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2023 Health Care Cost and Utilization Report

Analytic Methodology

2023 V1.0

September 2026

Note: This analytic methodology is appropriate for the *2023 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 *2023 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. The HCCI dataset includes data from 2012 to 2023. During the period examined in this study (2019-2023), the database includes over 750 million commercial medical and pharmacy claims per year, representing the health care activity of approximately 27 million individuals per year. 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* Report 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 2019 and 2023.

FIGURE 1: PROCESS FLOW



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. HCCI does not report on premiums or their determinants.



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2. Methods

2.1 Data collection

The HCCI 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 *2023 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 27 million covered lives per year, for the years 2019 through 2023 (Table 1). The claims used in the 2023 report include over 3.75 billion claim lines and represent the health care activity of approximately 20% 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 2023 REPORT – TOTAL COVERED LIVES BY CALENDAR YEAR

Year	Covered Lives
2019	30,300,000
2020	29,300,000
2021	25,400,000
2022	25,000,000
2023	29,000,000

Source: HCCI, 2026. 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

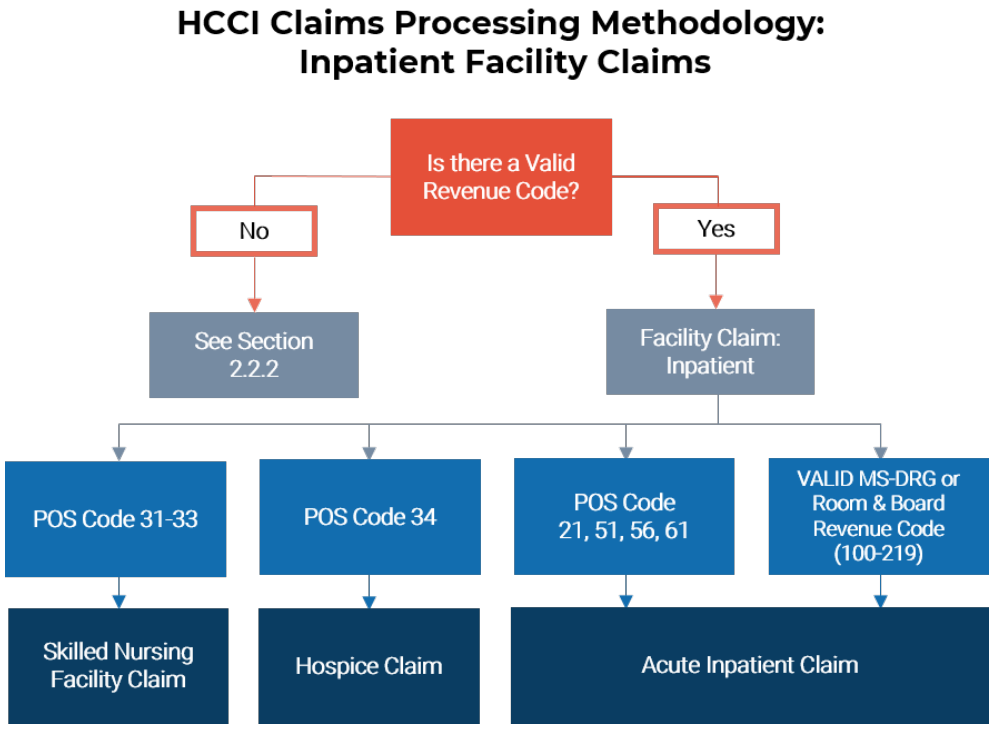
At the highest level, claims data were grouped into four major service categories: inpatient facility, outpatient facility, professional services, and prescription drugs and devices.

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 the 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).

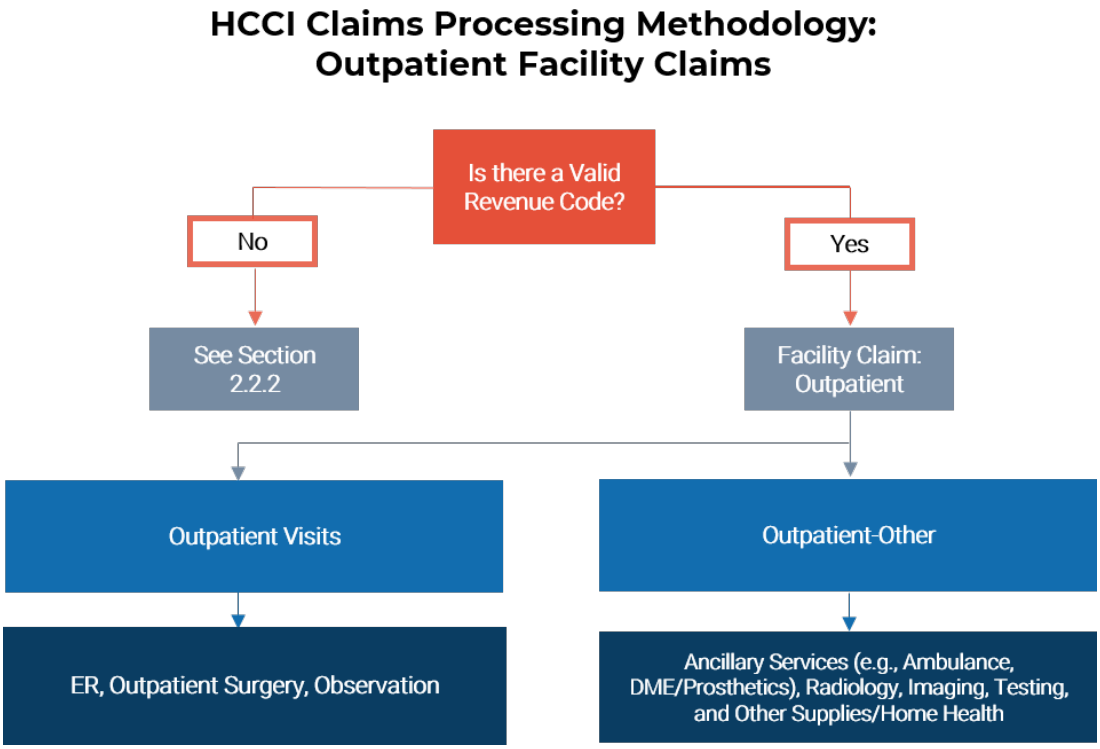
FIGURE 2: FACILITY CLAIMS PROCESS, INPATIENT



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 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.

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) 2023 5-year estimates Public Use Microdata Sample (PUMS) and geographic crosswalk from the Missouri Census Data Center at the University of Missouri. The Public Use Microdata Area (PUMA) boundaries for both input files were based on the US 2020 Census.

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, and =6 if AGE between 55 and 64). We excluded ACS records for ages 65 and over.
    a. We collapsed the records by age band code, sex, PUMA code and state code for total ESI enrollees. 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, state, and zip code for total enrollees and total enrollees' member months.

3) We used geographic crosswalk from the Missouri Census Data Center 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 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) We calculated an analogous set of ESI weights by age band code, sex, state and calendar year using the same formula except that *g* denotes a state geography.

6) We truncated ("winsorized") both sets of ESI Weights at the 5th/95th percentile of the weights in each calendar year so as to not under/over weight a given age-band, sex, PUMA code group with many/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 untruncated and 1st/99th percentile truncated distributions.
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.
8) Each member-month in the HCCI database was assigned an ESI weight based on the age band, sex, year, and geographic identifier of the record. Records with a valid (non-missing) ZIP code received the corresponding PUMA ESI weight (Step 4). Members with missing or invalid ZIP codes were assigned a state ESI weight (Step 5). Members with no valid ZIP code or state were excluded from analysis.
9) ESI Weights were applied by multiplying the spending, utilization, and member months in each year, age-band, sex, PUMA code group by the corresponding weights. Weighted spending, utilization, and annualized member months were then summed to create weighted national estimates.



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3. Analysis

The analytic dataset contains estimates of the key measures of the *2023 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 *2023 Health Care Cost and Utilization Report Downloadable Dataset*.

3.1 Key Measures

Key Measures in the *2023 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. 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, or filled prescription days. We divided total prescription days by 30 to standardize the units to "30-days' supply." The resulting utilization counts are divided by the total person-years of ESI enrollment and multiplied by 1,000 to express utilization as the annual count of services per 1000 members. When aggregating utilization across service categories, we weighted each service category by the share of total spending it represented in the year.

To determine the utilization count, we analyzed reimbursements for claims. 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, Current Procedural Terminology (CPT) code, and service dates they were grouped into one procedure.
    - Detailed categories were adapted using the current Berenson-Eggers Type of Service (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 RBCS. 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.

	2019			2022		
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 2019 to 2022 to the last year, 2023), and for each service category (inpatient, outpatient, professional services, and prescription drugs). The service mix factors in 2023 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 2023 then calculated the spending that would have occurred in each year if the service utilization occurred in the same shares as in 2023.



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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 2025 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: 2025 Medicare Trustees Report (see Table IV.B8)

4. Appendix

4.1 Inpatient facility service categories

Level 1	Level 2	Level 3
IP	Blood/Immunological	Medical
IP	Blood/Immunological	Surgical
IP	Burns	Medical
IP	Burns	Surgical
IP	Childbirth/Pregnancy	C-section
IP	Childbirth/Pregnancy	Other
IP	Childbirth/Pregnancy	Vaginal Delivery
IP	Circulatory	Medical
IP	Circulatory	Surgical
IP	Digestive	Medical
IP	Digestive	Surgical
IP	Ear/Nose/Mouth/Throat	Medical
IP	Ear/Nose/Mouth/Throat	Surgical
IP	Endocrine/Metabolic	Medical
IP	Endocrine/Metabolic	Surgical
IP	Eye	Medical
IP	Eye	Surgical
IP	Female Reproductive	Medical
IP	Female Reproductive	Surgical
IP	Health Status Factors	Medical
IP	Health Status Factors	Surgical
IP	HIV	Medical
IP	HIV	Surgical
IP	Infection	Medical
IP	Infection	Surgical
IP	Injury	Medical
IP	Injury	Surgical

IP	Kidney/Urinary	Medical
IP	Kidney/Urinary	Surgical
IP	Kidney/Urinary	Transplant
IP	Liver/Pancreas	Medical
IP	Liver/Pancreas	Surgical
IP	Male Reproductive	Medical
IP	Male Reproductive	Surgical
IP	Mental Health	Unknown
IP	Musculoskeletal	Medical
IP	Musculoskeletal	Surgical
IP	Neoplasms	Medical
IP	Neoplasms	Surgical
IP	Nervous System	Medical
IP	Nervous System	Surgical
IP	Newborns	Unknown
IP	Pre MDC/Other transplant	Transplant
IP	Respiratory	Medical
IP	Respiratory	Surgical
IP	Skin/breast	Medical
IP	Skin/breast	Surgical
IP	Substance Use	Unknown
IP	Trauma	Medical
IP	Trauma	Surgical
IP	Ungroupable	Unknown

4.2 Outpatient facility (OP) and professional (PH) service categories

Level 1	Level 2	Level 3
OP, PH	Ambulance	Ambulance
OP, PH	Anesthesia	Anesthesia

OP, PH	DME	Drugs Administered through DME
OP, PH	DME	Hospital Beds
OP, PH	DME	Medical/Surgical Supplies
OP, PH	DME	Orthotic Devices
OP, PH	DME	Other DME
OP, PH	DME	Oxygen & Supplies
OP, PH	DME	Wheelchairs
OP, PH	Drugs	Administration of Drugs
OP, PH	Drugs	Chemotherapy
OP, PH	Drugs	Injections and infusions (nononcologic)
OP, PH	Drugs	Pharmacy
OP, PH	Drugs	Vaccines
OP, PH	E&M	Behavioral health services
OP, PH	E&M	Care management/coordination
OP, PH	E&M	Critical care services
OP, PH	E&M	E&M - Miscellaneous
OP, PH	E&M	Emergency dept. services
OP, PH	E&M	Home services
OP, PH	E&M	Hospice
OP, PH	E&M	Hospital inpatient services
OP, PH	E&M	Non-MD Office/Outpatient services
OP, PH	E&M	Nursing facility services
OP, PH	E&M	Observation care services
OP, PH	E&M	Office/Outpatient Services
OP, PH	E&M	Opthalmological services
OP, PH	E&M	PCP Office/Outpatient services
OP, PH	E&M	Specialist Office/Outpatient Services
OP, PH	E&M	Telehealth
OP, PH	E&M	Urgent Care
OP, PH	General Lab	Test
OP, PH	Imaging	CT Scan
OP, PH	Imaging	Imaging - Miscellaneous
OP, PH	Imaging	MR

OP, PH	Imaging	Nuclear
OP, PH	Imaging	Standard X-ray
OP, PH	Imaging	Ultrasound
OP, PH	Other	Community support services
OP, PH	Other	Dental
OP, PH	Other	Enteral & Parenteral
OP, PH	Other	Habilitation services
OP, PH	Other	Non-emergency transportation
OP	Other	Other
OP, PH	Other	Personal care services
OP, PH	Other	Vision, Hearing, & Speech Services
OP	Post Acute Care	Home health
OP	Post Acute Care	Hospice
OP	Post Acute Care	Skilled Nursing Facilities
OP, PH	Procedure	Breast
OP, PH	Procedure	Cardiovascular
OP, PH	Procedure	Digestive/gastrointestinal
OP, PH	Procedure	ENT
OP, PH	Procedure	Eye
OP, PH	Procedure	Female Reproductive
OP, PH	Procedure	Hematology
OP, PH	Procedure	Male Reproductive
OP, PH	Procedure	Musculoskeletal
OP, PH	Procedure	Other organ systems
OP, PH	Procedure	Skin
OP, PH	Procedure	Urinary
OP, PH	Procedure	Vascular
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	Treatment	Dialysis
OP, PH	Treatment	Physical, occupational, and speech therapy
OP, PH	Treatment	Radiation oncology
OP, PH	Treatment	Spinal manipulation
OP, PH	Treatment	Treatment - Miscellaneous
OP, PH	Unknown	Unknown

4.3 Prescription drug service categories

Level I	Level 2	Level 3
RX	Antibiotics	Brand
RX	Antibiotics	Generic
RX	Blood Modifiers	Brand
RX	Blood Modifiers	Generic
RX	Cancer	Brand
RX	Cancer	Generic
RX	Cardiovascular	Brand
RX	Cardiovascular	Generic
RX	CNS	Brand
RX	CNS	Generic
RX	Dermatological	Brand
RX	Dermatological	Generic
RX	Dermatological	Unknown
RX	Eye	Brand
RX	Eye	Generic
RX	Eye	Unknown
RX	GI	Brand
RX	GI	Generic
RX	GI	Unknown
RX	GLP-1 Drugs	Brand
RX	Hormones	Brand

RX	Hormones	Generic
RX	Immunological	Brand
RX	Immunological	Generic
RX	Immunological	Unknown
RX	Insulin	Brand
RX	Insulin	Generic
RX	Musculoskeletal	Brand
RX	Musculoskeletal	Generic
RX	Other	Brand
RX	Other	Generic
RX	Other	Unknown
RX	Respiratory	Brand
RX	Respiratory	Generic
RX	Respiratory	Unknown
RX	Unknown	Unknown