

## Cost-to-Charge Ratio Files:

### 2014 National Inpatient Sample (NIS) User Guide

*Beginning with the 2012 data, the Cost-to-Charge Ratio (CCR) File for the NIS was revised to reflect the redesign of the National Inpatient Sample (NIS). This version of the CCR file includes HOSP\_NIS, which is a unique hospital number exclusive to the NIS. The CCR variables were also renamed to indicate they are designed to be used exclusively with the 2014 NIS.*

#### 1. Purpose

The purpose of this data file is to provide Healthcare Cost and Utilization Project (HCUP) NIS data users with ratios that will allow the conversion of charge data to cost estimates. The file is constructed using all-payer, inpatient cost and charge information from the detailed reports by hospitals to the Centers for Medicare & Medicaid Services (CMS). It provides an estimate of all-payer inpatient cost-to-charge ratios (CCR) for all hospitals in the HCUP NIS 2014.

The CCR file can be linked to the 2014 NIS file using the HOSP\_NIS variable. The cost of inpatient care for a discharge is estimated by multiplying TOTCHG (from the discharge record) by the all-payer inpatient cost/charge ratio CCR\_NIS. CCR\_NIS is based on the hospital-specific all-payer inpatient cost/charge ratio (APICC) when available, or the group average all-payer inpatient cost/charge ratio (GAPICC) otherwise.

*Note: The HOSP\_NIS variable on the CCR CSV (comma-separated value) text file is enclosed in quotations in order to preserve leading zeros in Excel. As a result, some software applications may interpret HOSP\_NIS as a character variable, which in turn would not match the numeric version of HOSP\_NIS on the NIS. This data element should be loaded as numeric or converted to numeric prior to merging with the NIS.*

#### 2. File Format

The dataset contains records for each of 4,411 hospitals in the 2014 NIS. All HCUP hospitals in the file are also in the American Hospital Association (AHA) 2014 survey.

Beginning with the 2012 data, the cost-to-charge ratio has been modified to enhance confidentiality of the NIS. Statistical reliability of the estimates is not affected.

### 3. Internal Validation Studies

A regression analysis of the all-payer inpatient CCR was performed in earlier years. This analysis used all clean HCUP and non-HCUP records with both AHA and CMS data. This was a weighted OLS regression using acute medical-surgical beds as the weighting variable, with separate state constant terms. Factors leading to significant differences in the CCR were: investor-ownership, rural location, large size (more than 300 beds), and a high ratio of interns and residents per bed (top 5%). Several of the state constant terms were also significant. The results tended to validate the “peer-grouping” method used here to create weighted group averages for each HCUP record.

In 2001 a study was performed for two states where different methods of calculating cost by DRG were compared. Hospital-wide CCRs as provided here, although not as accurate as department-based CCRs, are more accurate than gross charges in estimating relative cost by DRG. In more recent years, studies involving a dozen states with detailed charges have been done. These studies produced more accurate CCRs because they use departmental CCRs as opposed to hospital-wide CCRs. Users interested in quantifying potential biases due to use of the hospital-wide CCRs should contact HCUP user support ([hcup@ahrq.gov](mailto:hcup@ahrq.gov)).

Two HCUP Methods Series Reports provide correction factors by department. An initial report with correction factors by CCS and APR-DRG for 2006 data can be found at: [http://hcup-us.ahrq.gov/reports/2008\\_04.pdf](http://hcup-us.ahrq.gov/reports/2008_04.pdf). An updated report that used a more extensive methodology to develop correction factors for 2009 data by MS-DRG and CCS is available at [http://www.hcup-us.ahrq.gov/reports/methods/2011\\_04.pdf](http://www.hcup-us.ahrq.gov/reports/methods/2011_04.pdf).

### 4. Hospital-Specific CCR — APICC

The all-payer inpatient cost-to-charge ratio (APICC), which is used to populate CCR\_NIS when available, is created by dividing the inpatient costs by the inpatient charges. Both of these values are found on the CMS Healthcare Cost Reporting Information System (HCRIS) reports, or PPS data. APICC is kept for HCUP NIS hospitals that have a matching record in both the PPS and the AHA data. APICC is missing when there is no cost information in the PPS data or the calculated cost/charge values are considered outliers. Several adjustments are made to costs and charges before they are usable in this generalized formula, the most important being the assignment of a portion of ancillary costs to inpatient routine and acute cost centers.

### 5. Weighted Group Average—GAPICC

The group average CCR, which is used to populate CCR\_NIS when the APICC is not available, is a weighted average for the hospitals in peer groups (defined

by state, urban/rural, investor-owned/other, and bedsize), using the proportion of group beds as the weight for each hospital. These averages are based on clean observations with both AHA and PPS data. *Clean records* are defined by matching to a cost report, availability of certain completed data items in the report and passing certain edit checks.

Note that group averages can be based on only one hospital in the peer group (defined by state and hospital type). The group average may be associated with a non-HCUP hospital.

## 6. Hospital Type for Grouping—HTYPE

Although HTYPE is not provided on the NIS Cost-to-Charge file, it is helpful to know how this variable is defined to create peer groups within each state using all hospitals. Some researchers will find the information below useful with respect to replicability, and reviewers for journal articles might find this more detailed description especially valuable.

The following are values for the HTYPE variable:

- 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

State and local hospitals are included in the *not-for-profit categories*.

Unfortunately, interns and residents per bed are not available on the AHA survey so a high value of this indicator of teaching status could not be used for grouping. *Urban* is defined as being part of an MSA; *beds* are the total hospital beds set up (as defined in the 2014 AHA Annual Survey Database).

## 7. Area Wage Index—WAGEINDEX

The Area Wage Index is an index computed by CMS to measure the relative hospital wage level in a geographic area compared to the national average hospital wage level. It is provided on the file to allow researchers to analyze cost differences geographically or to control for price factors beyond the hospital's control. Hospital cost variation has a 0.8 elasticity with the area wage index in some AHRQ published studies, meaning that variation in the hospital cost is roughly proportional to the variation in overall hospital costs. Multivariate studies should not assume strict proportionality.

The index is computed for each urban Core-Based Statistical Area (CBSA) and then linked with the AHA 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 (AHRF) 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. For the HCUP NIS hospitals in 2014, all hospitals were matched to an area wage index using CMS files, the AHA survey, and the Area Resource File in cases where the AHA survey was incomplete.

Beginning in 2012, the index in the CCR file has been modified to enhance confidentiality of the NIS. Statistical reliability of the estimates is not affected.

#### 8. Variable List

There are four variables in the Cost-to-Charge file for the 2014 NIS. The following list summarizes the variables (and their respective labels) included in this file.

HOSP_NIS	NIS hospital number
CCR_NIS	All-payer inpatient or Group Average CCR
WAGEINDEX	Wage Index, source CMS, edited
YEAR	Year for linking to HCUP records