

Generating State-Level Quality Indicators by Community Income Quartile and Race/Ethnicity from Healthcare Cost and Utilization Project (HCUP) Data

The Agency for Healthcare Research and Quality (AHRQ) presented only national-level Quality Indicators (QIs) in the 2008 National Healthcare Disparities Report (NHDR); that is, state-level estimates of health care disparities based on QIs were not provided. Given the varied distribution of race, ethnicity, and socioeconomic groups across states, policymakers increasingly want to know if and how quality of care varies for these different populations. This document describes how state-level QIs by race/ethnicity and community income quartile were generated for the 2008 State Snapshots, a derivative product of the National Healthcare Quality Report (NHQR) and the NHDR.

Data from the 2005 State Inpatient Databases (SID), developed and maintained by the Healthcare Cost and Utilization Project (HCUP), were used to create individual state-specific disparities analysis files that were designed to provide estimates for the Focus on Disparities in the State Snapshots Website (<http://statesnapshots.ahrq.gov>). The SID contain a *census* of hospitals (with all of their discharges) from 37 participating States. All 37 data sources are listed in Table A1 at the end of this document. Of these, 23 HCUP States report race/ethnicity of patients.

The AHRQ QIs were applied to the HCUP SID to create 14 state-level measures consisting of selected Prevention Quality Indicators (PQIs) and Pediatric Quality Indicators (PDIs) by race/ethnicity and community income quartile. In general, the following steps were taken to produce the state-level rates: 1) QI software review and modification, 2) acquisition of population-based data, 3) selection of states, 4) assignment of values to HCUP data, 5) selection and weighting of HCUP hospitals, and 6) identification of statistical methods.

- 1. QI Software Review and Modification.** For the state-level estimates, we started with the potentially preventable hospitalization measures in PQI Version 3.1 and PDI Version 3.1a. These include the following QIs:

QI No.	Description
Prevention Quality Indicators	
PQI 1	Admissions for diabetes with short-term complications
PQI 3	Admissions for diabetes with long-term complications
PQI 5	Admissions for chronic obstructive pulmonary disease (COPD)
PQI 7	Admissions for hypertension
PQI 8	Admissions for congestive heart failure
PQI 11	Bacterial pneumonia admissions
PQI 13	Admissions for angina without procedure
PQI 14	Admissions for uncontrolled diabetes without complications
PQI 15	Adult asthma admissions, age 18 years and older
PQI 15b	Adult asthma admissions, age 65 years and older
PQI 16	Lower extremity amputations among patients with diabetes

QI No.	Description
PQI 18	Admissions for immunization-preventable influenza
Pediatric Quality Indicators	
PDI 14	Pediatric asthma admissions, age 2 years to 17 years
PDI 15	Admissions for diabetes with short-term complications, age 6 years to 17 years

Although each of these software modules was developed for State and hospital-level rates, some changes to the QI software were necessary to accommodate the additional reporting categories (i.e., race/ethnicity, median income quartile) for the weighted HCUP data.

2. **Acquisition of Population-Based Data.** The next step was to acquire data for the numerator and denominator populations for the selected QIs, which are area-based measures. For the numerator counts of the AHRQ QIs, we used HCUP data selected from the SID for each state-specific disparities analysis file. We identified Claritas as the source of denominator counts as well as data for risk adjustment and information about income. Claritas provides ZIP-Code-level population counts by age, gender, and race, in addition to the median household income. We redistributed into single race categories any portion of the population that is characterized as being of two or more race/ethnicities.
3. **Selection of States.** State-specific disparities files for generating QIs by community income quartile were created for 35 of the 37 states contributing HCUP data in 2005 that agreed to participate in state-level reporting by income group. Because race/ethnicity is a pivotal measure for the NHDR, the creation of state-specific disparities files for generating QIs by race/ethnicity was limited to the 22 of the 23 States that provide information on patient race and Hispanic ethnicity to HCUP and agreed to participate in state-level reporting by race and ethnicity. Additional steps, described below, were taken in an effort to overcome irregularities with race/ethnicity coding in the 23 states.
4. **Assignment of Values to HCUP Data.** The following issues regarding major data elements relevant to the disparities analysis had to be resolved before proceeding with certain other data preparations or applying the QI algorithms:
 - *Standardize Hispanic Ethnicity Coding Across States.* When a State and its hospitals collect Hispanic ethnicity separately from race, HCUP uses Hispanic ethnicity to override any other race category.
 - *Impute for Missing Race/Ethnicity and Other Characteristics.* Because the PQIs and PDIs selected for this report are area-level measures that use total state population in the denominator, minimizing the loss of discharges from the numerator for the QI calculation is critical to producing unbiased QI rates. For missing race, we used a “hot deck” imputation method (which draws donors from strata of similar patients within the same hospital) to assign values while preserving the variance within the data. In all but three States, no more than 7 percent of discharges started out with missing race values. We also used this imputation method for missing age, gender, and ZIP Code data that occurred on a small proportion of discharge records.
 - *Assign Additional Measures for Reporting.* We used an HCUP data element that assigns national quartiles for median household income based on the 2005 Claritas ZIP Code-level data. In 2005, the first community income quartile (“low-income communities”) includes patients who resided in ZIP Codes with median annual

household income of \$36,999 and below. Cut-offs for the second and third community income quartiles are \$45,999 and \$60,999, respectively.

5. **Selection and Weighting of HCUP Hospitals.** Before applying the QI algorithms, the HCUP SID were further modified to create state-specific disparities analysis files that were consistent across States.
- *Subset to Community Hospitals.* We selected community hospitals and eliminated rehabilitation hospitals from the SID, retaining non-resident discharges. Rehabilitation hospitals are excluded because the completeness of reporting for rehabilitation hospitals was inconsistent across States and because they represent different types of patients than other community hospitals.
 - *Calculate Weights for Community Income Analysis.* Because some statewide data organizations do not report data for all community hospitals in the State, state estimates were calculated by weighting hospitals in the SID to the State's universe of community, non-rehabilitation hospitals in the American Hospital Association (AHA) Annual Survey Database based on hospital characteristics including region, urban-rural designation, teaching status, control, and bed size. Discharge weights from sampled hospitals operating for the entire year, but not contributing data for one or more quarters, were adjusted to produce annual estimates for that institution.
 - *Calculate Weights for Race-Ethnicity Analysis.* A second set of weights was needed for the 23 state-specific disparities files used for generating QIs by race/ethnicity. We first selected hospitals whose original coding of patient race-ethnicity (i.e. before imputations for missing data) was not "suspect" and eliminated other hospitals where the quality of the race-ethnicity reporting was suspicious. The same four criteria for exclusion of hospitals with suspect race coding were applied as when creating the national disparities analysis file (see "Preparation of HCUP Data and Development of the Disparities Analysis File" in main report for details). Hospitals in 17 of the 23 States with race/ethnicity data were eliminated due to suspect race coding. Six States had no hospitals with suspect race coding. Overall, less than 6 percent of hospitals and 4 percent of discharges were excluded. The table below indicates the reason for excluding hospitals and their associated discharges from the state-level disparities analysis files. Except in a few instances, hospitals in a state were most often excluded because substantial shares of discharges were coded as "other" or "missing" race. We calculated discharge-level weights to account for hospitals excluded because of suspect race coding, community hospitals not reported in the SID, and missing quarters of data.

State-level Disparities Analysis Files for Race/Ethnicity	Excluded for any reason	Percent of Total	Excluded because >30% discharges are "other" race	Excluded because >50% discharges are "missing" race	Excluded because all discharges are White, other or missing	Excluded because all discharges are White and hospital has >50 beds
Total number of hospitals excluded	148	6%	61	62	25	0
Total number of discharges excluded	856,159	4%	328,009	515,946	12,204	0

6. **Statistical Methods.** Identification of statistical issues included age-gender adjustment for the PQIs and PDIs and derivation of standard errors and appropriate hypothesis tests (see main report for more detail on statistical methods).

State-level information on community income quartile and race/ethnicity is presented as relative rates in the State Snapshots. For reporting by community income, the age-gender adjusted rate for the lowest income communities (quartile 1) is divided by the age-gender adjusted rate for the highest income communities (quartile 4). For race/ethnicity, the minority adjusted rate is divided by the adjusted rate for Non-Hispanic Whites. Groups within a state that are reported as having different rates from each other have a p-value of less than 0.05 and a difference in QI values of at least 10 percent. States that are reported as having different rates than the U.S. have a difference in relative rate values of at least 10 percent.

Table A1. Sources of HCUP Data for the 2008 NHDR

State	Data Source
Arizona*	Arizona Department of Health Services
Arkansas*	Arkansas Department of Health
California*	Office of Statewide Health Planning and Development
Colorado*	Colorado Hospital Association
Connecticut*	Connecticut Hospital Association
Florida*	Florida Agency for Health Care Administration
Georgia*	Georgia Hospital Association
Hawaii*	Hawaii Health Information Corporation
Illinois	Illinois Department of Public Health
Indiana	Indiana Hospital Association
Iowa	Iowa Hospital Association
Kansas*	Kansas Hospital Association
Kentucky	Kentucky Cabinet for Health and Family Services
Maryland*	Health Services Cost Review Commission
Massachusetts*	Division of Health Care Finance and Policy
Michigan*	Michigan Health & Hospital Association
Minnesota	Minnesota Hospital Association
Missouri*	Hospital Industry Data Institute
Nebraska	Nebraska Hospital Association
Nevada	Nevada Department of Health and Human Services
New Hampshire*	New Hampshire Department of Health & Human Services
New Jersey*	New Jersey Department of Health and Senior Services
New York*	New York State Department of Health
North Carolina	North Carolina Department of Health and Human Services
Ohio	Ohio Hospital Association
Oklahoma*	Oklahoma State Department of Health
Oregon	Oregon Association of Hospitals and Health Systems
Rhode Island*	Rhode Island Department of Health
South Carolina*	South Carolina State Budget & Control Board
South Dakota	South Dakota Association of Healthcare Organizations
Tennessee*	Tennessee Hospital Association
Texas*	Texas Department of State Health Services
Utah	Office of Health Care Statistics, Utah Department of Health
Vermont*	Vermont Association of Hospitals and Health Systems
Washington	Washington State Department of Health
West Virginia	West Virginia Health Care Authority
Wisconsin*	Wisconsin Department of Health and Family Services

* Indicates that data source reports race/ethnicity for discharges.