USER GUIDE:
COST-TO-CHARGE RATIO (CCR)
FOR INPATIENT FILES

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EXECUTIVE SUMMARY

- The Healthcare Cost and Utilization Project (HCUP) Cost-to-Charge Ratio (CCR) Files are hospital-level files that can be linked to HCUP inpatient and emergency department databases to facilitate the conversion of total charges into hospital costs (expenses) for providing care. The CCRs are constructed using information from the Healthcare Cost Report Information System (HCRIS) files submitted by hospitals to the Centers for Medicare & Medicaid Services (CMS).
- Separate CCR Files are released for each inpatient database type. This document describes the following CCR for Inpatient Files:
    - CCR for the HCUP Central Distributor State Inpatient Databases (CCR for CD-SID), 2001–2023
    - CCR for the National (Nationwide) Inpatient Sample (CCR-NIS), 2001–2023
    - CCR for the Kids' Inpatient Database (CCR-KID), 2003–2022
    - CCR for the Nationwide Readmissions Database (CCR-NRD), 2010–2022
- The CCR Files are released for each data year and should be used with the corresponding year and database to ensure an appropriate match for the year and database-specific hospital identifiers.
- This document provides an overview of the CCR for Inpatient Files (e.g., background, file structure, and usage information), as well as information about the CCR methodology (e.g., source data, development process, and validations studies), data elements, file contents, and other considerations and recommendations for use.
- A separate user guide is available for the CCR for Emergency Department Files.

OVERVIEW

Background

The Healthcare Cost and Utilization Project (HCUP) Cost-to-Charge Ratio (CCR) for Inpatient Files (CCR Files) are hospital-level files that can be linked to HCUP inpatient databases to facilitate the conversion of total charges into hospital costs (expenses) for providing care. The files are designed to supplement the data elements in the HCUP inpatient databases, which contain data on total charges for each hospital stay. *Charges* represent the amount a hospital billed for the case; *costs* reflect the expenses incurred in the production of hospital services, such as wages, supplies, and utility costs. Neither charges nor costs represent the amounts that hospitals receive in payment.

Constructed from appropriate cost centers in the hospital cost reports obtained from the Centers for Medicare & Medicaid Services (CMS) Healthcare Cost Report Information System (HCRIS),[1] the CCR Files are annual datasets that provide hospital-specific CCRs based on all-payer inpatient costs for nearly every hospital in each year's collection of the HCUP Central Distributor State Inpatient Databases (CD-SID), National (Nationwide) Inpatient Sample (NIS), Kids' Inpatient Database (KID), and Nationwide Readmissions Database (NRD). Specifically, the following files/data years are available:

- CCR for CD-SID: 2001–2023
- CCR-NIS: 2001–2023
- CCR-KID: 2003–2022 (released 2003, 2006, 2009, 2012, 2016, 2019, 2022)
- CCR-NRD: 2010–2022

See Appendix A for information about the history of CCRs and CMS cost reports.

General File Structure

The HCUP CCR for Inpatient Files provide an estimate of all-payer, inpatient CCRs for hospitals in corresponding HCUP databases. The publicly available files are provided as comma-separated value (CSV) text files, which use a comma to separate values on each record. Records are included for all community hospitals from the corresponding HCUP database that match with both the American Hospital Association (AHA) Annual Survey Database and the CMS HCRIS file for the corresponding fiscal year.

Separate CCR Files are released for each data year and should be used with the corresponding year of the CD-SID, NIS, KID, or NRD to ensure an appropriate match of the year-specific hospital identifiers. In the case of the CCR for CD-SID, four States release State-specific files that are separate from the CCR for CD-SID File. For certain years, Iowa, Minnesota, Nebraska, and North Dakota CCR Files are released as separate, State-specific files available by request from the HCUP Central Distributor to purchasers whose organizational affiliation and ownership

[1] For more information, visit www.cms.gov/Research-Statistics-Data-and-Systems/Downloadable-Public-Use-Files/Cost-Reports.

meet the Partner's eligibility criteria. All other CD-SID States that permit release of the CCR measures are included in the CCR for CD-SID File.

Usage

Linkage

The CCR Files can be linked to discharge records in the HCUP databases using the HCUP hospital identification number, which is a unique hospital number exclusive to the HCUP data. The name of the data element representing the hospital identification number varies by file and data year, as summarized in Table 1.

For national database CCR Files (CCR-NIS, CCR-KID, and CCR-NRD), the CCR records can be merged directly with the discharge records in the corresponding database using the HCUP hospital identification number.

For States that release an HCUP AHA Linkage File, linkage between the CCR File and the CD-SID is achieved in two steps, first by linking records from the CCR for CD-SID File to the HCUP AHA Linkage File by the data element HOSPID and then by linking the resulting file to the CD-SID by State (Z013) and DSHOSPID.

For States that do not release an HCUP AHA Linkage File, HOSPID is included directly on their CD-SID File. For these States, the data elements from the CCR File can be merged onto the CD-SID by HOSPID. The AHA Linkage Files can be downloaded from the HCUP AHA Linkage Files page on the HCUP User Support (HCUP-US) website.

The HCUP hospital identifier (HOSPID, HOSP_NIS, HOSP_KID, HOSP_NRD) on the CCR CSV text file is enclosed in quotations to preserve leading zeros. As a result, some software applications may interpret the data element as a character variable, which in turn would not match the numeric version of the hospital identifier on the CD-SID, NIS, KID, or NRD. Users should load the hospital identifier data element on the CCR File as numeric or convert it to numeric prior to merging it with HCUP database files.

Cost Computation

The cost of inpatient care for a discharge is estimated by multiplying TOTCHG (total charges reported on the discharge record) by the CCR. The data element representing the CCR varies by file and data year, as summarized in Table 1. For all available data years of the CCR for CD-SID and through data year 2011 for the CCR-NIS and CCR-KID, the hospital-specific all-payer inpatient CCR (APICC) and the group average all-payer inpatient CCR (GAPICC) are available. (In these cases, users may consider overwriting a missing APICC value with the GAPICC value.) For all available data years of the CCR-NRD and beginning with the 2012 CCR-NIS and CCR-KID, a single CCR is provided (CCR_NIS, CCR_KID, CCR_NRD), with values based on the APICC when available or the GAPICC otherwise. The 2012 change to the CCR data element in the CCR-NIS and CCR-KID was intended to enhance the confidentiality of the databases. The CCR variables were renamed to indicate that they are designed to be used exclusively with data years 2012 and later. These changes did not affect statistical reliability of the estimates.

In addition, beginning in 2012, CCRs in the CCR-NIS, CCR-KID, and CCR-NRD are perturbed slightly to further protect hospital and Partner identity.

Table 1. Linkage and CCR Data Elements by CCR File and Data Year

CCR File	Data Years	Linkage Data Element	CCR Data Element(s)
CCR for CD-SID	2001–2023	HOSPID	APICC, GAPICC
CCR-NIS	2001–2011	HOSPID	APICC, GAPICC
CCR-NIS	2012–2023	HOSP_NIS*	CCR_NIS
CCR-KID	2001–2011	HOSPID	APICC, GAPICC
CCR-KID	2012–2022	HOSP_KID*	CCR_KID
CCR-NRD	2010–2022	HOSP_NRD*	CCR_NRD

Abbreviations: APICC, all-payer inpatient cost-to-charge ratio; CCR, cost-to-charge ratio; CD, HCUP Central Distributor; GAPICC, group average all-payer inpatient cost-to-charge ratio; KID, Kids' Inpatient Database; NIS, National (Nationwide) Inpatient Sample; NRD, Nationwide Readmissions Database; SID, State Inpatient Databases.

Note: Beginning with the 2012 data, the CCRs for the NIS and KID were modified to enhance the confidentiality of the databases. The CCR variables were renamed to indicate that they are designed to be used exclusively with data years 2012 and later. These changes did not affect statistical reliability of the estimates.

* HOSP_NIS, HOSP_KID, and HOSP_NRD are reassigned each year and do not (1) link to other HCUP databases or to external databases or (2) track hospitals over years.

Additional Data Elements

In addition to the linkage and CCR data elements summarized above, the CCR Files contain supplemental data elements that may be of interest to users. These data elements are summarized in the Data Elements section.

CCR METHODOLOGY

Development of the CCR Files

Source Data

The CCRs are constructed from cost and charge information contained in hospital cost reports obtained from the CMS HCRIS; this information is delineated by hospital cost center. HCRIS covers Medicare-reimbursable facilities, including hospitals.

Hospital-Specific Cost-to-Charge Ratios

The HCRIS hospital cost reports are downloaded for use by HCUP after most hospitals have filed them. The HCUP convention has been to obtain the publicly available HCRIS cost reports after the first quarter of the second year following the HCRIS data year. For example, the HCRIS 2017 data files were downloaded in April 2019.

Inpatient charges, outpatient charges, and total costs are extracted from HCRIS data by hospital identifier/provider number (CMS Certification Number, or CCN) and HCRIS standard cost center. Additional financial and hospital characteristic data are also extracted at this time.

After the CMS extract has been prepared, cost centers are organized into the following HCUP service groups:

- Routine Care Group
- Specialty Care Group
- Labor & Delivery Services Group
- Intermediate Care Services (Ancillary Services Group 1)
- All Other Non-Accommodation Cost Centers (Ancillary Services Group 2)
- Emergency Services Group

The Routine Care, Specialty Care, Labor & Delivery, and Ancillary Services Groups are used for calculation of the inpatient CCR. The Emergency Services Group is used to calculate the emergency department CCR.

For a complete mapping of HCRIS cost centers to HCUP service groups, see Appendix B.

There are several reasons why the service groupings are used in the calculations. First, grouping standard cost centers can lessen the impact of data entry errors at the hospital level and limit the effect of any misalignment in the mapping of cost and charge data from the hospital accounting systems to the HCRIS cost centers. Second, the proportion of charges attributed to inpatient stays is used to calculate costs, and this proportion varies markedly across service groups. As such, inpatient charge proportions based on service groups should produce more accurate cost estimates than those based on all cost centers. Third, the creation of service-group level CCRs allows for more sensitive data quality checks (i.e., outlier identification).

Calculation of the service group and hospital-wide CCRs proceeds as follows:

- For each hospital and service group (Routine, Specialty, Labor & Delivery, Ancillary 1, and Ancillary 2), inpatient charges, outpatient charges, and total costs are summed.
- Next, by hospital and service group, total costs are transformed to estimated inpatient costs by multiplying the proportion of inpatient charges and total costs. (Note that Ancillary Services Group 2 is the only service group with outpatient charges and is thus the only service group for which estimated inpatient costs are in practice calculated.)
- Following this, Ancillary Services Groups 1 and 2 are combined into one Ancillary Services Group.
- Service group-level inpatient CCRs are calculated as the ratio of estimated inpatient costs to inpatient charges.
- Hospital-level inpatient CCRs are calculated by summing the service group inpatient costs and then dividing by the sum of the service group charges.

Hospital-specific CCRs calculated in this way are not included in the CCR Files when there is no cost information in the HCRIS data.

Both operating costs and capital-related costs are included in the calculation of hospital-specific CCRs.

Group Average Cost-to-Charge Ratios

The group average all-payer inpatient CCR (GAPICC) is a weighted average for the hospitals in peer groups (defined by four dimensions: State, urbanicity, ownership, and bed size), using the proportion of each hospital's beds relative to its peer group as the weight for each hospital.

These averages are based on clean observations from all hospitals in the SID maintained by AHRQ, including SID that are not released through the HCUP Central Distributor. Clean records are defined as HCUP hospitals that have records in both the AHA and CMS data typically as of March 31, when the CMS files are acquired. These records have a matching hospital in the CMS cost report, have availability of certain completed data items in the report, and pass certain quality checks. Note that a group average can be based on only one hospital in the peer group (defined by State and hospital type). The group average may incorporate non-HCUP hospitals. Both operating costs and capital-related costs are included in the calculation of GAPICC.

The hospital type for grouping peer hospitals (HTYPE) is calculated within State, using hospital characteristics obtained from the AHA Annual Survey. These include hospital urban/rural location, type of ownership/control, and bed size. The GAPICC is calculated within State and for each of these groupings.

Urban is defined as being part of a Metropolitan Statistical Area. For type of ownership/control, State and local nongovernment hospitals are included in the *not-for-profit* categories. *Beds* are the total hospital beds set up (as reported in each year's AHA Annual Survey Database). *Teaching status*, which is often used for grouping HCUP hospitals, was not incorporated into the definition of HTYPE. This indicator is not present in the CMS hospital cost reports. A proxy measure, the ratio of interns and residents per bed, was tested in regression analyses, and the cost ratios by the proxy for teaching status were not significantly different. Therefore, only ownership and bed size were used for defining HTYPE. (See Table 2 for a summary of HTYPE values.)

Outliers

HCUP inpatient CCR outliers are identified using upper and lower limits for hospital-wide, Routine Care, Specialty Care, Labor & Delivery, and Ancillary Services CCRs. The hospital-specific CCR is set to missing if any of these conditions are met:

- The Routine Care Group inpatient CCR is less than 0 or greater than 4.
- The Labor & Delivery Group inpatient CCR is greater than 4.
- The Specialty Care Group inpatient CCR is greater than 4.
- The Combined Ancillary Services Group CCR is less than 0 or greater than 4.
- The hospital-wide inpatient CCR is less than .05 or greater than 2.

The inpatient CCR upper limit of 2.0 identifies about 2.5 percent of hospitals as outliers. Note that the CCR-NIS CCR upper limit is set at 1.87 to further protect hospital confidentiality.

See the HCUP CCR Outlier Methodologies document on the HCUP-US website for more information.

DATA ELEMENTS

Table 2 provides a summary of data elements included on the CCR for Inpatient Files.

Common Data Elements

As reviewed in Table 1, linkage variables (HOSPID, HOSP_NIS, HOSP_KID, or HOSP_NRD) and CCR variables (APICC, GAPICC, CCR_NIS, CCR_KID, or CCR_NRD) are provided on all CCR for Inpatient Files. These data elements allow users to merge the CCR Files with HCUP databases and to convert hospital charges to hospital costs.

All CCR Files also include data year (YEAR) and area wage index (WAGEINDEX or WI_X), which is an index computed by CMS to indicate the relative hospital wage level in a geographic area compared with the national average hospital wage level (see Appendix C for more information). Wage index is WI_X in all years of the CCR for CD-SID and WAGEINDEX in all years of the CCR-NRD. Through 2011, this data element is called WI_X in the CCR-NIS and CCR-KID. Beginning in 2012, it was modified to enhance confidentiality of the NIS and renamed as WAGEINDEX. Statistical reliability of the estimates was not affected.

Data Elements Available on a Subset of Files

Additional data elements are available on only some CCR for Inpatient Files.

The CCR for CD-SID Files also include hospital type for grouping peer hospitals (HTYPE). The GAPICC is calculated within State and for each of these groupings. Although HTYPE is not provided on the CCR-NIS, CCR-KID, and CCR-NRD Files, it is helpful to know how this variable is defined to create peer groups using all hospitals within each State. (The Group Average Cost-to-Charge Ratios development section provides more information about how HTYPE is used to calculate GAPICC.)

The CCR for CD-SID Files (all years), as well as the CCR-NIS and CCR-KID prior to 2012, include State postal code (Z013).

The CCR for CD-SID (beginning with 2009), the CCR-NIS (2001–2011), and the CCR-KID (2009 only) also include the geographic adjustment factor (GAF), which represents the capital cost adjustment index for Core-Based Statistical Areas (CBSAs). GAF is used in calculating the Medicare reimbursement payments for capital costs. This data element may prove useful in regression calculations. However, analysts should note that for a number of States contributing hospital data in the CD-SID, NIS, and KID, permission was not provided to release values of GAF.

Table 2. Data Elements on the CCR for Inpatient Files

Data Element Category	Data Element	Data Type	Coding Notes	CCR Files
Hospital ID Number	HOSPID	Character*	HCUP hospital identification number	CD-SID, 2001–2023; NIS 2001–2011; KID 2001–2011;

Data Element Category	Data Element	Data Type	Coding Notes	CCR Files
	HOSP_NIS	Character*	NIS hospital identification number	NIS 2012–2023
	HOSP_KID	Character*	KID hospital identification number	KID 2012–2022
	HOSP_NRD	Character*	NRD hospital identification number	NRD 2010–2022
Cost-to-Charge Ratio	APICC	Numeric (decimal values)	Hospital-specific all-payer inpatient CCR. Set to missing when there is no cost information in the HCRIS (PPS) data or the calculated CCR value is deemed an outlier.	CD-SID, 2001–2023; NIS 2001–2011; KID 2001–2011
	GAPICC	Numeric (decimal values)	Group average all-payer inpatient CCR, which is a weighted average for the hospitals in peer groups (see HTYPE variable), using the proportion of each hospital's beds relative to its peer group as the weight for each hospital.	CD-SID, 2001–2023; NIS 2001–2011; KID 2001–2011
	CCR_NIS	Numeric (decimal values)	NIS-specific CCR populated with the hospital-specific, all-payer inpatient CCR (APICC) when available and hospital group average CCR (GAPICC) when the APICC is not available.	NIS 2012–2023
	CCR_KID	Numeric (decimal values)	KID-specific CCR populated with the hospital-specific, all-payer inpatient CCR (APICC) when available and hospital group average CCR (GAPICC) when the APICC is not available.	KID 2012–2022
	CCR_NRD	Numeric (decimal values)	NRD-specific CCR populated with the hospital-specific, all-payer inpatient CCR (APICC) when available and hospital group average CCR (GAPICC) when the APICC is not available.	NRD 2010–2022

Data Element Category	Data Element	Data Type	Coding Notes	CCR Files
Hospital Characteristics	HTYPE	Numeric	Hospital type for grouping peer hospitals, calculated within State, using bed size, ownership/control, and urban/rural location. 1 = investor-owned, under 100 beds 2 = investor-owned, 100 or more beds 3 = not-for-profit, rural, under 100 beds 4 = not-for-profit, rural, 100 or more beds 5 = not-for-profit, urban, under 100 beds 6 = not-for-profit, urban, 100–299 beds 7 = not-for-profit, urban, 300 or more beds.	CD-SID, 2001–2023
	Z013	Character	Two-character State postal code (from AHA)	CD-SID, 2001–2023; NIS 2001–2011; KID 2001–2011
Area Wage Index	WI_X	Numeric	Area wage index computed by CMS to measure the relative hospital wage level in a CBSA compared with the national average hospital wage level.	CD-SID, 2001–2023; NIS 2001–2011; KID 2001–2011
	WAGEINDEX	Numeric	Area wage index computed by CMS to measure the relative hospital wage level in a CBSA compared with the national average hospital wage level.	NIS 2012–2023; KID 2012–2022; NRD 2010–2022
Geographic Adjustment Factor	GAF	Numeric (decimal values)	Capital cost adjustment factor for CBSAs	CD-SID, 2009–2023; NIS, 2001–2011; KID, 2009 only
Year	YEAR	Numeric	Data year	CD-SID, 2001–2023; NIS 2001–2023; KID 2001–2022; NRD 2010–2022;

Abbreviations: AHA, American Hospital Association; CBSA, Core-Based Statistical Area; CCR, cost-to-charge ratio; CD, HCUP Central Distributor; CMS, Centers for Medicare & Medicaid Services; HCRIS, Healthcare Cost Report Information System; HCUP, Healthcare Cost and Utilization Project; KID, Kids' Inpatient Database; NIS, National

(Nationwide) Inpatient Sample; NRD, Nationwide Readmissions Database; PPS, Prospective Payment System; SID, State Inpatient Databases.

CONSIDERATIONS

File Updates

AHRQ released revised versions of the 2010–2018 CCR for CD-SID Files in September 2021. These files were updated to accord with current Partner restrictions and to add State data that were not permissible at the time of the original release. See the tables provided in the CCR for CD-SID section for comparisons between file versions.

AHRQ released a revised version of the 2010 CCR for CD-SID and CCR-NIS in August 2013 to incorporate updated 2010 cost reports from CMS.

Data Notes and Recommendations

Due to factors such as changes to the hospital universe and variation in State participation in the 2001–2011 NIS databases, users may consider making some adjustments to cost estimates derived from these databases. Appendix D provides more detailed data notes and recommendations for users of the CCR-NIS Files.

FILE- AND YEAR-SPECIFIC INFORMATION

CCR for CD-SID

Table 3 provides the count of records (hospitals) included in the CCR for CD-SID Files each year compared with the count of all hospitals in the SID maintained by AHRQ (including SID that are not released through the HCUP Central Distributor).

Table 3. CCR for CD-SID Record (Hospital) Counts by Year

Year	Number of Records (Hospitals)		
	CCR for CD-SID[a]	CCR for CD-SID Separate Files (Combined)	Total SID[b]
2023	2,347	348	4,542
2022	2,773	331	4,985
2021	2,878	330	4,987
2020	2,937	327	5,071
2019	2,937	332	5,077
2018 v3	2,954	No v3 files	5,078
2018 v2	2,690	No v2 files	5,078
2018 v1	2,464	333	5,078
2017 v3	2,583	No v3 files	5,115
2017 v2	2,318	No v2 files	5,115
2017 v1	2,311	333	5,115
2016 v2	2,328	No v2 files	5,110
2016 v1	2,297	332	5,110

Year	Number of Records (Hospitals)		
	CCR for CD-SID[a]	CCR for CD-SID Separate Files (Combined)	Total SID[b]
2015 v2	2,328	No v2 files	5,122
2015 v1	2,178	336	5,122
2014 v2	2,304	No v2 files	5,025
2014 v1	2,078	337	5,025
2013 v2	2,293	No v2 files	5,025
2013 v1	1,876	336	5,025
2012 v2	2,202	No v2 files	5,058
2012 v1	2,313	336	5,058
2011 v2	2,702	No v2 files	5,039
2011 v1	2,412	332	5,039
2010 v2	2,691	334	4,995
2010 v1	2,519	217	4,995
2009	2,402	87	4,873
2008	2,367	87	4,798
2007	2,305	No separate files	4,453
2006	2,313	No separate files	4,426
2005	1,691	No separate files	4,264
2004	1,613	No separate files	4,099
2003	1,626	No separate files	4,216
2002	1,602	No separate files	4,063
2001	1,578	No separate files	3,816

Abbreviations: AHRQ, Agency for Healthcare Research and Quality; CCR, cost-to-charge ratio; CD, HCUP Central Distributor; SID, State Inpatient Databases.

All hospital counts in this table are the count of unique AHA ID for SID hospitals. Further, it is possible that several SID hospitals (DSHOSPID) may have been linked to a single AHA ID number. For more information about hospital identifiers can be found on the HCUP Hospital Identifiers, https://hcup-us.ahrq.gov/db/maphosp.pdf

[a] Excludes States that did not permit AHRQ to release their CCR measures.

[b] This represents the count of all hospitals in the SID maintained by AHRQ (including SID that are not released through the HCUP Central Distributor).

Table 4 provides the count of records with hospital-specific and group average CCRs. Where permitted by HCUP Partner organizations, the CCR for CD-SID File includes a hospital-specific all-payer inpatient CCR, APICC. For all hospitals, there is also a weighted group average, GAPICC. Analysts can use the APICC, when available, and can otherwise use the weighted group average, GAPICC.

Table 4. Records (Hospitals) in the CCR for CD-SID, by Year and Presence of APICC and GAPICC

Year	Number of Records (Hospitals) With APICC	Percent With APICC	Number of Records (Hospitals) With GAPICC Only
2023	1,315	56	1,032

Year	Number of Records (Hospitals) With APICC	Percent With APICC	Number of Records (Hospitals) With GAPICC Only
2022	1,702	61	1,071
2021	1,695	59	1,183
2020	1,725	59	1,212
2019	1,700	58	1,237
2018 v3	1,751	59	1,203
2018 v2	1,751	65	939
2018 v1	1,555	63	909
2017 v3	1,486	57	1,097
2017 v2	1,486	64	832
2017 v1	1,480	64	831
2016 v2	1,487	64	841
2016 v1	1,481	64	816
2015 v2	1,482	64	846
2015 v1	1,482	68	696
2014 v2	1,493	65	811
2014 v1	1,409	68	669
2013 v2	1,471	64	822
2013 v1	1,391	74	485
2012 v2	1,373	62	829
2012 v1	1,679	73	634
2011 v2	1,799	67	903
2011 v1	1,799	75	613
2010 v2	1,863	69	828
2010 v1	1,971	78	548
2009	1,749	73	653
2008	1,865	78	502
2007	1,705	74	600
2006	1,654	72	659
2005	1,112	66	579
2004	1,091	68	518
2003	1,084	66	542
2002	972	61	630
2001	984	62	594

Abbreviations: APICC, all-payer inpatient cost-to-charge ratio; CCR, cost-to-charge ratio; CD, HCUP Central Distributor; GAPICC, group average all-payer inpatient cost-to-charge ratio; SID, State Inpatient Databases.

Participating States

Almost all States participating in the HCUP Central Distributor are included in the CCR for CD-SID File. Table 5 lists the States included in each year's file. Four States—Iowa, Minnesota, Nebraska, and North Dakota—release their CCR measures in separate, State-specific files for

certain years. These files are available by request from the HCUP Central Distributor to purchasers whose organizational affiliation and ownership meet the Partner's eligibility criteria. One State, South Carolina, does not release HOSPID or, consequently, CCR for its CD-SID. States added to version 2 or 3 files are bolded.

Table 5. States Included in the CCR for CD-SID, by Data Year

Year	States in CCR for CD-SID File	State-Specific Files
2023	AK AR AZ CO DC DE FL GA HI IN KS KY MA MD ME MI MS NC NJ NM NY OR RI SD UT WA WI WV (28)	IA MN NE ND
2022	AK AR AZ CA CO DC DE FL GA HI IN KS KY MA MD ME MI MS NC NJ NM NY OR RI SD UT VT WA WI WV (30)	IA MN NE
2021	AK AZ AR CA CO DC DE FL GA IN KS KY MA MD ME MI MO MS NC NJ NM NY OR RI SD UT VT WA WI WV (30)	IA MN NE
2020	AK AZ AR CA CO DC DE FL GA IN KS KY MA MD ME MI MO MS NC NJ NM NV NY OR RI SD UT VT WA WI WV (31)	IA MN NE
2019	AK AZ AR CA CO DC DE FL GA IN KS KY MA MD ME MI MO MS NC NJ NM NV NY OR RI SD UT VT WA WI WV (31)	IA MN NE
2018 v3	AK AZ AR CA CO DC DE FL GA **IN** KS KY MA MD ME MI **MO** MS NC NJ NM NV NY OR RI SD UT VT WA WI WV (31)	IA MN NE
2018 v2	AK AZ AR CA CO DC DE FL GA KS KY MA MD ME MI MS NC NJ NM NV **NY** OR RI SD **UT** VT WA WI WV (29)	IA MN NE
2018 v1	AK AZ AR CA CO DC DE FL GA KS KY MA MD ME MI MS NC NJ NM NV OR RI SD VT WA WI WV (27)	IA MN NE
2017 v3	AK AZ AR CO DC DE FL GA **IN** KS KY MA MD ME MI **MO** MS NC NJ NM NV NY OR RI SD UT VT WA WI WV (30)	IA MN NE
2017 v2	AK AZ AR CO DC **DE** FL GA KS KY MA MD ME MI MS NC NJ NM NV NY OR RI SD UT VT WA WI WV (28)	IA MN NE
2017 v1	AK AZ AR CO DC FL GA KS KY MA MD ME MI MS NC NJ NM NV NY OR RI SD UT VT WA WI WV (27)	IA MN NE
2016 v2	**AK** AZ AR CO DC **DE** FL GA HI KS KY MA MD ME MI MS NC NJ NM NV NY OR RI SD UT VT WA WI WV (29)	IA MN NE
2016 v1	AZ AR CO DC FL GA HI KS KY MA MD ME MI MS NC NJ NM NV NY OR RI SD UT VT WA WI WV (27)	IA MN NE
2015 v2	**AK** AZ AR CO DC FL GA HI **KS** KY MA MD ME MI MS NC NJ NM NV NY OR RI SD UT VT WA WI WV (28)	IA MN NE
2015 v1	AZ AR CO DC FL GA HI KY MA MD ME MI MS NC NJ NM NV NY OR RI SD UT VT WA WI WV (26)	IA MN NE
2014 v2	AZ AR CO DC FL GA HI **KS** KY MA MD ME MI **MS** NC NJ NM NV NY OR RI SD UT VT WA WI WV (27)	IA MN NE
2014 v1	AZ AR CO DC FL GA HI KY MA MD ME MI NC NJ NM NV NY OR RI SD UT VT WA WI WV (25)	IA MN NE
2013 v2	AZ AR CO FL **GA** HI **KS** KY MA MD **ME** MI **MS** NC NJ NM NV NY OR RI SD UT VT WA WI WV (26)	IA MN NE
2013 v1	AZ AR CO FL HI KY MA MD MI NC NJ NM NV NY OR RI SD UT VT WA	IA MN NE

Year	States in CCR for CD-SID File	State-Specific Files
	WI WV (22)	
2012 v2	AZ AR CO FL **GA** HI **KS** KY MD MA ME MI NC NJ NM NV NY OR RI SD UT VT WA WI WV (25)	IA MN NE
2012 v1	AZ AR CA CO FL HI KY MD MA ME MI NC NJ NM NV NY OR RI SD UT VT WA WI WV (24)	IA MN NE
2011 v2	AZ AR CA CO FL **GA** HI **KS** KY MA MD ME MI MS NC NJ NM NV NY OR RI SD UT VT WA WI WV (27)	IA MN NE
2011 v1	AZ AR CA CO FL HI KY MA MD ME MI MS NC NJ NM NV NY OR RI SD UT VT WA WI WV (25)	IA MN NE
2010 v2	AZ AR CA CO FL **GA** HI **KS** KY MA MD ME MI MS NC NJ NM NV NY OR RI SD UT VT WA WI WV (27)	**IA** MN NE
2010 v1	AZ AR CA CO FL HI IA KY MA MD ME MI MS NC NJ NM NV NY OR RI SD UT VT WA WI WV (26)	MN NE
2009	AZ AR CA CO FL HI IA KY MA MD ME MI NC NJ NM NV NY OR RI SD UT VT WA WI WV (25)	NE
2008	AZ AR CA CO FL HI IA KY MA MD ME MI NC NJ NV NY OR RI SD UT VT WA WI WV (24)	NE
2007	AZ AR CA CO FL HI IA KY MA MD ME MI NC NJ NV NY OR RI UT VT WA WI WV (23)	none
2006	AZ AR CA CO FL HI IA KY MA MD ME MI NC NJ NV NY OR RI UT VT WA WI WV (23)	none
2005	AZ FL HI IA KY MA MD MI NV NJ NY NC OR RI UT VT WA WI WV (19)	none
2004	AZ FL IA KY MA MD MI NV NJ NY NC OR RI UT VT WA WI WV (18)	none
2003	AZ FL IA KY MA MD ME MI NV NJ NY NC OR RI UT WA WI WV (18)	none
2002	AZ FL IA KY MA MD ME MI NV NJ NY NC OR UT WA WI WV (17)	none
2001	AZ FL IA KY MA MD ME MI NV NJ NY NC OR UT WA WI WV (17)	none

Abbreviations: CCR, cost-to-charge ratio; CD, HCUP Central Distributor; SID, State Inpatient Databases.
Notes: States listed in bold text were added to the revised annual CCR for CD-SID File.

CCR-NIS

For 2012–2023, the datasets contain a record for each hospital (unduplicated HOSP_NIS) in the NIS (see Table 6).

Table 6. Records (Hospitals) in the CCR-NIS, 2012–2023

Year	Number of Records (Hospitals) in the CCR-NIS
2023	4,181
2022	4,544
2021	4,558
2020	4,580
2019	4,568
2018	4,550
2017	4,584

Year	Number of Records (Hospitals) in the CCR-NIS
2016	4,575
2015	4,573
2014	4,411
2013	4,363
2012	4,378

Abbreviations: CCR, cost-to-charge ratio; NIS, National Inpatient Sample.

For 2001–2011, the datasets contain a record for each hospital (unduplicated HOSPIDs) in the NIS *for States that permitted release* of their CCRs (see Table 7).[1]

Table 7. Records (Hospitals) in the CCR-NIS, 2001–2011

Year	Number of Records (Hospitals) in the CCR-NIS	Number of Records (Hospitals) in the NIS
2011	1,008	1,049
2010	1,010	1,051
2009	1,013	1,050
2008	1,017	1,056
2007	1,044	1,044
2006	1,045	1,045
2005	942	1,054
2004	908	1,004
2003	855	995
2002	855	995
2001	851	986

Abbreviations: CCR, cost-to-charge ratio; NIS, Nationwide Inpatient Sample.

Through 2011, one or more States did not provide permission to include their hospital-specific CCRs in the CCR-NIS Files. Beginning with 2012, all States in the NIS are included in the CCR-NIS Files.

Prior to 2012, the CCR-NIS Files provide a hospital-specific all-payer inpatient CCR, APICC, where permitted by HCUP Partner organizations (see Table 8).

Table 8. CCR-NIS Records (Hospitals) With APICC, 2001–2011

Year	Number of Records (Hospitals) With APICC	Percentage With APICC	Number of Records (Hospitals) With GAPICC Only
2011	889	88	119
2010	920	91	90
2009	906	89	107
2008	888	87	129
2007	818	78	226
2006	807	77	238

2005	657	70	285
2004	669	74	239
2003	641	75	214
2002	571	67	284
2001	623	73	228

Abbreviations: APICC, all-payer inpatient cost-to-charge ratio; CCR, cost-to-charge ratio; GAPICC, group average all-payer inpatient cost-to-charge ratio; NIS, Nationwide Inpatient Sample.

CCR-KID

For 2012, 2016, 2019, and 2022, the datasets contain a record for each hospital (unduplicated HOSP_KID) in the KID (see Table 9).

Table 9. Records (Hospitals) in the CCR-KID, 2012, 2016, 2019, 2022

Year	Number of Records (Hospitals) in the CCR-KID
2022	3,811
2019	3,998
2016	4,200
2012	4,179

Abbreviations: CCR, cost-to-charge ratio; KID, Kids' Inpatient Database.

For 2003, 2006, and 2009, the datasets contain a record for each hospital (unduplicated HOSPIDs) in the KID for States that permitted release of their CCRs (see Table 10).

Table 10. Records (Hospitals) in the CCR-KID, 2003, 2006, 2009

Year	Number of Records (Hospitals) in the CCR-KID	Number of Records (Hospitals) in the KID
2009	3,956	4,121
2006	3,739	3,739
2003	2,965	3,438

Abbreviations: CCR, cost-to-charge ratio; KID, Kids' Inpatient Database.

All HCUP hospitals in the CCR-KID Files are in the AHA Annual Survey.

Prior to 2012, the CCR-KID Files provide a hospital-specific all-payer inpatient CCR, APICC, where permitted by HCUP Partner organizations (see Table 11).

Table 11. Records (Hospitals) With Hospital-Specific CCR in the CCR-KID, 2003, 2006, 2009

Year	Number of Records (Hospitals) With APICC	Percentage With APICC	Number of Records (Hospitals) With GAPICC Only
2009	3,816	93	305
2006	2,935	78	804
2003	2,243	76	722

Abbreviations: APICC, all-payer inpatient cost-to-charge ratio; CCR, cost-to-charge ratio; GAPICC, group average all-payer inpatient cost-to-charge ratio; KID, Kids' Inpatient Database.

CCR-NRD

For 2010–2022, the datasets contain a record for each of the hospitals (unduplicated HOSP_NRD) in the NRD (see Table 12).

Table 12. Records (Hospitals) in the CCR-NRD

Year	Number of Records (Hospitals) in the CCR-NRD
2022	2,505
2021	2,505
2020	2,539
2019	2,507
2018	2,430
2017	2,454
2016	2,355
2015	2,367
2014	2,048
2013	2,006
2012	1,715
2011	1,804
2010	1,809

Abbreviations: CCR, cost-to-charge ratio; NRD, Nationwide Readmissions Database.

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APPENDIX A: ORIGINS OF COST-TO-CHARGE RATIOS AND COST REPORTS

CCRs have likely been used on an ad hoc basis by hospitals for estimating treatment costs for a considerable time. The impetus for creating a national database of hospital accounting data was Medicare prospective payment, which was established by the Social Security Amendments Act of 1983, with implementation starting in 1984. At that time, CMS, then known as the Health Care Financing Administration (HFCA), established the inpatient prospective payment system (PPS) as a means of controlling rapidly increasing hospital expenditures that threatened solvency of the Medicare Trust Fund. The fundamental concepts behind PPS were (1) creation of categories of inpatient encounters within which intensity of service delivery was similar (diagnosis-related groups, or DRGs) and (2) reimbursement to hospitals based on the costs of services within DRGs. This led to development of the cost reports, used by HCFA to estimate national costs of service delivery for DRGs, among other uses. DRG cost estimates relied on CCRs calculated from the cost reports and were integral to creation of DRG “relative weights,” which determine payments to hospitals based on DRGs (see Pettengill and Vertrees, 1982, for a discussion of initial development of DRGs and relative weights).

Once the cost reports became accessible to the public, CCRs began being used to estimate service delivery costs for individual hospitals, hospital systems, and peer groups. This in turn led to a focus on hospital cost-efficiency analysis and benchmarking. AHRQ developed a methodology for estimating hospital inpatient costs based on the cost reports in the early 2000s (Friedman et al., 2002). More recently, AHRQ developed a methodology for estimating the cost of treat-and-release emergency department visits (Pickens et al., 2021).

APPENDIX B: ASSIGNMENT OF HCRIS COST CENTERS TO HCUP SERVICE GROUPS

The table below details the mapping between HCRIS cost centers and HCUP service groups.

Table B1. Assignment of HCRIS Cost Centers to HCUP Service Groups

HCRIS Standard Cost Center Description	Inpatient Cost-to-Charge Ratios					Emergency Department Cost-to-Charge Ratios
	Routine Care Group	Specialty Care Group	Labor & Delivery Group	Ancillary Services Group 1	Ancillary Services Group 2	Emergency Services Group
Adults & Pediatrics (General Routine Care)	X					
Intensive Care Unit		X				
Coronary Care Unit		X				
Burn Intensive Care Unit		X				
Surgical Intensive Care Unit		X				
Other Intensive Care		X				
Inpatient Psychiatric Facility Subprovider				X		
Inpatient Rehabilitation Facility Subprovider				X		
Other Subprovider				X		
Nursery		X				
Skilled Nursing Facility				X		
Nursing Facility				X		
Other Long-Term Care				X		
Operating Room, Endoscopy, Prostheses					X	
Recovery Room					X	
Delivery Room & Labor Room			X			
Anesthesiology & Acupuncture					X	
Radiology-Diagnostic					X	X
Radiology-Therapeutic					X	
Radioisotope					X	
CAT Scan					X	X
MRI					X	
Cardiac Catheterization Lab					X	
Laboratory					X	X
PBP Clinical Lab Service Program Only					X	
Whole Blood & Packed Red Blood Cells					X	
Blood Storing, Processing, & Transfusing					X	

HCRIS Standard Cost Center Description	Inpatient Cost-to-Charge Ratios					Emergency Department Cost-to-Charge Ratios
	Routine Care Group	Specialty Care Group	Labor & Delivery Group	Ancillary Services Group 1	Ancillary Services Group 2	Emergency Services Group
Intravenous Therapy					X	
Respiratory Therapy					X	
Physical Therapy					X	
Occupational Therapy					X	
Speech Pathology					X	
Electrocardiology					X	
Electroencephalography					X	
Medical Supplies Charged to Patients					X	
Implants Charged to Patients					X	
Drugs Charged to Patients					X	X
Renal Dialysis					X	
Ambulatory Surgery Center (Non-distinct Part)					X	
Other Ancillary					X	
Rural Health Clinic					X	
Federally Qualified Health Center					X	
Clinic					X	
Emergency Room					X	X
Observation Beds					X	X
Other Outpatient Service					X	
Home Program Dialysis					X	
Ambulance Services					X	
Durable Medical Equipment -Rented					X	
Durable Medical Equipment -Sold					X	
Other Reimbursable Cost Centers (excluding Home Health Agency and Comprehensive Outpatient Rehabilitation Facility)					X	

Abbreviations: CAT, computerized axial tomography; HCRIS, Healthcare Cost Report Information System; HCUP, Healthcare Cost and Utilization Project; MRI, magnetic resonance imaging; PRP, provider-based physician.

APPENDIX C: ADDITIONAL DATA ELEMENT INFORMATION

Area Wage Index (WAGEINDEX or WI_X)

Area wage index is provided on the file to allow researchers to analyze cost differences geographically or to control for price factors beyond the hospital's control. Multivariate studies should not assume strict proportionality. Some analysts use the area wage index to adjust the labor portion of the hospital's estimated cost to reflect local labor market conditions.

The index is computed for each urban CBSA and then linked with the AHA data before it is added to the file. If the AHA-reported CBSA does not match the CMS hospital area, then the Area Health Resources Files and other hospitals in the same county are used to find a matching CBSA. All rural areas in each State are combined for a single wage index. This information is available for download from CMS.[2]

For the HCUP hospitals in each year, all hospitals were matched to an area wage index using CMS files, the AHA Annual Survey, and the Area Health Resources Files in cases where the AHA Survey was incomplete.

Geographic Adjustment Factor (GAF)

GAF represents the capital cost adjustment index CBSAs and is used in calculating the Medicare reimbursement payments for capital costs. This data element may prove useful in regression calculations. However, analysts should note that for a number of States contributing hospital data in the CD-SEDD, permission was not provided to release values of GAF. GAF values are available for download from CMS.[3]

[2] Visit www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Wage-Index-Files for more information. Navigate to the Wage Index page for the year of interest.

[3] Visit www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Wage-Index-Files for more information. Navigate to the Wage Index page for the year of interest.

APPENDIX D: NIS DATA NOTES AND RECOMMENDATIONS

The use of CCRs with the NIS is an important application for estimating the service delivery costs of U.S. inpatient services. The CCR-NIS Files and the NIS itself have instituted design improvements over time. What follows are considerations users of the CCR-NIS Files should keep in mind when applying them to the NIS, especially in analyses involving trending. Analysts should apply the NIS Trend Weights Files when conducting analyses involving years before and after the 2012 NIS redesign (see below).

CCR-NIS Missing Data 2001–2011

The frequency of missing total charge (TOTCHG) data in the NIS between 2001 and 2019 is very small: usually 1 percent or less. However, between 2001 and 2011, there were hospitals in the NIS sample that were not included in the CCR-NIS Files. In addition, there were hospitals in the CCR-NIS Files that had the hospital-specific CCRs (APICCs) set to missing for all records; only the group average CCR (GAPICC) was provided (see Table 8). This resulted in a much larger number of missing cost estimates than the missing TOTCHG data would imply.

To obtain national cost estimates for a set of cases, for analyses involving years 2001–2011, one option is to reweight all discharges to account for cases where cost estimates are missing. The original discharge weight (DISCWT) should be multiplied by the following: total weight of original cases divided by total weights, after excluding cases with missing cost. By performing these calculations, the weights for remaining cases are increased. A second, more sophisticated approach is to use techniques for imputing missing data, as detailed in a 2015 HCUP Methods Series Report (see Houchens, 2015).

2005 Hospital Universe Change

The AHA changed the criteria defining a hospital for data year 2005. The change had the effect that long-term acute care facilities (LTACs) were reclassified as hospitals. As a result, about 285 unregistered hospitals were added to the 2005 AHA Survey Database, of which 220 were community, nonrehabilitation hospitals that became part of the NIS hospital universe. Of these, 125 were LTACs and had higher mean charges. As a result, the estimated mean cost for the 2005 NIS was approximately 2 percent higher than it would have been without the addition of the LTACs.

2012 NIS and CCR-NIS Changes

In 2012, the NIS was extensively redesigned to improve the precision of estimates produced by the database. (See the NIS Redesign Final Report, Houchens et al., 2014, for details.) Among other changes, the LTACs explicitly introduced into the NIS universe in 2005 were removed in 2012 and years that followed. The CCR-NIS File was revised to contain a NIS-specific CCR (CCR_NIS) populated with the hospital-specific, all-payer inpatient CCR (APICC), when available, and hospital group average CCR (GAPICC) when the APICC was not available. This had the net effect of reducing the frequency of missing cost estimates, compared with the years 2001–2011.