55,906
Total	681,747	561,741

5.6 Low Value Care

Identifying a Low Value Service

The measures generally adhere to the following logic:

- Measure exclusions: Remove all claims for patients that have at the time of the procedure, or in their claims history, have had any diagnosis code for which the procedure in question may be indicated.

- Identify the eligible population (denominator): Use ICD-10 codes and/or CPT codes to capture all encounters. Encounters were defined as unique patient on a unique date.

- Identify low value care (LVC) service (numerator): Identify all encounters that include a claim for the procedure code that is of low value for the eligible population.

The HPC took a conservative approach in implementing the existing measures. For example, only the first screening identified in a patient's claim history was labeled as being low value. If that patient received more than one non-indicated screening test, all subsequent tests were considered monitoring, not screening, based on clinical opinion. Each LVC measures had was constructed based on specific criteria (different sample sizes because they had different eligibility criteria, denominators, and numerators.

Analysis Timeframe

The HPC measured low value services that occurred in 2019 and 2020 claims data. Claims from 2018 and 2019 respectively were included as a "look-back period" to determine whether members should be included in the eligible population. For example, if a patient received a hypothyroidism diagnosis in July 2018 and subsequently received a T3 test in August 2018 and March 2019, only the March 2019 T3 test was included in the calculation of low value use and spending for the purpose of reporting on low value care in 2019.

Low Value Care Spending

After identifying the low value encounters, the HPC calculated spending by only including spending on the specific claim line attached to the LVC service. Some claim amounts (e.g., $0) were determined to be not representative of the actual cost because these services were likely paid under a global payment, capitated encounter records, or secondary payments where another carrier covers a portion of the reimbursement. Claims with these amounts were counted in total spending by imputing the median spending for the particular procedure code in the eligible population.

As previously mentioned, these low value care spending estimates only include the 9 services that were used in the study and do not represent all low value services. Spending includes insurer and enrollee payments for covered medical services.

Spending on a PMPY basis for the last Chartpack exhibit was calculated by finding the total spending among the 9 LVC services and then divided by the attributed population for each provider organization. Unlike the medical spending and most of the other analyses, the only restrictions on this attributed population size by provider organization is that individuals are over 18 years of age and they are attributed to one of the largest 14 provider organizations in the state. There is not a restriction on having 12 months of coverage for this analysis.

Measure Source and Specification for LVC

Screening		
T3 screening for patients with hypothyroidism	Schwartz AL, Jena AB, Zaslavsky AM, McWilliams JM. Analysis of Physician Variation in Provision of Low-Value Services. JAMA Intern Med. 2019 Jan 1;179(1):16-25.	**Eligible population:** CCW codes (ICD-10) for acquired hypothyroidism **Exclusions:** None **Numerator:** Total or free T3 test. CPT: 84480 84481
Stress testing for patients with an established diagnosis of ischemic heart disease or angina	Schwartz AL, Landon BE, Elshaug AG, Chernew ME, McWilliams JM. Measuring low-value care in Medicare. JAMA Intern Med. 2014 Jul;174(7):1067-76.	**Eligible population:** CCW codes (ICD-10) for ischemic heart disease **Exclusions:** None **Numerator:** Cardiac stress testing. CPT: 93015 93016 93017 93018 93350 93351 78451 78452 78453 78454 78460 78461 78464 78465 78472 78473 78481 78483 78491 78492
Vitamin D screening for patient without chronic conditions	Mafi JN, Russell K, Bortz BA, Dachary M, Hazel WA Jr, Fendrick AM. Low-Cost, High-Volume Health Services Contribute The Most To	**Eligible population:** All patients **Exclusions:** Members who had 25-Ohvitamin D screening and diagnosis of chronic conditions

	Unnecessary Health Spending. Health Aff (Millwood). 2017 Oct 1;36(10):1701-1704. Colla CH, Morden NE, Sequist TD, Schpero WL, Rosenthal MB. Choosing wisely: prevalence and correlates of low-value health care services in the United States. J Gen Intern Med. 2015 Feb;30(2):221-8.	within 1 year on or prior to the testing. ICD-10: E550 E559 E643 M83 N18 K7200 E8411 E8419 E848 E849 K50 K51 K520 Z9884 K7030 K740 K7460 K7469 K743 K744 K745 E8351 E8352 E673 E678 Q780 Q782 M3210 M3390 M889 Z79891 Z79899 G737 L400 L401 L402 L403 L404 L4050 L4051 L4052 L4053 L4054 L4055 L4056 L4057 L4058 L4059 L408 L409 E210 E211 E212 E213 E214 E215 Z7951 Z7952 K900 K901 K902 K903 K904 K9089 K909 K7201 K762 K7031 K702 K741 K742 K7689 K760 K7581 K7291 K7211 K7041 K7111 K7290 K912 N251 E209 E200 E208 E892 M833 E840 E662 E672 E68 L419 L410 L411 L418 L413 L414 L415 L945 M899 M949 M859 M32 M33 M360 M88 M81 M80 Members who had 25-Ohvitamin D screening and diagnosis of risk factors within 90 days on or prior to the testing. ICD-10: D86 A15 A17 A18 A19 B39 B38 J63 C81 C82 C83 E440 E83 G40 C84 C85 C86 C96 C88 C91 Members who had 25-Ohvitamin D screening and diagnosis of pregnancy and obesity on the day of the testing. ICD-10: O02 O03 O69 O04 O07 Z33 O08 A34 O20 O44 O45 O46 O67 O10 O11 O13 O16 O14 O15 O21 O90 O33 O30 O36 O09 O71 Z32 O68 O60 O23 O9A O31 O35 O76 O72 Z36 O77 O47 O99 O25 O32 O40 O62 O73 E66 O00 O48 O29 O34 O64 O41 O63

		O74 Z68 O12 O98 O75 O66 O42 O43 O82 O01 O26 O24 O80 O65 O61 O70 Z34 P50 Members who had 25-Ohvitamin D screening and diagnosis of falls and non-traumatic fracture within 1 year on or prior to the testing. ICD-10: Z9181 Z87311 Z87310 Members who had 1, 25-(OH)2-vitamin D screening and diagnosis of inherited or acquired disorders of vitamin D and phosphate metabolism within 90 days on or prior to the testing. ICD-10: D86 A15 A17 A18 A19 B39 B38 J63 C81 C82 C83 E44 E83 C84 C85 C86 C96 C88 C91 M83 N18 **Numerator:** Vitamin D test. CPT: 82306 82652
Preoperative Testing		
Chest radiographs occurring ≤30d before a low- or intermediate-risk non-cardiothoracic surgical procedure (not associated with inpatient or emergency care)	Schwartz AL, Landon BE, Elshaug AG, Chernew ME, McWilliams JM. Measuring low-value care in Medicare. JAMA Intern Med. 2014 Jul;174(7):1067-76.	**Eligible population:** Patients undergoing a low- or intermediate-risk non-cardiothoracic surgical procedure. BETOS: P1x P3D P4A P4B P4C P5C P5D P8A P8G. CPT: 19120 19125 47562 47563 49560 58558 **Exclusions:** None **Numerator:** Chest X-Ray. CPT: 71010 71015 71020-71023 71030 71034 71035
Baseline labs in patients without significant systemic disease undergoing low-risk surgery	Mafi JN, Russell K, Bortz BA, Dachary M, Hazel WA Jr, Fendrick AM. Low-Cost, High-Volume Health Services Contribute The Most To Unnecessary Health Spending. Health Aff (Millwood). 2017 Oct 1;36(10):1701-1704.	**Eligible population:** Patients without significant systemic disease undergoing low-risk surgery. BETOS: P1x P3D P4A P4B P4C P5C P5D P8A P8G. CPT: 19120 19125 47562 47563 49560 58558 **Exclusions:** All services where the low risk surgery falls on or 1 day after the E&M visit for emergency care, observation or urgent care visit. CPT: 99217

		99219 99226 99284 99218 99220 99281 99285 99224 99282 99225 99283 5160 4590 7620 9810 4500 4520 All electrolyte testing laboratory related services. CPT: 82374 82435 80051 82435 80047 80053 84132 80048 84295 80050 All services with a diagnosis of endocrine, liver or renal disorders. ICD-10: E08 E09 E10 E11 E13 E16 E20 E21 E22 E23 E24 E25 E26 E27 E28 E29 E30 E31 E32 E34 E35 E89 K70 K71 K72 K73 K74 K75 K76 K77 K80 K81 K82 K83 K87 K91 M3214 M3215 M3504 N00 N01 N02 N03 N04 N05 N06 N07 N08 N11 N14 N15 N16 N17 N18 N19 N25 N26 N27 CBC testing related services and a diagnosis of anemia or history suggestive of recent blood loss in the last 6 months prior to the CBC testing. CPT: 85014 85018 G0306 85025 G0307 85027 85032. ICD-10: C966 D5* D6* D71* D72* D73* D74* D75* D761 D762 D763 I8501 I880 I881 I882 I883 I884 I885 I886 I887 I888 I889 K270 K272 K920 K921 K922 R58 Z832 Coagulation testing related services in those with a diagnosis of coagulation disorders up to 2 years prior to the coagulation testing event or on anticoagulant medications 3 months prior to the coagulation testing. CPT: 85002 85611 85049 85730 85055 85732 85610. ICD-10: D65-D69.9 **Numerator:** Laboratory tests. CPT: 80047 80048 80050 80051 80053 81000 81001 81002

		81003 81005 81007 81020 81050 81099 82040 82247 82310 82330 82374 82435 82565 82947 82948 82950 82953 84075 84132 84155 84295 84450 84460 85002 85014 85018 85025 85027 85032 85049 85055 85610 85611 85730 85732 95250 95251 G0306 G0307
Procedures		
Coronary stent placement or balloon angioplasty for patients with an established (≥6 mo before the procedure) diagnosis of ischemic heart disease or angina (not associated with an ED visit)	Schwartz AL, Landon BE, Elshaug AG, Chernew ME, McWilliams JM. Measuring low-value care in Medicare. JAMA Intern Med. 2014 Jul;174(7):1067-76.	**Eligible population:** CCW codes (ICD-10) for ischemic heart disease **Exclusions:** None **Numerator**: Stenting and balloon angiography. CPT: 92928 92933 92929 92934 92920 92921
Outpatient epidural, facet, or trigger point injections for lower back pain	Schwartz AL, Jena AB, Zaslavsky AM, McWilliams JM. Analysis of Physician Variation in Provision of Low-Value Services. JAMA Intern Med. 2019 Jan 1;179(1):16-25.	**Eligible population:** Patients with low back pain. ICD-10: M47817 M47819 M5126 M519 M5136 M5134 M961 M961 M4647 M4800 M4806 M4806 M545 M5489 M4327 M533 M532X8 M533 M4300 M9983 M9903 M9904 Q762 S338XXA S336XXA S338XXA S338XXA S338XXA S339XXA S335XXA M5127 M5137 M5135 M5186 M549 M4328 M4310 M9984 M5136 M5187 M532X7 M5137 M533 I256 I25700 I25701 I25708 I25709 I25710 I25711 I25718 I25719 I25720 I25721 I25728 I25729 I25730 I25731 I25738 I25739 I25750 I25751 I25758 I25759 I25760 I25761 I25768 I25769 I25790 I25791 I25798 I25799 I25810 I25811 I25812 I2582 I2583 I2584 I2589 I259 I2101 I2102 I2109 I2111 I2119 I2121 I2129 I213 I214 I219 I21A1 I21A9 I220 I221 I222 I228 I229

		Exclusions: Patients with radicular back pain. ICD-10: M4716 M4710 M519 M5106 M5430 M5414 M5107 M5415 M5416 M5417 J1438 **Numerator:** Spinal injections. CPT: 62311 64483 20552 20553 64493 64475
Imaging		

DEXA Screening for Osteoporosis	Mafi JN, Reid RO, Baseman LH, et al. Trends in low-value health service use and spending in the US Medicare fee-for-service program, 2014-2018. JAMA Netw Open. 2021;4(2):e2037328. doi:10.1001/jamanetworkopen.2020.37328	**Eligible population:** All women under 65 years of age and men 50-69 who have had a DEXA screening with an office visit 30 days prior to the DEXA screening
		DEXA CPT: 77080, 77081
		Exclusions:
		• Patients with a diagnosis of osteoporosis on the day of the DEXA or a far back in the claims (as possible) before the DEXA screening.
		• Osteoporosis ICD-10 diagnosis codes starting with: M80, M81, M83, M84, or M85.
		• Competing diagnosis or risk factor diagnosis before the DEXA scan as far as possible in the claims.
		  ○ Diagnosis codes starting with:
		  ○ Vertebral compression: M485
		  ○ Maladaptive syndrome diagnosis: K90
		  ○ rheumatoid arthritis diagnosis: M05 and M06
		  ○ Hyperthyroidism: E05

		Numerator: All remaining

Brain Imaging Studies (CT or MRI) for Simple Syncope	Mafi JN, Reid RO, Baseman LH, et al. Trends in low-value health service use and spending in the US Medicare fee-for-service program, 2014-2018. JAMA Netw Open. 2021;4(2):e2037328. doi:10.1001/jamanetworkopen.2020.37328	**Eligible population:** All individuals 18 or older with a brain imaging study (CT or MRI) within 30 days of a diagnosis of syncope.
		• CT scan procedure codes: 70450 70460 70470.
		• MRI procedure codes: 70551 70552 70553 70554 70555 70557 70558 70559.
		• Syncope diagnosis codes starting with: "R55".
		
		Exclusions:
		• An inpatient admission within the time period from the diagnosis of syncope to the brain imaging. Inpatient site of service codes: 21 31 51 61.
		• A competing diagnosis (CVA, intracranial hemorrhage, brain tumors, etc.)
		  ○ Intracranial Hemorrhage: diagnosis code starting with I62
		  ○ Stroke: diagnosis codes starting with I63 G459 I693 Z8673
		• Head and neck tumor diagnosis within 1 year prior to imaging
		  ○ Tumor diagnosis codes starting with: C71 D330 D331 D332 D333 C760 D234 D233 D3611

		• Head injury withing 7 days prior to imaging
		  ○ Diagnostic code starting with S0
		• Members with a neurological deficit
		  ○ Diagnosis codes starting with R298 R299
		
		Numerator: All remaining

6 Control variables

Adjusted rates are reported for all exhibits in this chart pack except for those pertaining to low value care (section 4.4). Adjusted rates take into account the potential differences across provider organizations in patient health status, age, sex, patient insurance type, and insurer type. Patient health status is based on risk score information processed by software called The Johns Hopkins ACG® System © 1990, 2017, Johns Hopkins University. All Rights Reserved.

In addition to these variables, the HPC linked community-level variables at the member zip code level, based on CHIA analysis of the 2017 American Community Survey. These variables include:

- Median family income
- Median home value
- Percent of employed persons ages 16 and over in white collar occupations
- Percent of households with dependents under age 18 headed by single parents
- Whether or not the population ages 25 and over with at least a high school education is over 80%
- Percent of population receiving food stamps/SNAP
- Percent of population who have lived in the same house in the past 12 months
- Percent of population ages 16 and over who are unemployed

A multivariable regression model was used to calculate adjusted rates. For each analysis, all independent variables were means-centered and reported adjusted rates were scaled per 1,000 attributed measures.