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2022 Health Care Cost and Utilization Report

Analytic Methodology

2022 V1.0

April 2024

Note: This analytic methodology is appropriate for the *2022 Health Care Cost and Utilization Report*, as our methods are continually refined. Interested parties are encouraged to refer to the appropriate methodology and report.

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1. Introduction

For the *2022 Health Care Cost and Utilization Report*, the Health Care Cost Institute (HCCI) presented national estimates of health care spending, utilization, prices, and service-mix for the population of individuals younger than 65 and covered by employer-sponsored private health insurance (ESI). The data behind these estimates came from a national, multipayer, commercial health care claims database containing information provided by three data contributors – Aetna, Humana, and Blue Health Intelligence. The HCCI dataset contains over 1 billion commercial medical and pharmacy claims per year, representing the health care activity of more than 55 million individuals per year for the years 2012 through 2022. This document describes in detail the methods used to transform raw claims into descriptive statistics presented in the annual report.

For the annual *Health Care Cost and Utilization* reports HCCI produces an analytic subset of its database, consisting of all primary coverage commercial claims for beneficiaries younger than age 65, covered by ESI and whose claims were filed with a contributing health plan between 2018 and 2022. Figure 1 shows the process used to clean the ESI claims data. The process included categorizing claims, calculating utilization by service category, and adjustments to make the data representative of the national population younger than 65 with ESI.

The data are made representative of the national population younger than 65 with ESI using population weights based on U. S. Census Bureau data.

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FIGURE 1: PROCESS FLOW

A note on premiums

HCCI does not report on premiums or their determinants. For more information on health insurance premiums and the multiple factors that affect them (including health care expenditures; insured, group, and market characteristics; benefit design; and the regulatory environment), see Congressional Budget Office, Private Health Insurance and Federal Policy,[i] and Kaiser Family Foundation and Health Research & Education Trust, 2018 Employer Health Benefits Survey.[ii]

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2. Methods

2.1 Data collection

HCCI has access to health care claims data for approximately 55 million Americans in every year between 2012 and 2022 who have commercial health insurance coverage. This dataset was developed from de-identified claims data that were compliant with the Health Insurance Portability and Accountability Act (HIPAA) and included the allowed amounts (actual prices paid) to providers for services. To produce the findings in the *2022 Health Care Cost and Utilization Report*, HCCI used an analytic subset of its data consisting of all eligible claims for insured individuals younger than age 65, covered by either fully-insured or self-insured employer-sponsored health insurance (ESI).

The final analytic subset consisted of approximately 50 million covered lives per year, for the years 2018 through 2022 (Table 1). The claims used in the 2022 report include over 5 billion claim lines and represent the health care activity of 35% of all individuals younger than 65 covered by ESI, making this one of the largest data sources on the privately insured available.

TABLE 1: ANALYTIC SUBSET FOR 2022 REPORT – TOTAL COVERED LIVES BY CALENDAR YEAR

Year	Covered Lives
2018	53,000,000
2019	51,600,000
2020	49,000,000
2021	45,000,000
2022	42,000,000

Source: HCCI, 2024. Notes: Data refer only to HCCI holdings of claims for beneficiaries covered by employer-sponsored health insurance and younger than age 65. Data rounded to the nearest 100,000.

From these base datasets, a single analytical dataset was constructed for analysis using the process shown in Figure 1. Analysis of the analytic dataset is described in Section 3.

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2.2 Claims categorization

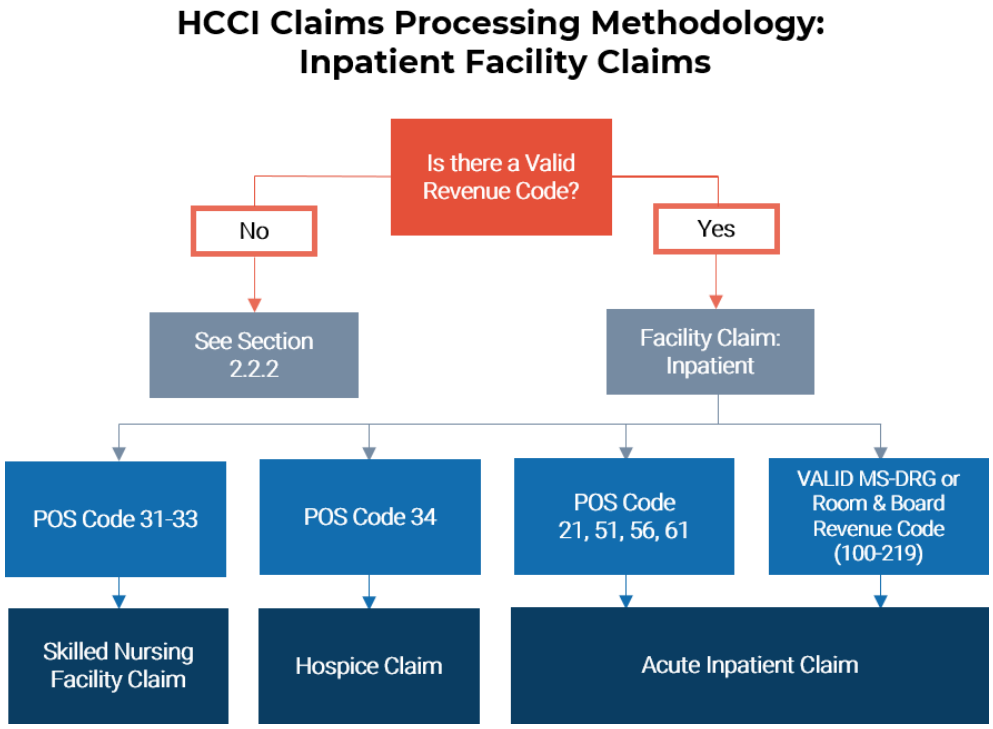
At the highest level, claims data were grouped into four major service categories: inpatient facility, outpatient facility, professional services, and prescription drugs and devices.

Inpatient facility claims were from hospitals, skilled nursing facilities (SNFs), and hospices, where there was evidence that the insured stayed overnight (Figure 2). The outpatient facility category contained claims that did not include an overnight stay but included observation and emergency room claims as well as claims for other outpatient services (Figure 3). Both outpatient and inpatient claims were for only the facility charges associated with such claims. HCCI classified services as professional procedure services if claims did not include valid revenue codes (i.e., were not billed by facilities).

2.2.1 Facility claims

Medical claims with a valid revenue code were assumed to be facility claims. In absence of that, claims were assumed to be professional procedure claims. Once processed, facility claims were grouped into two major service categories—inpatient and outpatient based on place of service (POS) codes (Figure 2 and Figure 3).

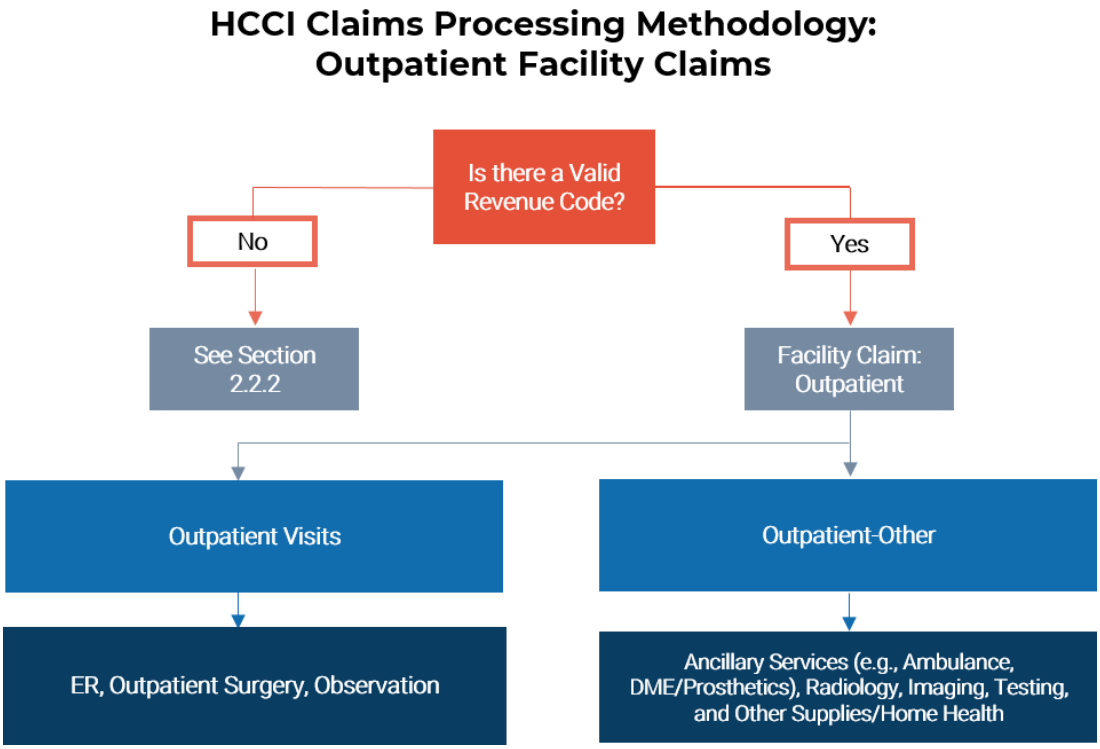
FIGURE 2: FACILITY CLAIMS PROCESS, INPATIENT



2.2.1.1 Inpatient facility claims

Inpatient services are rendered when patients are kept overnight for treatment but not observation (Figure 2). The inpatient services category included claims with the following criteria: place of service (POS) codes 21, 51, 56, and 61; a valid Medicare Severity Diagnosis-Related Group (MS-DRG) code; or a room and board revenue code of 100-219. This category also included skilled nursing facility (SNF) and hospice claims.

FIGURE 3: FACILITY CLAIMS PROCESS, OUTPATIENT



2.2.1.2 Outpatient facility claims

Outpatient services are rendered by sections of a hospital providing medical services that do not require an overnight stay or hospitalization (e.g., emergency room (ER), outpatient surgery, observation). These services can also be provided at freestanding outpatient facilities, including free-standing surgical centers, ambulatory surgical centers (ASCs), and clinics with certain diagnostic testing technologies (e.g., MRIs). These outpatient facilities all file UB-04 claim form with insurers. The outpatient category was used for all facility claims not characterized as inpatient (Figure 3).

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2.2.2 Professional procedure and prescription claims

2.2.2.1 Professional procedure claims

Professional procedure claims are claims filed by a health care professional for medical services provided. These services included those provided in both hospital and non-hospital settings. Claims with no valid revenue code were assumed to be a professional procedure claim, unless otherwise noted.

2.2.2.2 Prescription drug claims

Prescription drug claims are claims submitted by retail, mail-order, and specialty pharmacies for prescription drugs and devices.

Administered drugs and any devices rendered by a physician or facility were identified as professional procedures, outpatient services, or part of an inpatient admission.

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2.3 Adjustment methodologies

2.3.1 Population weighting methodology

We weighted spending, utilization, and enrollment using ESI weights to develop estimates that were representative of the national ESI population younger than 65. ESI weights were calculated using the American Community Survey (ACS) 2022 5-year estimates Public Use Microdata Sample (PUMS).

Data Processing Steps

1) We subset the raw ACS data to records with private health insurance coverage and generated age band codes (=1 if AGE between 0 and 17, =2 if AGE between 18 and 24, =3 if AGE between 25 and 34, =4 if AGE between 35 and 44, =5 if AGE between 45 and 54, =6 if AGE between 55 and 64, and =7 if age >= 65).
    a. We then collapsed the records by age band code, sex, PUMA code and state code for total ESI enrollees. We used PUMA boundaries based on US Census. This enabled the development of weights using the survey-based targets. Over 27,000 age-band, sex, PUMA code groups were created per calendar year with corresponding weights.

2) From the HCCI enrollment data, we collapsed the records by calendar year, age band code, sex, and zip code for total enrollees and total enrollees' member months.

3) We used geographic crosswalk from the Missouri Census DataCenter at the University of Missouri to merge data from ACS ESI (step 1) to HCCI ESI (step2) by zip codes/ZCTA and PUMA-state code. Note, standard residential zip codes and ZCTAs are identical.

4) We then calculated the ESI weights by age band code, sex, PUMA-state and calendar year using the following formula:

$$ESI\ Weights_{y,s,g,a} = \frac{Number\ of ESI\ enrollees\ from\ ACS_{y,s,g,a}}{Number\ of\ ESI\ enrollees\ from\ HCCI\ 2.0_{y,s,g,a}}$$

Where:

- *y denotes calendar year*
- *s denotes sex*
- *g denotes PUMA-state geography*
- *a denotes age band code.*

5) ESI Weights were capped at the 95th percentile of the weights in each calendar year so as to not overly weight a given age-band, sex, PUMA code group with few enrollees in the HCCI database.
    a. Capping ESI weights at the 95th percentile affected less than 5% of the age-band, sex, PUMA code groups containing approximately 6% of the total ESI population and 0.5% of the HCCI enrollment.
    b. Sensitivity analysis was performed using the 90th and 99th percentiles.
6) ESI Weights were applied by multiplying the spending, utilization, and member months in each age-band, sex, PUMA code group by the corresponding weights. Weighted spending, utilization, and member months were then summed to create weighted national estimates.
7) A separate set of weights for prescription drug data were created following the same method with the restriction on the HCCI enrollment that members have prescription drug benefits.

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3. Analysis

The analytic dataset contains estimates of the key measures of the *2022 Health Care Cost and Utilization Report*--spending, out-of-pocket spending, utilization, and prices--for people younger than 65 and covered by ESI. The statistics were weighted by geography-age-sex to be nationally representative as described in Section 2.3.2 of this document.

All estimates presented in the report can be found in the *2022 Health Care Cost and Utilization Report Downloadable Dataset*.

3.1 Key Measures

Key Measures in the *2022 Health Care Cost and Utilization Report*:

- Spending per person
- Out-of-pocket spending per person
- Utilization per 1,000 people
- Average price per service
- Average out-of-pocket payment per service
- Service mix

3.1.1 Population membership

Membership in the ESI population is calculated using the total number of months individuals are insured. The average number of people with ESI are calculated using total member months divided by 12, to estimate 12 months of coverage or the cost for a year of health care. This method of estimation counts two people with 6 months of coverage the same as one person with 12 months of insurance coverage.

3.1.2 Spending per Person

Per capita health care spending on people with ESI is calculated by summing in each year all the dollars directly spent on health care services for filed claims and dividing that amount by the average number of people with ESI (total months of ESI coverage divided by 12). Both dollars and people are weighted to be representative of the national ESI population (Section 2.3.2). By this method, the per person spending in the report estimates the cost per person, even for people who did not use health care services.[iii] This metric is a subset of overall national health care spending and may not be comparable to other metrics of national spending because it covers only persons having group ESI and younger than 65 years.

Similar methods were used to calculate out-of-pocket spending per person (the dollars paid by members for health services through copayments, co-insurance, and deductibles).

3.1.3 Utilization per 1,000 people

In the annual *Health Care Cost and Utilization Report*s, HCCI calculated utilization rates per 1,000 insured individuals. The utilization measure was produced by summing for each service category the admissions, procedures, and filled prescription days. The resulting amount was divided by the average number of people with ESI. This provided a per-person utilization count by service category, which was then multiplied by 1,000. Total utilization reflects the spending weighted sum of inpatient, outpatient, professional procedures, and prescription utilization. We use the average spending share in the previous year as the spending weight.

To determine the utilization count, reimbursements for claims were analyzed. In the following rules, *reimbursement* refers to any monetary payment to a provider, whether a professional procedure provider, facility, or pharmaceutical vendor.

- If the reimbursement dollars for an admission, visit, or procedure were equal to 0, the utilization count was set at 0.

- If the reimbursement dollars for an admission, visit, or procedure were less than 0, the utilization count was set at minus 1. Negative reimbursement amounts occur from claim reversals, making it important to reverse the utilization count as well.
- If the reimbursement dollars for an admission, visit, or procedure were greater than 0, the utilization count was set at 1.

Service category-specific rules are as follows:

- Inpatient facility: acute, SNF, and hospice
    - If multiple claims had the same patient identification, DRG, and provider with overlapping or contiguous admission or discharge dates, they were grouped into one admission. Admission and discharge dates were calculated as dates of contiguous claims with room and board revenue charge and place of service at inpatient hospital.
- Outpatient facility
    - If multiple claims and/or claim lines had the same patient identification, CPT code, and service dates they were grouped into one procedure.
    - Detailed categories were adapted using the current BETOS code system RBCS (Restructured BETOS Classification System). HCCI created custom BETOS categorizations for services rendered in ESI population such as reproductive health services.
- Professional services
    - If multiple claims and/or claim lines had the same patient identification, CPT code, and service dates they were grouped into one procedure.

- Detailed categories were adapted using the current BETOS code system RBCS (Restructured BETOS Classification System). HCCI created custom BETOS categorizations for services rendered in ESI population such as reproductive health services.

- Prescriptions

  - Prescription drug utilization counts were the number of filled days of a prescription dispensed by retail, mail-order, and specialty pharmacies for prescription drugs and devices. This provides a standard unit, since differing classes of scripts may be for different lengths of time, which could obscure changes in prescription utilization if the number of filled scripts was instead counted. For example, one month of birth control is 28 filled days, while a round of antibiotics might be 14 filled days.

  - Detail categories were based on Veteran Affairs Formulary classifications and brand/generic indicators available from RxNorm provided by the National Library of Medicine.

3.1.4 Price

In the annual *Health Care Cost and Utilization Report*s, HCCI calculated prices as the average price per service by dividing total spending by total utilization per service or subservice category. By this method, the derived calculation includes the “prices” paid by the payer and the patient out of pocket.

3.2 Service Mix

Trends in spending are attributable to shifts in the prices and use of services, as well as changes in the types of services provided. Take, for example, the hypothetical scenario below of a given provider who performs two types of chest X-rays in their clinic: a less expensive 2-view X-ray and a more expensive 4-view X-ray with computer aid detection. In this hypothetical, X-ray prices and the total volume of X-rays performed can both remain constant over time but spending on X-rays still increased by $3,000 due to shifts in the types of services used.

	2018			2021		
Service	Price	Use	Spend	Price	Use	Spend
2-view Chest X-ray	$200	35	$7,000	$200	20	$4,000
4-view Chest X-ray (CAD)	$400	15	$6,000	$400	30	$12,000
Total		50	$13,000		50	$16,000

To estimate the impact of service mix composition on spending, we calculated a service mix factor, which measures how spending would be different in a given year if people utilized the same services in the same proportions relative to the final year of the study.

A service mix factor was calculated separately for each year during the study period (comparing each year from 2018 to 2021 to the last year, 2022), and for each service category (inpatient, outpatient, professional services, and prescription drugs). The service mix factors in 2022 report estimate changes in the mix of services across subcategories within broad service categories. The calculation involved two key steps. First, we calculated the share of utilization each service represented in 2022 then calculated the spending that would have occurred in each year if the service utilization occurred in the same shares as in 2022.

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3.3 **Rebates**

Prescription drug rebates are discounts negotiated between drug manufacturers and pharmacy benefit managers (PBMs) and/or health insurance plans. Commercial claims data does not reflect rebates or discounts negotiated between drug manufacturers and pharmacy benefit managers and/or health insurance plans, which result in lower spending on prescription drugs. To estimate the impact of prescription drug rebates on our analysis, we recalculated gross spending on prescription drugs each year to reflect rebates.

The 2023 Medicare Trustees Report includes data on direct and indirect renumeration (DIR), post point-of-sale compensation including rebates provided by manufacturers and concessions paid by pharmacies, as a proportion of gross spending. The percentage is inclusive of rebates and other non-rebate forms of DIR for brand name and generic drugs.

To calculate an estimated effect of rebates on prices and spending, we assume commercial rebates are the same as Medicare. We recalculated spending per person net of the percentage of DIR. We multiplied total spending per person by DIR. The estimated prices were recalculated using the same utilization and updated spending.

Source: 2023 Medicare Trustees Report

4. Appendix

4.1 Acute inpatient facility detailed service categories and corresponding MS-DRG codes [V36.0]

Level I	Level 2	Level 3	DRG
IP	NERVOUS SYSTEM	Medical	052-103
IP	NERVOUS SYSTEM	Surgical	020-042
IP	EYE	Medical	121-125
IP	EYE	Surgical	113-117
IP	ENT	Medical	146-159
IP	ENT	Surgical	129-139
IP	RESPIRATORY	Medical	175-208
IP	RESPIRATORY	Surgical	163-168
IP	CIRCULATORY	Medical	280-316
IP	CIRCULATORY	Surgical	215-274
IP	DIGESTIVE	Medical	368-395
IP	DIGESTIVE	Surgical	326-358
IP	LIVER/PANCREAS	Medical	432-446
IP	LIVER/PANCREAS	Surgical	405-425
IP	MUSCULOSKELETAL	Medical	533-566
IP	MUSCULOSKELETAL	Surgical	453-520
IP	SKIN/BREAST	Medical	592-607
IP	SKIN/BREAST	Surgical	570-585
IP	ENDOCRINE/METABOLIC	Medical	637-645
IP	ENDOCRINE/METABOLIC	Surgical	614-630
IP	KIDNEY/URINARY	Medical	682-700
IP	KIDNEY/URINARY	Surgical	652-675

IP	MALE REPRODUCTIVE	Medical	722-730
IP	MALE REPRODUCTIVE	Surgical	707-718
IP	FEMALE REPRODUCTIVE	Medical	754-761
IP	FEMALE REPRODUCTIVE	Surgical	734-750
IP	BLOOD/IMMUNOLOGICAL	Medical	808-816
IP	BLOOD/IMMUNOLOGICAL	Surgical	799-804
IP	NEOPLASMS	Medical	834-849
IP	NEOPLASMS	Surgical	820-830
IP	INFECTION	Medical	862-872
IP	INFECTION	Surgical	853-858
IP	INJURY	Medical	913-923
IP	INJURY	Surgical	901-909
IP	BURNS	Medical	933-935
IP	BURNS	Surgical	927-929
IP	HEALTH STATUS FACTORS	Medical	945-951
IP	HEALTH STATUS FACTORS	Surgical	939-941
IP	TRAUMA	Medical	963-965
IP	TRAUMA	Surgical	955-959
IP	HIV	Medical	974-977
IP	HIV	Surgical	969-970
IP	UNGROUPABLE	Surgical	981-989; 998-999
IP	NEWBORNS	Complex NICU	789-794
IP	NEWBORNS	Routine	795
IP	CHILDBIRTH	Vaginal Delivery	767-768; 774-775; 796-798; 805-807
IP	CHILDBIRTH	C-section	765-766; 783-788
IP	CHILDBIRTH	Other	769; 770;

			776-782; 817-819; 831-833
IP	MENTAL HEALTH		876-887
IP	SUBSTANCE USE		894-897
IP	TRANSPLANTS		001-017

4.2 Outpatient facility and professional service categories mapping to CPT/HCPCS/revenue codes/hierarchies

Level 1	Level 2	Level 3
OP, PH	Anesthesia	Anesthesia
OP, PH	Ambulance	Ambulance
OP, PH	DME	Medical/Surgical Supplies
OP, PH	DME	Hospital Beds
OP, PH	DME	Oxygen & Supplies
OP, PH	DME	Wheelchairs
OP, PH	DME	Other DME
OP, PH	DME	Orthotic Devices
OP, PH	DME	Drugs Administered through DME
PH	E&M	PCP Office/Outpatient services
OP, PH	E&M	Behavioral health services
OP, PH	E&M	Critical care services
PH	E&M	Non-MD Office/Outpatient services
OP, PH	E&M	Ophthalmological services
PH	E&M	Specialist Office/Outpatient Services
OP, PH	E&M	Telehealth
OP, PH	E&M	Home services

OP, PH	E&M	Hospital inpatient services
OP, PH	E&M	Care management/coordination
OP, PH	E&M	Nursing facility services
OP, PH	E&M	Observation care services
OP, PH	E&M	Hospice
OP, PH	E&M	Emergency dept. services
OP, PH	E&M	Urgent Care
OP, PH	E&M	E&M - Miscellaneous
OP, PH	E&M	Office/Outpatient Services
OP, PH	Drugs	Administration of Drugs
OP, PH	Drugs	Chemotherapy
OP, PH	Drugs	Injections and infusions (nononcologic)
OP, PH	Drugs	Vaccines
OP, PH	Drugs	Pharmacy
OP, PH	General Lab	Test
OP	Home health	Home health
OP, PH	Imaging	CT Scan
OP, PH	Imaging	MR
OP, PH	Imaging	Nuclear
OP, PH	Imaging	Standard X-ray
OP, PH	Imaging	Ultrasound
OP, PH	Imaging	Imaging - Miscellaneous
OP, PH	Other	Enteral & Parenteral
OP, PH	Other	Vision, Hearing, & Speech Services
OP, PH	Other	Dental
OP, PH	Other	Non-emergency transportation
OP, PH	Other	Community support services
OP, PH	Other	Habilitation services
OP, PH	Other	Personal care services
OP, PH	Other	Other
OP, PH	Procedure	ENT
OP, PH	Procedure	Breast
OP, PH	Procedure	Cardiovascular

OP, PH	Procedure	Female Reproductive
OP, PH	Procedure	Eye
OP, PH	Procedure	Male Reproductive
OP, PH	Procedure	Digestive/gastrointestinal
OP, PH	Procedure	Hematology
OP, PH	Procedure	Musculoskeletal
OP, PH	Procedure	Other organ systems
OP, PH	Procedure	Skin
OP, PH	Procedure	Urinary
OP, PH	Procedure	Vascular
OP, PH	Treatment	Spinal manipulation
OP, PH	Treatment	Dialysis
OP, PH	Treatment	Radiation oncology
OP, PH	Treatment	Physical, occupational, and speech therapy
OP, PH	Treatment	Treatment - Miscellaneous
OP	SNF	SNF
OP, PH	Test	Anatomic pathology
OP, PH	Test	Cardiography
OP, PH	Test	Molecular testing
OP, PH	Test	Neurologic
OP, PH	Test	Pulmonary function
OP, PH	Test	Test - Miscellaneous
OP, PH	Unknown	Unknown

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4.3 Prescription detailed service categories

Prescription drugs were categorized using NDCs mapped to publicly available VA Formulary classifications. https://www.pbm.va.gov/nationalformulary.asp

Level I	Level 2	Reported As
RX	HORMONES/SYNTHETICS/MODIFIERS	Hormones
RX	MUSCULOSKELETAL MEDICATIONS	Musculoskeletal
RX	CENTRAL NERVOUS SYSTEM MEDICATIONS	CNS
RX	IMMUNOLOGICAL AGENTS	Immunological
RX	ANTIMICROBIALS	Antibiotics
RX	RESPIRATORY TRACT MEDICATIONS	Respiratory
RX	CARDIOVASCULAR MEDICATIONS	Cardiovascular
RX	ANTINEOPLASTICS	Cancer
RX	DERMATOLOGICAL AGENTS	Dermatological
RX	GASTROINTESTINAL MEDICATIONS	GI
RX	BLOOD PRODUCTS/MODIFIERS/VOLUME EXPANDERS	Blood Modifiers
RX	OPHTHALMIC AGENTS	Eye
RX	GENITOURINARY MEDICATIONS	Other
RX	AUTONOMIC MEDICATIONS	Other
RX	ANTIDOTES,DETERRENTS AND POISON CONTROL	Other
RX	NASAL AND THROAT AGENTS,TOPICAL	Other
RX	ANTIPARASITICS	Other
RX	OTIC AGENTS	Other
RX	RECTAL,LOCAL	Other
RX	VITAMINS	Other
RX	THERAPEUTIC NUTRIENTS/MINERALS/ELECTROLYTES	Other
RX	ANTIHISTAMINES	Other
RX	DENTAL AND ORAL AGENTS,TOPICAL	Other
RX	PROSTHETICS/SUPPLIES/DEVICES	Other

RX	DIAGNOSTIC AGENTS	Other
RX	IRRIGATION/DIALYSIS SOLUTIONS	Other
RX	HERBS/ALTERNATIVE THERAPIES	Other
RX	PHARMACEUTICAL AIDS/REAGENTS	Other
RX	MISCELLANEOUS AGENTS	Other
RX	ANTISEPTICS/DISINFECTANTS	Other

Notes

[i] Congressional Budget Office. Private Health Insurance Premiums and Federal Policy. February 11, 2016. Available from: https://www.cbo.gov/publication/51130.

[ii] Kaiser Family Foundation and Health Research & Educational Trust, "2018 Employer Health Benefits Survey." https://www.kff.org/health-costs/report/2018-employer-health-benefits-survey/.

[iii] To calculate total prices paid for total expenditures per capita, the insured (co-payments, coinsurance, and deductibles) and payer expenditures per capita are summed. For inpatient, outpatient, and professional claims, prices paid are calculated for all members who have medical insurance. For prescription claims, prices paid are calculated for all members with medical and prescription insurance.

[10] Calculated using data from the Center for Health Information Analysis, State of Massachusetts, "Annual Report on the Performance of the Massachusetts Health Care System" for 2017 through 2020. Available from: http://www.chiamass.gov/annual-report/?_ga=2.88182555.1443192041.1576609192-1511595466.1576609192

[11] Altarum, "The Impact of Prescription Drug Rebates on Health Plans and Consumers," April 2018. Available at: https://altarum.org/sites/default/files/Altarum-Prescription-Drug-Rebate-Report_April-2018.pdf.

[12] Department of Managed Health Care, State of California, "Prescription Drug Cost Transparency Report (SB 17), Measurement Year 2017." Available at: https://www.dmhc.ca.gov/Portals/0/Docs/DO/SB17Report.pdf.