

## **Cost-to-Charge Ratio Files:**

### **2005 Central Distributor State Inpatient Database (CD-SID) User Guide**

#### **1. Purpose**

The purpose of this data file is to provide Healthcare Cost and Utilization Project (HCUP) 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 and Medicaid Services (CMS). It provides an estimate of all-payer inpatient cost-to-charge (CCR) for hospitals in states that participate in the 2005 SID Cost-to-Charge Central Distributor. The participating states are: AZ, FL, HI, IA, KY, MD, MA, MI, NV, NJ, NY, NC, OR, RI, UT, VT, WA, WI, and WV. Where permitted by HCUP State Partners, the dataset provides a hospital-specific CCR and a weighted group average.

The file can be linked to participating 2005 Central Distributor SID files by using the HOSPID variable (HOSPID on the CCR CSV text file is enclosed in quotations, so it should be loaded as numeric or converted to numeric prior to merging with the CD SID). This is achieved by first linking the Cost-to-Charge file to the hospital linkage file (that comes with the Central Distributor SID) by HOSPID and then linking the result to the Central Distributor SID file by DSHOSPID. Some states will include HOSPID directly on the CD SID file because they do not release AHAIID on the hospital linkage file. For these states, the Cost-to-Charge file can be merged directly onto the CD SID file by HOSPID. The cost of inpatient care for a discharge can then be estimated by multiplying TOTCHG (from the discharge record) by either the all-payer inpatient cost/charge ratio (APICC), or the group average all-payer inpatient cost/charge ratio (GAPICC).

#### **2. File Format**

The dataset contains one record for each of 1691 of 1830 Central Distributor SID hospitals in 2005 (unduplicated HOSPIDs). All HCUP hospitals in the file are also in the American Hospital Association (AHA) 2005 survey.

Analysts might want to use the hospital-specific cost-to-charge when available (1112 cases approximating 66%) and the weighted group average when the hospital-specific CCR is not available (579 cases). Alternatively, one might use the group average in all cases. In 1 case there is no available CCR due to incomplete or unbelievable data.

Two states were dropped from the file (CO and NE). Two states do not participate in the Central Distributor at this time (CA and SC). Two states, MI and OR, only include the group average.

### 3. Internal Validation Studies

A regression analysis of the all-payer inpatient CCR was performed this year and in earlier years. This analysis used all clean HCUP and non-HCUP records with both AHA and CMS data. (Clean records are defined as having complete CMS schedules and worksheets, containing key variables within an acceptable range). 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.

A second type of validation study was performed for two states. In one case, the state accounting system by department was taken as the “gold standard” for cost estimation. Three alternatives were compared as predictors of differences in cost by DRG: Centers for Medicare and Medicaid Services (CMS) departmental cost-to-charge ratios, CMS hospital-wide inpatient cost-to-charge, and raw charges. The mean-squared-error criterion was used. The CMS departmental cost-to-charge ratios applied to detailed charges are somewhat more accurate in predicting the “gold standard” costs than are the hospital-wide inpatient cost-to-charge. The latter is substantially more accurate as a predictor than the raw charges. Unfortunately, detailed charges are not available for all HCUP states, so we can only use the hospital-wide inpatient cost-to-charge for cost estimation with the CD SID.

### 4. Weighted Group Average—GAPICC

The group average CCR (GAPICC) is a weighted average for the hospitals in the group (defined by state, urban/rural, investor-owned/other, and number of beds), using the proportion of group beds as the weight for each hospital. The groups are defined based on all clean HCUP and non-HCUP records for community hospitals with matching AHA 2005 Annual Survey data and CMS accounting database records as of June 30, 2007. Both operating costs and capital-related costs are included.

### 5. Hospital Type for Grouping—HTYPE

HTYPE is available on the Central Distributor SID Cost-to-Charge file. It is helpful to know how this variable is defined to create peer groups within each state using all hospitals – not only those participating in the Central Distributor SID. 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.

Unfortunately, data about the ratio of 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 a Metropolitan Statistical Area (MSA); *beds* are the total hospital beds set up (2005 AHA survey). State and local hospitals are included in the not-for-profit categories.

#### 6. Area Wage Index—WI\_X

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 .8 elasticity with the area wage index in some AHRQ published studies, meaning that changes in the hospital wages are closely linked to changes in overall hospital costs. The index is computed for each urban Core-Based Statistical Area (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 CD SID hospitals in 2005, all hospitals were matched to an area wage index using CMS and the AHA survey.

#### 8. Changes from Previous Years

The CCRs in this file, when applied to the 2005 Nationwide Inpatient Sample, result in somewhat higher mean cost than anticipated. This atypical increase in the national CCR can be associated with a change in the hospital universe for the NIS. This phenomenon can happen in any year, but in 2005 it had the effect of increasing the national CCR.

The Annual Report at [http://www.hcup-us.ahrq.gov/reports/factsandfigures/HAR\\_2005.pdf](http://www.hcup-us.ahrq.gov/reports/factsandfigures/HAR_2005.pdf) was prepared before the CMS 2005 data were assembled. It is based on preliminary assumptions that give a lower overall CCR than we find in the more recent data. As a result, the mean cost for 2005 now appears to be \$8079 rather than the \$7900 estimated in the annual report, a difference of 2%.

## 7. Variable List

There are seven variables in the HCUP Central Distributor Cost-to-Charge file. The following list summarizes the variables (and their respective labels) included in the Cost-to-Charge data file.

HOSPID	HCUP hospital identification number
WI_X	Wage Index, source CMS, edited
Z013	State postal code
APICC	All-payer inpatient CCR, hosp-specific
GAPICC	Group average all-payer inpatient CCR
HTYPE	Hospital type used for grouping
YEAR	Year for linking to HCUP records