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INTRODUCTION

The mission of the Agency for Healthcare Research and Quality (AHRQ) is to produce evidence to make health care safer, higher quality, more accessible, equitable, and affordable, and to work with the U.S. Department of Health and Human Services (HHS) and with other partners to make sure that the evidence is understood and used.

AHRQ promotes health care quality improvement by conducting and supporting health services research that develops and presents scientific evidence regarding all aspects of health care. Health services research addresses issues of organization, delivery, financing, utilization, patient and provider behavior, quality, outcomes, effectiveness, and cost. AHRQ develops the knowledge, tools, and data needed to improve the health care system and help Americans, health care professionals, and policymakers make informed health decisions.

The AHRQ-sponsored Healthcare Cost and Utilization Project (HCUP, pronounced “H-Cup”) is a vital resource, helping the Agency achieve its research agenda and thereby furthering its goal of improving the delivery of health care in the United States.

AHRQ releases the HCUP Annual Activities Report each spring to describe HCUP accomplishments in the previous year and to detail current plans for the upcoming year. This report is intended to inform HCUP Partners about project activities and ways in which HCUP data currently are used.

HEALTHCARE COST AND UTILIZATION PROJECT

In 2017, AHRQ completed the final year of its HCUP five-year plan and executed a new contract which will carry HCUP forward from 2018–2022. The scope of the HCUP builds on and maintains a strong foundation of valuable data, useful analytic tools, and important partnerships with State data organizations, hospital associations, and private data organizations.

HCUP’s objectives are to accomplish the following:

- Create and enhance a powerful source of national, State, and all-payer health care data.
- Produce a broad set of software tools and products to facilitate the use of HCUP and other administrative data.
- Enrich a collaborative partnership with statewide data organizations aimed at increasing the quality and use of health care data.
- Conduct and translate research to inform decisionmaking and improve health care delivery.

The current plan focuses on the following strategies to increase the impact of HCUP:

- Maintain a strong core while enhancing data tools and measures.
- Improve the value of HCUP by producing and disseminating information derived from the data.
- Explore additional data and linkages that would enable HCUP to examine a wider set of health care encounters.
- Place greater emphasis on and capacity for research analyses that use the breadth and depth of HCUP data to explore the impact of changes in health policy on health care.
- Emphasize the importance of data partnerships.
- Expand outpatient data.

AHRQ continued to hold HCUP Partners Meetings via Webinar on a quarterly schedule in 2017. Partners were invited to provide input regarding their priorities, to suggest possible changes for the project, and to discuss current data activities in their organizations. AHRQ shared challenges and accomplishments of the project as well as upcoming plans and initiatives. Many interesting topics were reported, such as using HCUP data to increase understanding of utilization for mental health, patient identifiers and Medicare Access and CHIP Reauthorization Act (MACRA), HCUP Partners’ access to Electronic Healthcare Records (EHRs), and Linking All Payer Claims Data (APCD) with hospital discharge data. In 2018, AHRQ will continue the HCUP Partners Meetings by Webinar. Notes from the HCUP Partners Meetings are available on the password-protected Partners section of the HCUP-US Web site: www.hcup-us.ahrq.gov/login.jsp. AHRQ places great value on Partner input and will continue to seek Partner guidance on the use and development of HCUP data.

**Overview of the HCUP Project**

HCUP develops and maintains health care databases, related software tools, support services, and products created through a Federal-State-Industry partnership and sponsored by AHRQ. HCUP databases are derived from administrative data and contain encounter-level, clinical and nonclinical information including all-listed diagnoses and procedures, discharge status, patient demographics, and charges for all patients, regardless of payer (e.g., Medicare, Medicaid, private insurance, and the uninsured), beginning in 1988. These databases enable research on a broad range of health policy issues, including cost and quality of health services, medical practice patterns, access to health care programs, and outcomes of treatments at the national, State, and local market levels.

The HCUP databases are based on the data collection efforts of organizations in participating States that maintain statewide data systems, and are developed in partnership with organizations (referred to as “HCUP Partners”) and AHRQ.

Note that the HCUP databases were revised to include ICD-10-CM/PCS codes beginning with October 2015. To alert users to the change, the file structure differs from the annual files for earlier years. The nationwide and State databases for 2015 include a combination of nine months with ICD-9-CM codes (January 1 – September 30) and three months with ICD-10-CM/PCS codes (October 1 – December 31).

**HCUP Partner Participation by Data Type**

The current status of States participating in HCUP data collection and a description of the types of data they provide are displayed in the map below.
HCUP databases include the following:

- **National (Nationwide) Inpatient Sample (NIS)** is the largest publicly available, all-payer inpatient health care database in the United States, yielding national estimates of inpatient stays. Beginning with the 2012 data year, the National Inpatient Sample (NIS) was redesigned to improve national estimates. It contains a sample of inpatient discharges equal to approximately 20 percent of the total discharges from U.S. community hospitals, representing more than 97 percent of the U.S. population. The NIS contains information on all patients, regardless of payer, including individuals covered by Medicare, Medicaid, private insurance, and the uninsured.

- **Kids’ Inpatient Database (KID)** is the only all-payer database for children in the United States. The KID contains a nationwide sample of pediatric inpatient discharges for patients younger than 21 years of age and is generally produced every three years. The next KID will be available for 2016, after the transition from ICD-9-CM codes, and will be comprised of ICD-10-CM/PCS data only.

- **Nationwide Emergency Department Sample (NEDS)** is the largest all-payer emergency department (ED) database in the United States. The NEDS includes discharge data on ED visits from a nationwide sample of approximately 950 hospitals each year. It captures information for both treat-and-release visits and visits resulting in a hospital admission.
Nationwide Readmissions Database (NRD) is designed to create national readmission rates. The NRD includes a sample of approximately 14 to 17 million discharges each year for discharges with and without readmissions, taken from HCUP Partners with verified patient linkage numbers. It addresses the need for nationally representative information on hospital readmissions for all ages.

State Inpatient Databases (SID) contain the universe of inpatient discharges from participating States. The data are translated into a uniform format to facilitate multi-State comparisons and analyses. Together, the SID encompass about 97 percent of all U.S. community hospital discharges.

State Ambulatory Surgery and Services Databases (SASD) include encounter-level data for ambulatory surgery and other outpatient services from hospital-owned facilities. In addition, some States provide ambulatory surgery and outpatient services from nonhospital-owned facilities.

State Emergency Department Databases (SEDD) contain data from hospital-affiliated emergency departments for visits that do not result in hospitalizations. The SEDD files include all patients, regardless of payer, providing a unique view of emergency department care in a State or in a defined market over time.

Supplemental files for use with HCUP databases include the following:

Cost-to-Charge Ratio Files (CCR Files) are hospital-level files that facilitate the conversion of inpatient total charges to total costs.

Hospital Market Structure Files (HMS Files) are hospital-level files that contain various measures of hospital market competition. These measures are aggregate and are meant to provide a broad characterization of the intensity of competition that hospitals may be facing under various definitions of market area.

Kids’ Inpatient Database Trend Weights (KID-Trend Weights) File is a discharge-level file that provides KID data users with trend weights for the 1997 KID that are calculated in the same way as the weights for the 2000 and later years of the KID.

1993-2011 NIS Trend Weights Files provide revised weights for the 1993-2011 NIS that adjust for changes in the 2012 NIS design. The trend weights were calculated in the same way as weights for the 2012 and later NIS. For trends analysis using NIS data 2011 and earlier, the revised weights should be used to make national estimates comparable to the new design beginning with 2012 data.

1993-2002 NIS Supplemental Discharge-Level Files provide both the trend weights and data elements that are consistently defined across data years to facilitate analysis using earlier years of NIS data. The files provide supplemental data elements that were not contained on the original 1993-2002 NIS files, which were added to the design in later years. The NIS trend weights are included for convenience.

Supplemental Variables for Revisit Analyses are discharge-level variables designed to facilitate analyses that track patients within a State as well as across time and hospital settings (inpatient, emergency department, and ambulatory surgery) while adhering to strict privacy guidelines. For data years 2003-2008, the revisit variables were provided in separate supplemental files. Beginning with 2009 data, the revisit variables are included in the SID, SASD, and SEDD databases and are no longer released separately.
Highlights of 2017

In 2017, HCUP focused on expanding the type and number of data projects and resources available to researchers and policymakers. Project achievements during 2017 included the following:

HCUP Contract and Project Director

- AHRQ awarded a new contract on December 27, 2017 for HCUP. Following an open competition, the 5-year contract award was made to Truven Health Analytics.
- Carol Stocks, Ph.D. was named the HCUP Project Manager and William (Bill) Freeman, Dr.P.H. was named the HCUP Project Coordinator. Jenny Schnaier will remain in close contact with HCUP as its Project Director and in her new role as Division Director.

Databases and Software Tools

- HCUP produced and released the 2015 NIS, NEDS, and NRD. The 2015 NIS, NEDS, and NRD include a combination of nine months of ICD-9-CM (January 1-September 30) and three months of ICD-10-CM-PCS codes (October 1–December 31).
- HCUP produced and released the 2015 SID, SASD, and SEDD. The 2015 SID, SASD, and SEDD include a combination of nine months of ICD-9-CM (January 1-September 30) and three months of ICD-10-CM-PCS codes (October 1–December 31).
- HCUP began creating the 2016 SID, SASD, and SEDD using revised programs that accept ICD-10-CM/PCS data.
- HCUP continued to release the State and nationwide databases via the Central Distributor. In 2017, 3,747 State databases and 3,948 nationwide databases were distributed through the HCUP Central Distributor.
- HCUP made further progress in producing timely information, using quarterly data for 2016–2017 from 22 HCUP Partners to generate projections and to identify utilization and outcome changes.
- HCUP released the 2015 Partner-approved Cost-to-Charge Ratio (CCR) Files that contain hospital-specific, cost-to-charge ratios based on all-payer inpatient cost for nearly every hospital in the corresponding NIS, KID, NRD, and SID.
- AHRQ redesigned HCUPnet—HCUP’s free, online query system. The new site has a modernized look and feel, a simplified process for querying data, fewer clicks to reach information, and more flexibility in changing the content and display of data.
- HCUP released 2013 and 2014 updates for Community Statistics on HCUPnet and continued to develop enhancements. New features include statistics for alcohol and other drug use, statistics for U.S.—Mexico border regions, and time-aggregated statistics across three years of data (to reduce the incidence of insufficient sample size).
- AHRQ made several new enhancements to HCUP Fast Stats—an online tool that provides easy access to the latest HCUP-based statistics for select State and national health information topics. AHRQ added new States, and more recent data through 2017 where available. Topics currently available in HCUP Fast Stats include the State Trends in Hospital Use by Payer; National Hospital Utilization and Costs; and Opioid-Related Hospital Use (national and State).
Reports and Analyses

- HCUP developed and released a new [ICD-10-CM/PCS Resources Page](#) on HCUP-US that summarizes key issues for researchers using HCUP and other administrative databases that include ICD-10-CM/PCS coding. This includes information about the revised file structure for 2015 HCUP databases, and guidance on analyzing outcomes that may be affected by the transition to the ICD-10-CM/PCS coding system. Several reports are available that offer HCUP recommendations for reporting trend analyses. Links are provided to other Federal or State web-related resources with information on ICD-10-CM/PCS.

- HCUP continued to produce the Statistical Briefs series on the HCUP User Support (HCUP-US) Web site, releasing 14 new Statistical Briefs. The Statistical Briefs covered topics such as trends in emergency department visits, patient characteristics of opioid-related inpatient stays and emergency department visits. Hospitalizations involving preeclampsia and eclampsia deliveries, and a comparison of all-cause 7-day and 30-day readmissions.

- AHRQ released the 2016 National Healthcare Quality and Disparities Report (QDR), which included national and State-level estimates from the 2014 HCUP data. The QDR reports are available on QRDRnet ([www.nhqnet.ahrq.gov](http://www.nhqnet.ahrq.gov)).

- AHRQ provided estimates of selected AHRQ Quality Indicator (QI) measures using 2015 HCUP data for the development of the next annual QDR, which is planned for release in early 2018.

- HCUP released five new or updated Methods Series reports. The reports covered topics such as Calculating Nationwide Readmissions Database (NRD) Variances, Feasibility Report on Redesigning the Nationwide Emergency Department Sample (NEDS), and Methods for Applying the AHRQ QIs to HCUP data for the 2016 QDR.

Presentations and Outreach

- The User Support team showcased HCUP resources via presentations, Webinars, exhibit booths, and developed 27 presentations for 11 events.

- HCUP presented two HCUP data users’ workshops for health services researchers where attendees received in-person, face-to-face training using the HCUP databases and related tools.

- HCUP hosted a two-part Webinar series on HCUP databases, products, and tools.

- AHRQ presented the HCUP Outstanding Article of the Year Award at the 2017 AcademyHealth Annual Research Meeting.

- HCUP updated two trainings from the [HCUP Online Tutorial Series](#): HCUP Privacy and DUA Course, and the HCUP Overview Course.

- HCUP released four quarterly newsletters to provide a summary of activities.

- HCUP highlighted select research studies that show interesting and important uses of data on the HCUP-US [Research Spotlights](#) page.

- HCUP provided monthly updates for HCUP-US Events and Product Release Calendars.

Partnership Activities and Resources

- AHRQ held quarterly Webinars with HCUP Partners to inform and involve Partners in the design and direction of the project. Meeting minutes, slides, and additional resources for
HCUP Partners Meetings are available on the Partner section of the HCUP-US Web site.

- HCUP presented an overview of changes to the Medicare Access and Children’s Health Insurance Program (CHIP) Reauthorization Act (MACRA) policies that may impact the ability of Partners to create patient linkage elements and offered some alternatives for patient identification using discharge records at the point of data submission.
- HCUP developed the 2015 Border Crossing Report, which provides information on the flow of patients into and out of HCUP States. The report is available on the HCUP-US Partners page.
- HCUP continued to provide Partners with technical support, software tools, and reports designed to enhance the collection and use of inpatient and outpatient data.

**Objectives for 2018**

In 2018, HCUP will continue to maintain the databases, tools, and reports as part of our commitment to ensure that HCUP remains a unique and valuable resource for health services research. We remain committed to supporting communication among HCUP Partners as well as between Partners and AHRQ. During the coming year, the project goals are to accomplish the following:

- Produce and release the 2016 NIS, KID, NEDS, and NRD.
- Complete the 2016 SID, SASD, and SEDD and begin production of 2017 State Databases as participating Partner organizations complete and release their annual or quarterly data files.
- Work with Partners to review and seek their permission for the release of a restricted-access public release Nationwide Ambulatory Surgery Sample (NASS) in 2019.
- Work with Partners to review and seek their permission to release new Emergency Department Cost-to-Charge Ratio Files (ED CCR), designed similarly to the inpatient CCRs.
- Continue to produce HCUP Statistical Briefs—a series of online reports available on the HCUP-US Web site that are designed to summarize HCUP data for policy and nontechnical audiences.
- Continue to expand the collection of quarterly data from additional HCUP Partners to produce timely information and to support HCUP Fast Stats.
- Generate estimates using HCUP data for the National Healthcare Quality and Disparities Report (QDR).
- Conduct research and analyses using HCUP data to explore the impact of changes in health policy, to analyze trends, and to evaluate structural and clinical factors on health care outcomes.
- Conduct quick turn-around analyses using HCUP data in collaboration with federal agencies and other entities to address timely health issues and monitor ongoing trends.
- Explore new types of data and entities (e.g., registry, EHI, nonhospital outpatient data) to expand and enhance the core HCUP data.
- Further enhance the Community-Level Statistics on HCUPnet by designing new maps and adding 2015 data.
- Develop enhancements to HCUP Fast Stats, including new topics, and update existing topics quarterly or annually as newer data become available.

- Update and add new HCUP Methods Series Reports that assist users with using the HCUP databases and software tools.

- Begin five new research HCUP studies: Projecting Inpatient and Emergency Department Hospital Use Following a Hurricane; Factors Related to County-Level Hot Spots for Opioid-Related Hospitalizations; Health Systems/Market Forces: Hospital Use; Evaluating Definitions of Safety-Net Hospitals and Geographic Variation in Opioid Prescriptions; and Opioid-related Hospital Stays among Neonatal and Maternal Populations.

- Communicate changes in databases, tools, and query sites to Partners and provide briefings on research studies.

**SUMMARY OF HCUP RESEARCH ACTIVITIES FOR 2017**

AHRQ conducts exploratory studies using HCUP data to examine current health research topics and to identify areas for further data refinement. The studies described in this section were in response to carefully selected topics that are consistent with the AHRQ research agenda. AHRQ develops this agenda in consultation with many agencies within the Department of Health and Human Services and with prominent health care organizations and institutions. AHRQ’s research agenda reflects current priorities and emerging policy issues.

AHRQ also consults with industry experts, public officials, and other researchers to select topics for study. Finally, AHRQ solicits advice from data organizations participating in HCUP concerning product development and research.

In addition to exploratory studies conducted by the HCUP team, HCUP produces software tools and supplemental files to further enhance the administrative databases and to improve their value and ease of use. HCUP also produces methods reports including statistics, findings, and special technical analyses aimed at communicating and disseminating information about HCUP data. Additional information about HCUP software tools, supplemental files, and data reports is provided in the HCUP Project Overview Binder.

Finally, AHRQ researchers use HCUP data to conduct their own research and to engage in collaborations intended for publication in peer-reviewed journals or disseminated through other mediums. AHRQ conducts specific studies using HCUP data in collaboration with other Federal agencies, including the Centers for Disease Control and Prevention (CDC), the Food and Drug Administration (FDA), and the Substance Abuse and Mental Health Services Administration (SAMHSA). In these instances, an AHRQ HCUP team member works with a colleague at another agency, bringing together expertise in knowledge areas and respective data resources. All collaborations using HCUP data are conducted under the supervision of the AHRQ HCUP researcher.

In 2017, AHRQ investigated numerous HCUP-related topics with the dual goals of developing data for research use and exploring health outcomes to inform policy decisions. Studies that began in 2017 or began earlier but changed significantly in 2017 are listed below. The HCUP databases used in these studies are shown in parentheses.
Studies Using State Databases

- Accountable Care Organizations and Inpatient Mortality Rates (SID)
- Estimating the Availability of Deceased Potential Organ Donors by Geographic Area (SID)
- Health Insurance for Young Adults: Eligibility and Health Capital (SID, SEDD)
- Impact of Accountable Care Organizations on In-Hospital Care (SID)
- Insurance Expansion and Hospital Emergency Department Access (SID, SEDD)
- Medicaid Accountable Care Organizations and Childbirth Outcomes (SID)
- Medicare Advantage Penetration and Hospital Costs Before and After the Affordable Care Act (SID)
- Observation Care for Nonspecific Chest Pain Results in Fewer Hospital Revisits Within 7 Days of Care: A Comparison of Emergency Department, Observation, and Inpatient Visits (SID, SASD, SEDD)
- Readmission Following Inpatient Treatment for Opioid-Related Conditions (SID, SEDD)
- State Variations in Opioid Treatment Policies: Effects on Opioid-Related Hospital Readmissions (SID, SEDD)
- Young Adults, Health Insurance Expansions and Hospital Service Utilization (SID, SEDD)

Studies Using Nationwide Databases

- U.S. Trends in Frequencies, Length of Stay, and Outcomes of Hospitalizations for Ischemic Stroke, Transient Ischemic Attack and Intracerebral Hemorrhage, 2006-2014 (NIS)

Studies Using Both Nationwide and State Databases

- Emergency Department Visits for Severe Pediatric Injuries: Effect of Hospital Trauma Level on Rate of Admissions (SID, SEDD, NIS, NEDS)
- National Healthcare Quality and Disparities Reports (QDR) Special Analyses (SID, SEDD, NIS, NEDS)
- Using the Healthcare Cost Utilization Project to Inform State Health Policy: Opportunities and Challenges (SEDD, NEDS)

Ongoing Studies

- National Healthcare Quality and Disparities Report (QDR)

Descriptions of these studies are provided below.

Studies Using State Databases

**Accountable Care Organizations and Inpatient Mortality Rates**

**Introduction:** Accountable care organizations (ACOs) have proliferated since 2011. Although primary care is the core of the ACO model, hospitals are key partners in many ACOs, because reducing inpatient costs and readmissions is crucial for achieving success. Inpatient quality indicator (IQI) mortality rates are not measures on which ACOs are explicitly accountable, but an important aspect of the ACO concept is to improve care delivery at the organizational level. It is important to know whether hospital participation in ACOs benefits not only ACO-aligned
populations but also unaligned populations on measures beyond those factored into shared savings determinations. **Methods:** Data were from the Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP) 2008–2014 State Inpatient Databases (SID) from 34 States. We obtained hospital ACO participation from the American Hospital Association (AHA) Annual Survey and from the AHA Survey of Care Systems and Payment. We studied mortality rates among Medicare patients aged 65 years or older following admissions for IQI-associated conditions: abdominal aortic aneurysm repair, coronary artery bypass grafting, acute myocardial infarction, and pneumonia. We used logistic regression modeling outcome probabilities to estimate effects of ACO participation, with hospital fixed effects, ACO participation indicators, secular time trends, and demographic covariates.

**Results:** ACO implementation was associated with reductions in the average odds of mortality among Medicare admissions for the selected conditions; however, in many cases the results were not statistically significant, which may suggest heterogeneity in effect sign and magnitude at the hospital level. Average effect magnitudes increased steadily over time for all outcomes as hospitals gained more experience with the ACO model, and effects were larger among hospitals that participated in ACOs led by the hospital or jointly led by the hospital and physician groups compared with other leadership structures. **Conclusion:** Medicare ACOs appear to improve inpatient mortality outcomes for Medicare patients despite not being explicitly tied to ACO incentives.

Eli Cutler, Ph.D., Zeynal Karaca, Ph.D., Rachel Henke, Ph.D., Michael Head, M.S., and Herbert S. Wong, Ph.D.

**Estimating the Availability of Deceased Potential Organ Donors by Geographic Area**

**Introduction:** This project sought to better identify potential organ donors to help in the evaluation of organ procurement organizations (OPO). **Methods:** Agency for Healthcare Research and Quality researchers analyzed Healthcare Cost and Utilization Project (HCUP) data to identify potential organ donors in OPOs, using methodology and identification of OPOs provided by collaborator Dr. David S. Goldberg. OPOs are 58 broad geographic areas in the United States and each OPO includes at least two hospitals, so no individual hospital was identifiable. The analysis used State Inpatient Databases (SID) for 2012 through 2015. We created a file that contained a summary count of potential organ donors by OPO to contribute to the development of methods to identify potential organ donors in the future. We ensured that there were at least 11 cases per OPO to adhere to HCUP Data Use Agreements. When there are too few cases, we collapsed OPOs to avoid violating the small cell size restrictions associated with HCUP data. Therefore, we provided 58 counts of potential donors and did not at any time share the HCUP SID data. We also provided these counts by age group (0–17, 18–39, 40–49, 50–59, 60–65, 66–74 years), but only if there were at least 11 cases in each age group within each OPO.

Anne Elixhauser, PhD., David Goldberg, M.D.

**Health Insurance for Young Adults: Eligibility and Health Capital**

**Introduction:** This study builds on work conducted in 2015 to evaluate the large-scale impact of the Affordable Care Act provision implemented midway through 2010 that compelled private insurers to allow young adults to stay on their parents’ insurance plan through age 25. We track cohorts of individuals eligible for the dependent coverage expansion (DCE) and a comparison group of ineligible cohorts to assess the impacts of the DCE on hospital utilization. We track cohorts through 2014, which allows us to assess whether the Medicaid expansion and health insurance exchanges moderated the DCE impact. Using a cohort-based study design, we also can estimate DCE impacts on cohorts after they age out of eligibility; such age-out effects can be motivated by the theory of health capital. **Methods:** Data were from the Agency for
Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP) 2008–2014 State Inpatient Databases (SID) and State Emergency Department Databases (SEDD). We used 36 States from the SID (Arizona, Arkansas, California, Colorado, Connecticut, Florida, Georgia, Hawaii, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Minnesota, Missouri, Nebraska, Nevada, New Jersey, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, West Virginia, Wisconsin, Wyoming) and 19 States from the SEDD (California, Connecticut, Florida, Georgia, Indiana, Iowa, Kansas, Kentucky, Minnesota, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, Rhode Island, South Carolina, Tennessee, and Wisconsin). HCUP data were linked with American Community Survey (ACS) population data at the State level to derive utilization rates. Outcomes included utilization rates for nonmaternal encounters, maternal encounters, behavioral health encounters, encounters for ambulatory-care-sensitive conditions, and total encounters. We used a difference-in-differences approach to examine the impact of the DCE on hospital use, comparing cohorts of patients between the ages of 20 and 25 when the DCE went into effect against a comparison group of cohorts between the ages of 27 and 33. We estimated effects over second quarter (Q2) 2010 through 2013—the initial time period after the DCE was implemented—and in 2014, after the private and State Medicaid insurance expansions. Several of the cohorts aged out of DCE eligibility during this timeframe.

Results: Relative to the comparison cohorts that never were eligible for the DCE, hospitalizations covered by private insurance were substantially higher for the DCE-eligible cohorts in the periods following DCE implementation. In our analysis of the cohort aged 21 when the DCE was implemented, effect estimates of the DCE impact for private payer inpatient utilization rates relative to private payer enrollment increased steadily over the initial DCE period, peaking at a 36 percent increase in Q2 2013 before leveling off. We found a similar pattern when analyzing the same cohort and outcome except with all-payer enrollees as the denominator, but effect estimates increased even more rapidly, peaking at 29 percent in Q2 2013 before leveling off. For the cohort aged 24 when the DCE was implemented, inpatient utilization patterns through 2012 for the privately insured were similar to those for the cohort aged 21 when the DCE was implemented. However, in 2013, when the cohort aged 24 at DCE implementation aged out of DCE eligibility, effect estimates fell to effectively zero, both with respect to private enrollment and all-payer enrollment denominators. Analyzing emergency department utilization, the DCE effects were negligible with respect to private payer enrollment denominators; with respect to all-payer enrollment denominators, DCE effects increased gradually, although the relative sizes of the increases were somewhat smaller for emergency department utilization than they were for inpatient utilization. For the cohort aged 21 when the DCE went into effect, DCE effect estimates fell below zero following age-out. Comparing all payer results for those aging out of the DCE to those who were never eligible for the DCE showed declines in ambulatory-care-sensitive conditions.

Conclusion: The DCE was associated with a large increase in privately insured hospitalizations. This increase likely was due to new individuals taking up private coverage. Upon gaining coverage, these newly insured individuals likely used hospital services more frequently than those already enrolled. Our findings do not support the “pent-up demand” hypothesis, which anticipated a jump in utilization upon gaining coverage before falling back down to a stable level. All-payer results showed limited support for the health capital effect.

Teresa B. Gibson, Ph.D., Zeynal Karaca, Ph.D., Michael Dworsky, Ph.D., Eli Cutler, Ph.D., Brian J. Moore, Ph.D., Richele Benevent, M.S., and Herbert S. Wong, Ph.D.

Impact of Accountable Care Organizations on In-Hospital Care

Introduction: The purpose of this study is to examine the impact of accountable care organizations (ACOs) on the cost and quality of hospital care. Methods: We used data from the
Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP) 2008–2015 State Inpatient Databases (SID). As of August 2015, nine States with SID data had launched Medicaid ACO programs: Colorado, Iowa, Illinois, Maine, Minnesota, New Jersey, Oregon, Utah, and Vermont. We reviewed program descriptions to identify and confirm the States or counties within States to include, and we focused our analyses on three geographic areas in which a Medicaid ACO program had been implemented. Maternal and neonatal outcomes from three States (Colorado, Oregon, and New Jersey) implementing Medicaid ACO programs were compared with three adjacent States without these models (New Mexico, Washington, and New York). We linked HCUP discharge data with American Hospital Association Annual Survey data to obtain hospital characteristics. Cost-to-charge ratios were derived from Centers for Medicare & Medicaid Services (CMS) hospital cost reports. We obtained price inflation data from the Bureau of Economic Analysis and county characteristics from the Area Health Resources Files. Kaiser Family Foundation had information about income eligibility limits for pregnant women. We obtained details about ACO program implementation from online documentation released by State Medicaid agencies as well as information compiled by the Center for Health Care Strategies. Following use of a coarsened exact matching approach to filter the sample to comparable discharges from the ACO and non-ACO States, difference-in-differences regression models were estimated to study Medicaid ACO impacts on rates of infant mortality, neonatal intensive care unit utilization, low birthweight, uncomplicated Cesarean section (C-section) delivery, and severe maternal morbidity, as well as cost per birth. **Results:** On average, Medicaid ACOs were associated with a $535 reduction in cost per birth (p=0.01). Medicaid ACOs were associated with an estimated 0.31 percentage point reduction in C-section probability on average, although this result was not statistically significant (p=0.38). Medicaid ACOs were associated with a 0.41 percentage point reduction in the probability of severe maternal morbidity in Colorado (p<0.05) and a 1.0 percentage point increase in neonatal intensive care unit usage (p=0.38), although the latter estimate was not statistically significant. In addition, Medicaid ACOs were associated with a 0.74 percentage point increase in the probability of low birthweight (p=0.04).

Teresa B. Gibson, Ph.D., Rachel Henke, Ph.D., Chapin White, Ph.D., Eli Cutler, Ph.D., Michael Head, M.S., Herbert S. Wong, Ph.D., and Zeynal Karaca, Ph.D.

**Insurance Expansion: Hospital and Emergency Department Access**

**Introduction:** This project investigates how the Affordable Care Act has affected hospitalizations among newly insured patients. The analysts will use the average distance patients traveled to the hospital to determine whether the expansion of insurance changed the hospitals the patients visited. **Methods:** Hospital inpatient and State emergency department data will be drawn from the Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP) 2010–2014 State Inpatient Databases (SID) and State Emergency Department Databases (SEDD). Data will come from 28 States: Arizona, California, Connecticut, Florida, Georgia, Hawaii, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Massachusetts, Minnesota, Missouri, Nebraska, Nevada, New Jersey, New York, North Dakota, Ohio, Rhode Island, South Carolina, South Dakota, Tennessee, Utah, Vermont, and Wisconsin. Craig Garthwaite, Ph.D., Tal Gross, Ph.D., Matthew Notowidigdo, Ph.D., and Zeynal Karaca, Ph.D.

**Medicaid Accountable Care Organizations and Childbirth Outcomes**

**Introduction:** States and providers have started to pursue accountable care organization (ACO) contracts for Medicaid beneficiaries. Many Medicaid enrollees are pregnant women, some of whom have mental health conditions and substance use disorders that require intensive services. ACOs have the flexibility to invest in novel and cost-effective prenatal care
programs that address social determinants, such as group prenatal care programs that are oriented toward preventing premature births and improving maternal outcomes. This study analyzes the impact of Medicaid ACOs on maternal and neonatal outcomes. **Methods:** We used SID data between 2008 and the third quarter of 2015 from Colorado, Oregon, and New Jersey, which implemented Medicaid ACO programs, as well as SID data from New Mexico, Washington, and New York, which did not implement these programs. Following use of a coarsened exact matching approach to filter the sample to comparable discharges from the ACO and non-ACO States, difference-in-differences regressions were deployed to study Medicaid ACO impacts on rates of infant mortality, neonatal intensive care unit utilization, low birthweight, uncomplicated Cesarean section (C-section) delivery, and severe maternal morbidity, as well as on cost per birth. **Results:** Medicaid ACOs were associated with an estimated 0.31 percentage point reduction in C-section probability on average, although this result was not statistically significant. Medicaid ACOs were associated with a 0.41 percentage point reduction in the probability of severe maternal morbidity in Colorado. On average, Medicaid ACOs were associated with an estimated $535 reduction in cost per birth, 1.0 percentage point increase in neonatal intensive care unit usage (although the latter estimate was not statistically significant), and a 0.74 percentage point increase in the probability of low birthweight. **Conclusion:** For the most part, Medicaid ACOs appear to be more successful at reducing childbirth costs than improving birth outcomes. However, the uncovered association between Medicaid ACOs and increased rates of low birthweight may suggest that Medicaid ACOs have improved prenatal care, resulting in more fetuses surviving to birth but being born preterm. Despite having leadership and funding to support new initiatives, Medicaid ACOs still face challenges, including lack of provider engagement and information systems that do not communicate.

Rachel Henke, Ph.D., Zeynal Karaca, Ph.D., Eli Cutler, Ph.D., Michael Head, M.S., Chapin White, Ph.D., Teresa B. Gibson, Ph.D., and Herbert S. Wong, Ph.D.

**Medicare Advantage Penetration and Hospital Costs Before and After the Affordable Care Act**

**Introduction:** The Medicare Advantage (MA) program has expanded dramatically since 2000, now covering approximately 30 percent of all Medicare beneficiaries. For this study, we examined the relationship between MA enrollment rates and overall utilization (e.g., hospital admission and readmission rates, types of hospitalizations, and associated costs) before and after implementation of the major provisions in the Affordable Care Act that affected the MA program. We compared data from MA, traditional Medicare, and overall Medicare beneficiaries aged 65 years and older, and from non-Medicare beneficiaries aged 45–64 years. We also stratified analyses by urgent vs nonurgent admissions. **Methods:** We used Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID) data spanning 2005–2014 from 14 States that differentiated between TM and MA: California, Connecticut, Florida, Georgia, Iowa, Massachusetts, Michigan, New Jersey, Nevada, New York, Ohio, Rhode Island, Tennessee, and Wisconsin. We calculated MA enrollment rates for 2004–2013 from the Centers for Medicare & Medicaid Services (CMS) Denominator File combined with publicly available enrollment by plan type data. Other data sources included Nielsen/Claritas population data, Census Bureau Small Area Health Insurance Estimates (SAHIE), Bureau of Labor Statistics (BLS) unemployment data, and Bureau of Economic Analysis (BEA) Gross Domestic Product (GDP) deflator data. We estimated longitudinal models using lagged MA enrollment (per capita or percent) as the key predictor of overall Medicare utilization, allowing its effect to differ before and after 2011, when the major Affordable Care Act provisions affecting the MA program went into effect. We used county-level fixed effects to control for time-invariant area characteristics. The primary outcome measure
was cost per capita within each study population, which can be decomposed into the following components: discharges per capita, diagnosis-related group (DRG) intensity weight per discharge, and cost per DRG intensity weight. These constituent measures also were modeled. All models controlled for time-varying, county-level characteristics, including demographic composition, uninsurance rate, and unemployment rate. **Results:** A 10 percent increase in MA penetration was associated with a 2-percentage point decrease in inpatient cost per Medicare enrollee. This effect was more prominent in nonurgent admissions and diminished after the Affordable Care Act. **Conclusion:** Results suggest that MA enrollment growth is no longer associated with spillover reductions in hospital admission costs after the Affordable Care Act. Future research should examine whether spillover effects still are observed in outpatient settings.

Rachel Henke, Ph.D., Zeynal Karaca, Ph.D., Teresa B. Gibson, Ph.D., Eli Cutler, Ph.D., Chapin White, Ph.D., and Herbert S. Wong, Ph.D.

**Observation Care for Nonspecific Chest Pain Results in Fewer Hospital Revisits Within 7 Days of Care: A Comparison of Emergency Department, Observation, and Inpatient Visits**

**Introduction:** Patients with nonspecific chest pain increasingly receive care in outpatient observation services rather than being admitted to the hospital. Our objective was to describe risk-adjusted, 7-day revisit rates among patients who receive hospital-based care for nonspecific chest pain, and to compare revisit rates after index observation visits with rates after index emergency department (ED) and index inpatient visits. **Methods:** We used 2013 and 2014 data from the Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID), State Emergency Department Databases (SEDD), and State Ambulatory Surgery and Services Databases (SASD) from 10 States (Georgia, Iowa, Maryland, Nebraska, Nevada, South Carolina, South Dakota, Tennessee, Vermont, and Wisconsin). Using logistic regression models, we derived risk-adjusted, 7-day revisit rates for index visits for ED, observation, and inpatient care, and then compared rates across ED, observation, and inpatient index visits by primary expected payer and by the diagnosis at the revisit. **Results:** Of 1,005,866 index visits, 86,692 were followed by revisits within 7 days. Risk-adjusted revisit rates following an index observation visit (6.5 percent) were significantly lower than revisit rates following index ED visits (9.7 percent, p<0.001) and index inpatient visits (7.7 percent, p<0.001). Revisits for acute coronary syndromes were rare (0.3 percent to 0.5 percent of index visits), whereas revisits for nonspecific chest pain and conditions potentially associated with chest pain were common (4.7 percent to 7.2 percent of index visits), irrespective of the type of index visit. Revisit rates were lower after index observation visits than after index ED and inpatient visits with and without adjustment, across payer populations, for acute coronary syndromes, and for nonspecific chest pain and conditions potentially associated with chest pain. The team currently is deciding on a journal for submission.

Grant R. Martsolf, Ph.D., M.P.H, R.N., Katie Fingar, Ph.D., M.P.H, Marguerite L. Barrett, M.S., Carol Stocks, Ph.D., R.N., Pamela L. Owens, Ph.D., H. Joanna Jiang, Ph.D., and Teryl Nuckols, M.D., M.S.H.S.

**Readmission Following Inpatient Treatment for Opioid-Related Conditions**

**Introduction:** Previous research suggests that relatively few hospitalized patients with opioid-related conditions receive substance use treatment during their inpatient stay. Without treatment, these individuals may be more likely to have subsequent hospitalizations for continued opioid use disorder and resulting physical health problems. **Objective:** To evaluate the relationship between inpatient drug detoxification and/or rehabilitation treatment and subsequent opioid-related readmission. **Methods:** We used hospital inpatient discharge and
emergency department (ED) visit data from community hospitals in California, Florida, Hawaii, Massachusetts, New York, South Carolina, and Tennessee from the Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP). We used encrypted patient linkage numbers to link hospitalization records from the 2010–2013 State Inpatient Databases (SID) and ED visit records from the State Emergency Department Databases (SEDD) so that there was only one episode of care per person during the study period. Results: A relatively small percentage (19.4 percent) of patients with identified opioid-related conditions received treatment for drug use during their hospital inpatient stay: 16.0 percent received drug detoxification services, 1.6 percent received drug rehabilitation services, and 1.8 percent received combined drug detoxification and rehabilitation services. Controlling for sociodemographic, clinical, and hospital factors, patients who received drug rehabilitation but not drug detoxification during an opioid-related index hospitalization had lower odds of an opioid-related readmission within 90 days of discharge (odds ratio=0.60; 95% confidence interval=0.54–0.67) compared with patients with no inpatient drug detoxification or rehabilitation treatment. Conclusions: Our findings indicate that receipt of drug rehabilitation services in acute care hospitals is associated with a lower 90-day readmission rate. Further research is needed to understand whether this result is due to the treatment per se or to the sociodemographic or clinical characteristics of patients who receive rehabilitation.

Janice Blanchard, M.D., Ph.D., Audrey J. Weiss, Ph.D., Marguerite L. Barrett, M.S., Carol Stocks, Ph.D., R.N., Pamela L. Owens, Ph.D., Rosanna M. Coffey, Ph.D., and Kevin C. Heslin, Ph.D.

State Variations in Opioid Treatment Policies: Effects on Opioid-Related Hospital Readmissions

Objectives: The objective of this study was to evaluate the relationship between the presence of State opioid treatment policies—naloxone standing orders, Good Samaritan laws, and Medicaid medication-assisted treatment (MAT) coverage—and opioid-related hospital readmissions. Methods: We used inpatient discharge data from nonfederal community hospitals in Arkansas, California, Florida, Georgia, Iowa, Maryland, Massachusetts, Nebraska, Nevada, New York, Tennessee, Vermont, and Wisconsin from the Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP). We used encrypted patient linkage numbers to link records from the 2013, 2014, and 2015 (quarters 1 through 3) HCUP State Inpatient Databases (SID) during the study period. We examined the relationship between State opioid treatment policies and 90-day opioid-related readmissions after a stay involving an opioid diagnosis. Results: Our sample included 383,334 opioid-related index hospitalizations. Patients treated in States with naloxone standing-order policies at the time of the index stay had higher adjusted odds of an opioid-related readmission than did those treated in States without such policies; however, this relationship was not present in States with Good Samaritan laws. Medicaid methadone coverage was associated with higher odds of readmission among all insurance groups except Medicaid. Medicaid MAT coverage generosity was associated with higher odds of readmission among the Medicaid group but lower odds of readmission among the Medicare and privately insured groups. Control variables—coverage of more comprehensive substance use disorder treatment services for Medicaid enrollees and for more opioid treatment programs—were associated with lower odds of readmission. Conclusion: Differences in index hospitalization rates suggest that States with opioid treatment policies had a higher level of need for opioid-related intervention, which also may account for higher rates of readmission. More research is needed to understand how these policies can be most effective in influencing acute care use.

Janice Blanchard, M.D., Ph.D., Audrey J. Weiss, Ph.D., Marguerite L. Barrett, M.S., Kimberly McDermott, Ph.D., and Kevin C. Heslin, Ph.D.
**Young Adults, Health Insurance Expansions and Hospital Service Utilization**

**Introduction:** This study builds on work conducted in 2015 to evaluate the large-scale impact of the Affordable Care Act provision implemented midway through 2010 that compelled private insurers to allow young adults to stay on their parents’ insurance plan through age 25. With more data years available, we are better positioned to assess the longer-term impacts of this dependent coverage expansion (DCE) on hospital utilization, including assessing whether the DCE impact was moderated by the Medicaid expansion and health insurance exchange implementations in 2014. **Methods:** Data were from the Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP) 2008–2014 State Inpatient Databases (SID) and State Emergency Department Databases (SEDD). We used 36 States from the SID (Arizona, Arkansas, California, Colorado, Connecticut, Florida, Georgia, Hawaii, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Minnesota, Missouri, Nebraska, Nevada, New Jersey, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, West Virginia, Wisconsin, Wyoming) and 19 States from the SEDD (California, Connecticut, Florida, Georgia, Indiana, Iowa, Kansas, Kentucky, Minnesota, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, Rhode Island, South Carolina, Tennessee, and Wisconsin). HCUP data were linked with American Community Survey (ACS) population data at the State level to derive utilization rates. Outcomes included utilization rates for nonmaternal encounters, maternal encounters, behavioral health encounters, encounters for ambulatory-care-sensitive conditions, and total encounters. We used a difference-in-differences approach to examine the impact of the DCE on hospital use, comparing patients between the ages of 20 and 25 when the DCE went into effect against a comparison group of patients between the ages of 27 and 33 when the DCE went into effect. We estimated effects over second quarter 2010 through 2013—the initial time period after the DCE was implemented—and in 2014, after the private and State Medicaid insurance expansions. **Results:** We found the DCE to be associated with a 1.5 percent increase in all-payer inpatient discharges. In 2014, after the State expansions, the all-payer discharge rate increased by 1.6 percent for the DCE-eligible group relative to the comparison group. Medicaid discharge rates declined in the DCE period, with most reductions exceeding 9 percent. Medicaid discharge rates also declined in 2014, but to a lesser degree. In the DCE period, private discharges for all conditions rose, and in 2014, private discharge rates increased by smaller magnitudes. **Conclusion:** The major trends we observed during the DCE time period included a shift toward private visits and discharges, a shift away from Medicaid visits and discharges, and significantly lower rates of uninsured visits and discharges. These trends shifted after the State expansions in 2014: Medicaid expansion States experienced much higher adjusted utilization rates for Medicaid visits and discharges and large declines in the uninsured. The DCE impact on private insurance appeared to have persisted into 2014. The smaller impact of the DCE on this group may be due to increased access to other sources of private insurance from the exchanges for the comparison age group and to increased access to Medicaid for the comparison group in expansion States.

*Teresa B. Gibson, Ph.D., Zeynal Karaca, Ph.D., Gary Pickens, Ph.D., Michael Dworsky, Ph.D., Eli Cutler, Ph.D., Brian J. Moore, Ph.D., Richele Benevent, M.S., and Herbert S. Wong, Ph.D.*
Studies Using Nationwide Databases


Introduction: Differentiating a transient ischemic attack (TIA) from an ischemic stroke (IS) has progressed from using time-based to tissue-based criteria. The impact of this change on observed hospital rates is unknown. We tracked nationwide trends in inpatient discharge volumes, population-based rates, and inpatient outcomes for TIAs and ISs. Corresponding data on intracerebral hemorrhages (ICHs) were used to put TIA and IS results into perspective.

Methods: The Agency for Healthcare Research and Quality Healthcare Cost and Utilization Project (HCUP) captures administrative data on all-payer inpatient discharges from a sampling frame now exceeding 4,000 non-Federal U.S. acute-care hospitals. The annual National Inpatient Sample (NIS) samples 20 percent of HCUP discharges. We used NIS 2006–2014 data from HCUP’s on-line query system to generate nationwide data for individuals aged 18 years and older with International Classification of Diseases, Ninth Revision, Clinical Modification principal discharge diagnosis codes for IS (433.XX-434.XX), TIA (435.XX), and ICH (431.XX). Results: IS volumes (rates) rose from 392,790 cases (174.9/100,000 population) in 2006 to 475,085 (193.7/100,000 in 2014. Rates rose for individuals aged 18–44 and 45–64 but declined for individuals aged 65–84 and 85+ years. The overall mean length of stay (LOS) fell from 6.0 to 4.9 days. Inpatient mortality fell from 5.8 percent to 4.4 percent. Overall TIA frequencies fell from 186,105 cases (82.9/100,000) in 2006 to 132,375 (54.0/100,000) in 2014. Overall, TIA LOS and mortality fell from 2.8 days and 0.18 percent, respectively, in 2006 to 2.3 days and 0.15 percent in 2014. For both IS and TIA, patterns of LOS and mortality varied by age group. Concurrent ICH rates fell from 27.9 to 26.2 cases/100,000. Rates fell for individuals aged 65–84 and 85+ years but essentially were unchanged in younger patients. Overall ICH LOS and mortality fell from 8.1 days and 27.5 percent, respectively, in 2006 to 7.6 days and 24.1 percent in 2014. Conclusions: Observed patterns of frequencies and outcomes for IS, TIA, and ICH hospitalizations only partially support the hypothesis that changing TIA diagnostic criteria shifted cases from the TIA to the IS category. Identifying the impact of this change in criteria requires examination of encounter-level data.

Darryl Gray, M.D., Sc.D., Anne McLeod, D.N.P., Chinagozi Ugwu, M.P.H., and James Burke, M.D, M.S.

Studies Using Both Nationwide and State Databases

Emergency Department Visits for Severe Pediatric Injuries: Effect of Hospital Trauma Level on Rate of Admissions

Introduction: The purpose of this study was to address two broad research questions related to pediatric injuries: (1) What are the demographic, clinical, and insurance characteristics of emergency department (ED) visits for severe pediatric injuries in the United States? (2) How does a hospital’s trauma level affect its overall rate of admissions through the ED, transfer patterns, mortality rate, and/or follow-up care? Methods: We used the Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP) 2005–2014 Nationwide Emergency Department Sample (NEDS), National (Nationwide) Inpatient Sample (NIS), State Inpatient Databases (SID), and State Emergency Department Databases (SEDD). The events of interest included pediatric ED visits and inpatient stays for severe injury, such as traumatic brain injuries, spinal injuries, and fractures for children aged 15 years and younger (excluding newborns). This work was funded via an interagency agreement with the Health Services Research and Administration (HRSA) Bureau’s Emergency Medical Services for Children (EMSC) Program. Results are forthcoming.

Pamela L. Owens, Ph.D. and Marguerite L. Barrett, M.S.
National Healthcare Quality and Disparities Report (QDR) Special Analyses

In support of the National Healthcare Quality and Disparities Report (QDR), various Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization (HCUP) databases are being used for special analyses that are directed by AHRQ.

In 2017, we published three manuscripts:

  - This study used 2009 State Inpatient Databases (SID) data for 11 States to examine the association between managed care and inpatient mortality for four common inpatient conditions: acute myocardial infarction, stroke, pneumonia, and congestive heart failure. Privately insured patients in managed care plans had better outcomes than those in fee-for-service plans. Patients in Medicare managed care had outcomes similar to those in Medicare fee-for-service plans.

  - This study used 2009 and 2012 SID and State Emergency Department Databases (SEDD) data from 31 States. The authors examined whether older adults with a traumatic head injury were less likely to receive initial treatment at a trauma center before and after introduction of the revised field triage guidelines. Between 2009 and 2012, the likelihood of trauma center care increased for all age groups. However, trauma center care still was less likely for adults aged 45 years and older than for younger adults.

  - This study used 2004–2013 SID data to describe trends in sepsis-related hospitalizations and in-hospital mortality rates by race/ethnicity. During the study period, sepsis hospitalizations for all racial/ethnic groups increased, and mortality rates decreased. However, mortality rates adjusted for patient characteristics were higher for all minority groups than for white patients. Hospital characteristics contributed to higher rates of sepsis mortality for black and Hispanic patients.

Ernest Moy, M.D., M.P.H., Kevin C. Heslin, Ph.D., Karen Chaves, M.H.S., Rosanna M. Coffey, Ph.D., Marguerite L. Barrett, M.S., Katie Fingar, Ph.D., M.P.H., Susan O. Raetzman, M.S.P.H., Thomas J. Flottemesch, Ph.D., Jenna Jones, Ph.D., Brian J. Moore, Ph.D., and Anika L. Hines, Ph.D., M.P.H.

Using the Healthcare Cost Utilization Project to Inform State Health Policy: Opportunities and Challenges

Research and policy analysts seeking to understand the changing health care environment increasingly are turning to the State and national databases of the Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP). These discharge-level databases contain diverse data to help answer important policy questions,
particularly at the State level. In general, statewide databases include nearly the census of discharge-level encounters from community hospitals in States that participate in HCUP. Nationwide databases involve complex sampling of discharges from the statewide databases. HCUP data can be used to address specific objectives that are consistent with the databases’ design. The specific database choice is an important analytic consideration that often is misunderstood. Choosing a database that is less than ideal for the research question at hand and the analytic methods deployed may produce misleading inference. This study will provide an overview of the HCUP databases with particular attention to the objectives, strengths, and limitations of their different classes. It also will provide specific guidance on database selection in the context of State health policy research.

Michel Boudreaux, Ph.D., Sharon Long, Ph.D., and Zeynal Karaca, Ph.D.

Ongoing Studies

National Healthcare Quality and Disparities Report (QDR)

Since 2003, the Agency for Healthcare Research and Quality (AHRQ) has produced congressionally mandated reports each year on health care quality and disparities for vulnerable populations in the United States. The National Healthcare Quality and Disparities Report (QDR) includes information from the AHRQ Healthcare Cost and Utilization Project (HCUP) and from numerous other organizations, including the Centers for Disease Control and Prevention (CDC), the National Center for Health Statistics (NCHS), and the Centers for Medicare & Medicaid Services (CMS).

The QDR provides a comprehensive overview of the quality of health care received by the general population and disparities in care experienced by different racial, ethnic, and socioeconomic groups. Information on individual measures is available through chartbooks, which are posted monthly.

The QDR measures and tracks trends in quality and disparities in seven key areas of health care: access to health care, patient safety, person-centered care, care coordination, effective treatment, healthy living, and care affordability. A focus on priority populations summarizes quality and disparities in care for populations at elevated risk for receiving poor health care. This section includes HCUP-based measures related to racial, ethnic, and socioeconomic factors for priority populations as well as changes over time and across the urban-rural continuum.

The 2017 QDR (to be released in 2018) will include national estimates of the AHRQ Quality Indicators (AHRQ QI™) version 4.4, for data years 2000–2015 and State-level estimates for data years 2004 and 2011–2015. For the national estimates in 2013–2015, HCUP created a nationally weighted analysis file from the State Inpatient Databases (SID). The sampling design (sample of hospitals) was similar to the 2012 Nationwide Inpatient Sample (NIS) and was used to report national estimates by various patient characteristics (e.g., age, sex, race/ethnicity, community income, expected payer, urban-rural location of the patient’s residence) and hospital characteristics (e.g., region, ownership, teaching status, urban-rural location). National QI estimates for years prior to 2013 were derived using the NIS. Individual SID were used for reporting State-level estimates of the AHRQ QIs overall and by race/ethnicity, expected payer, and community income. State-level rates are reported only for HCUP Partners that have volunteered previously to participate in the report and for new participants.

AHRQ disseminates the QDR information through the AHRQ Web site at www.ahrq.gov/research/findings/nhqrdr/index.html. There also is an integrated Web site at
www.nhqnet.ahrq.gov that provides a single access point to the QDR data, including State-specific information (i.e., the State Snapshots and a query tool for accessing the underlying data).

Marguerite L. Barrett, M.S., Kevin C. Heslin, Ph.D., and Karen Chaves, M.H.S.

NEW STUDIES PLANNED FOR 2018

Studies Using State Databases

- Evaluating Definitions of Safety-Net Hospitals (SID, SEDD)
- Evaluation of the Impact of New Adult PCV13 Recommendation on Community-Acquired Pneumonia Hospitalizations in the United States (SID)
- Factors Associated With Preeclampsia and Eclampsia Among Delivery Hospitalizations in the United States (SID)
- Factors Related to County-Level Hot Spots for Opioid-Related Hospitalizations (SID, SEDD)
- Hospitalization Burden and Vaccination Studies of Influenza and Respiratory Syncytial Virus (SID)
- Impact of Vertical Integration on Hospital Utilization (SID, SEDD)
- Neonatal Abstinence Syndrome (SID)
- Projecting Inpatient and Emergency Department Hospital Use Following a Hurricane (SID, SEDD)
- Spatial Transmission Dynamics and Environmental Drivers of Influenza and Respiratory Syncytial Virus (SID)
- Variation of Risk-Adjusted Patient Safety Indicators for Hospital Inpatient Care Across Payer Categories, 2013–2014 (SID)

Descriptions for these studies are provided below. The databases used in these studies are shown in parentheses above.

Studies Using State Databases

Evaluating Definitions of Safety-Net Hospitals

Introduction: Understanding the empirical implications of different definitions of safety-net hospitals (SNHs) will help guide government decisions concerning SNH funding. It is important for policymakers to know how many hospitals in their jurisdiction are designated as SNHs under various definitions, and whether the hospitals that are designated as SNHs are serving the communities that they are expected to serve. A recent report suggested that Disproportionate Share Hospital (DSH) payments, which help hospitals cover the cost of charity care, may not always align with hospitals with high levels of uncompensated care that also provide essential services to low-income and vulnerable populations. Objective: The proposed study will identify alternative SNH definitions and test the agreement among these definitions. Overarching goals of the study are to identify a core set of hospitals that meet the designation of an SNH across multiple definitions and to answer two broad questions: what are the distinguishing characteristics of this core group of SNHs, and what is their financial situation? To accomplish these goals, the study has three specific aims. First, we will catalog common conceptual definitions of SNHs and analyze agreement among them. Second, we will evaluate HCUP source-of-payment data in defining SNHs, using Medicare Cost Reports for comparison. Finally, we will assess the associations between different SNH definitions and hospitals’ characteristics and financial viability (e.g., total and operating margins, receipt of DSH.
payments). **Methods:** This study will use the 2014–2015 Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID) for validation of HCUP source-of-payment coding and for analyzing alternate SNH definitions. Medicare Cost Reports for 2014–2015 will be used for comparison and merged with HCUP data at the hospital level. American Hospital Association Annual Survey data will be used to obtain hospital characteristics.

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**Evaluation of the Impact of New Adult PCV13 Recommendation on Community-Acquired Pneumonia Hospitalizations in the United States**

Following the introduction of the 7 valent-pneumococcal conjugate vaccine (PCV7) into the routine childhood immunization schedule in 2000, declines in pneumonia hospitalization rates were seen among children younger than 2 years as well as among older age groups because of indirect vaccine effects. In 2010, PCV7 was replaced by PCV13, which includes six additional serotypes. An initial study from the first 2 years following PCV13 introduction suggests that there was a further decline in pneumonia hospitalizations among children younger than 2 years. However, *Streptococcus pneumoniae* (pneumococcus) remains an important cause of community-acquired pneumonia (CAP) in adults. According to a U.S. multicenter pneumonia etiology study conducted a decade after PCV7 introduction and several years after PCV13 introduction in children, pneumococcus is the leading cause of CAP bacterial pneumonia among adults. The goals of this study are (1) to evaluate the effect of the 2014 PCV13 recommendation for adults on CAP hospitalizations, pneumococcal pneumonia, and invasive pneumococcal disease among adults aged 65 years and older, and (2) to assess cost effectiveness of 2014 PCV13 recommendation in adults. The outcomes of interest for this project will be all-cause CAP hospitalizations, pneumococcal pneumonia hospitalizations without invasive disease, and invasive pneumococcal disease.

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**Factors Associated With Preeclampsia and Eclampsia Among Delivery Hospitalizations in the United States**

**Background:** A recent analysis of Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP) data provided descriptive information about the epidemiology of preeclampsia/eclampsia among inpatient deliveries. Results showed that in 2014, almost 5 percent of all inpatient deliveries in the United States involved preeclampsia/eclampsia—a 21 percent increase from 2005. Preeclampsia/eclampsia rates for Black women were 60 percent higher than for White women, and Black women were more likely to have a severe diagnosis. Age, socioeconomic status, and geographic region also were associated with preeclampsia/eclampsia. In addition, severe obstetric morbidities and adverse fetal outcomes were more common among deliveries involving preeclampsia/eclampsia than among other deliveries. Additional information can be found in HCUP Statistical Brief #222. More research is needed to examine the independent associations between sociodemographic and clinical characteristics and preeclampsia/eclampsia. **Purpose:** The proposed study will expand on the previous analysis by conducting bivariate and multivariable analyses to examine associations between selected maternal characteristics and preeclampsia/eclampsia as well as other related maternal and fetal outcomes, while controlling for relevant variables available in the HCUP dataset.
Factors Related to County-Level Hot Spots for Opioid-Related Hospitalizations

Introduction: Although the rising rate of opioid abuse and misuse is a national issue, research has demonstrated drastic geographic variation in patterns of opioid use, opioid-related overdose, and opioid-related hospital use. Understanding the community-level factors that characterize opioid “hot spots” and “not spots” can help guide policymakers’ efforts to address the opioid epidemic. Objectives: Identify opioid hot spot counties in the United States as defined by opioid-related hospitalization rate, define patterns of county-level factors strongly associated with opioid hot spots, and estimate the impact of changes to these factors (via policy levers) on opioid-related hospitalizations in high-need areas. Methods: To determine county-level opioid-related hospitalization rates, we will use hospital inpatient discharge and emergency department visit data from the 2013–2015 Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID) and State Emergency Department Databases (SEDD) for 31 states: Arizona, Arkansas, California, Connecticut, Florida, Georgia, Hawaii, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Minnesota, Missouri, Nebraska, Nevada, New Jersey, New York, North Carolina, North Dakota, Ohio, Rhode Island, South Carolina, South Dakota, Tennessee, Utah, Vermont, and Wisconsin. We then will examine how county-level factors are associated with opioid-related hospitalization rates to identify the strongest factors driving these rates. We will consider a variety of county characteristics, such as prescription opioid supply, social and economic factors, and treatment and recovery options. Finally, we will apply predictive analytic techniques to estimate what would happen to a hot spot county’s opioid-related hospitalization rate if the county made changes to certain key factors.

Hospitalization Burden and Vaccination Studies of Influenza and Respiratory Syncytial Virus

Immune imprinting relates to the lifelong persistence of immunity associated with the first encounter with influenza virus in childhood, a phenomenon, which has major implications for development of a universal influenza vaccine. With recent progress in the development of a respiratory syncytial virus (RSV) vaccine, it has become key to estimate the age-specific burden of this disease and seasonality of epidemics, in an effort to guide future United States vaccination efforts. The purpose of this research is explore how immune imprinting affects vaccine benefits by age cohorts using the Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID). The SID dataset also provides a unique opportunity to explore the burden of respiratory syncytial virus and associated impact on asthma in children and on chronic obstructive pulmonary disease and heart diseases in adults. These analyses will help project the expected benefits of a vaccine program in the United States.

Impact of Vertical Integration on Hospital Utilization

Introduction: The continuing waves of mergers, acquisitions, and vertical integration between hospitals, physicians, and other providers, as well as integration among insurers, create concerns about the effects of changes in market competition on the consumer, on payers, and
on health and health care utilization and outcomes. High levels of market concentration could limit competition, increase prices, and limit access to providers, with a potential effect on quality of care, costs, and outcomes. **Objective:** The objective of this study is to understand how vertical integration between hospital systems and physician practices impacts hospital services utilization and outcomes. The Centers for Medicare & Medicaid Services (CMS) has implemented reforms such as accountable care organizations and bundled payment models that have led to vertical integration. Because the government can take actions that influence vertical integration, it is important to understand the ramifications of leaning on these policy levers.

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**Neonatal Abstinence Syndrome**

**Introduction:** Neonatal abstinence syndrome (NAS) is characterized by withdrawal symptoms caused by abrupt cessation of illicit or prescription substances at birth. NAS is most commonly caused by maternal use of opioids, either illicitly or as part of pain management or substance use disorder treatment. NAS has increased five-fold from 2000 to 2012 in parallel with increases in drug and opioid overdose deaths. In recent years States have enacted a range of policies to combat the opioid crisis, but there has been little focus on identifying policies or other policy-related factors that may reduce NAS. **Objective:** In this study we will identify discharge-, county-, and State-level factors that are associated with higher rates of NAS, and may also identify those factors that have been associated with a reduction in the rate of NAS over time. **Methods:** We will utilize data from the HCUP State Inpatient Databases (SID) to identify births with a diagnosis of NAS out of all birth hospitalizations. The years of analysis and data sources containing county- and State-level factors have yet to be defined. **Results:** TBD.

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**Projecting Inpatient and Emergency Department Hospital Use Following a Hurricane**

**Introduction:** Estimates of increased hospital utilization after a natural disaster such as a hurricane are important for preparing disaster recovery teams. Condition- and age-specific estimates provide information about which communities will need additional pediatricians, cardiologists, or other physician specialties. These estimates also help identify which communities may need temporary clinics to handle the expected overflow of patients. **Methods:** In 2017, the Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP) team developed a heuristic approach to estimate the impacts of two hurricanes on subsequent hospital utilization: Hurricane Harvey in Texas and Hurricane Irma in Florida. Specifically, the HCUP State Inpatient Databases (SID) were used to calculate historical changes in hospital utilization one month after hurricanes in the same area (i.e., Hurricane Ike in Texas and Hurricanes Frances and Wilma in Florida). The monthly changes after these hurricanes were calculated by county, age groups (pediatric, adults younger than 65 years, and adults aged 65 years and older), and select conditions. In most cases, increases in hospital utilization were estimated. These estimated increases then were applied to current SID to estimate the impact of Hurricanes Harvey and Irma. As a follow-up to this analysis, the HCUP team will develop a predictive modeling approach for estimating a hurricane’s impact on hospital utilization for up to 12 months after landfall. Predictors will include HCUP data pulled from time periods that coincide with several historical U.S. hurricanes as well as supplemental information on available health care services, storm attributes, geographic characteristics of the area, and community characteristics.
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Spatial Transmission Dynamics and Environmental Drivers of Influenza and Respiratory Syncytial Virus

Immune imprinting relates to the lifelong persistence of immunity associated with the first encounter with influenza virus in childhood, a phenomenon, which has major implications for development of a universal influenza vaccine. With recent progress in the development of a respiratory syncytial virus (RSV) vaccine, it has become key to estimate the age-specific burden of this disease and seasonality of epidemics, in an effort to guide future United States vaccination efforts. Our work so far has focused on the period before the 2009 pandemic. Analysis of Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID) data at the county level would provide a unique opportunity to address this question and confirm or infirm our counter-intuitive findings of earlier influenza onsets in the Southern United States. A more detailed study at the county level would also provide a clearer picture of the environmental forces driving RSV dynamics, help refine existing RSV transmission models, and provide more accurate projections of vaccine effects.

Cecile Viboud, Ph.D., Zeynal Karaca, Ph.D

Variation of Risk-Adjusted Patient Safety Indicators for Hospital Inpatient Care Across Payer Categories, 2013–2014

Objective: The primary goal of this study was to compare rates of 10 Agency for Healthcare Research and Quality (AHRQ) Patient Safety Indicators (PSIs) and hospital rankings for a Patient Safety and Adverse Events composite score (PSI 90) across all-payer, Medicare, Medicaid, and privately insured categories. Methods: The most recent International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) PSI technical specifications (v6.0.2) use present on admission [POA] data for secondary diagnosis, as well as methods suggested from past research and implemented by clinical and statistical experts with review by the National Quality Forum. We separately calculated risk-adjusted rates (RARs) and the PSI 90 composite score by payer group for each hospital. We compared the hospital PSI 90 scores and the hospital rankings across payer groups. Data were from adult inpatient stays in 2013 and 2014 in over 3,228 qualifying hospitals from AHRQ Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID) from 36 states. Principal Findings: Across the large sample of hospitals for 10 PSIs, all differences in RARs between pairs of payer groups were significant (P < .001), but only four of the 30 comparisons were more than 5 percent different (range, 5 percent to 10.5 percent). A modest correlation was evident in pairwise comparisons of hospital PSI 90 scores by payer populations (Medicare vs. privately insured, Medicare vs. Medicaid, privately insured vs. Medicaid) (r < .52, P < .0001). Hospital ranking based on PSI 90 scores differed across payer groups. For example, 22 percent of hospitals were ranked in the top two quintiles using discharges billed to private insurance and ranked in the worst two quintiles using discharges billed to Medicare.

Rhona Limcangco, Ph.D., Bernard Friedman, Ph.D., Pamela L. Owens, Ph.D.

Using HCUP Data in Conjunction with Other Data Sources

To enhance the value of Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (HCUP) data as a research tool, AHRQ supplements the HCUP databases with information about hospital and community characteristics obtained from Partner-approved and other external sources. AHRQ conducts this data augmentation for three
reasons: (1) to supplement information available to AHRQ intramural researchers and their contractors on specific, approved research projects; (2) to create derivative data elements for the externally released State and Nationwide Databases; and (3) to add supplementary data elements for the externally released State and Nationwide Databases. These types of linkages leverage other data sources, thus increasing the value of HCUP data for research.

AHRQ releases two hospital-level HCUP Supplemental Files based on external data that are designed to augment the data elements in the National Inpatient Sample (NIS), Kids' Inpatient Database (KID), Nationwide Readmissions Database (NRD), and State Inpatient Databases (SID). The HCUP Cost-to-Charge Ratio Files (CCR Files) provide a conversion between the total charge information (representing the amount hospitals billed for services) and the cost for hospital services. CCR File measures, which are developed using Centers for Medicare & Medicaid Services (CMS) Hospital Cost Report data, are available at the hospital level.

The HCUP Hospital Market Structure Files (HMS Files) contain various measures of hospital market competition. These measures are available at the hospital level and are developed using data from the American Hospital Association (AHA) Annual Survey of Hospitals Database, Area Health Resource File (AHRF), linkage to urban/rural indicators, and ZIP-Code data based on longitude and latitude for calculations of distance and travel times. Data for a State’s hospitals are included in the CCR and HMS Files at the discretion of the participating data organization. Beginning with 2012 data, the HMS Files are no longer linkable to the national inpatient databases – the NIS and KID files. HMS Files are not available for the NRD.

The following descriptions provide a sample of the protocols used to link HCUP data to other data files.

American Community Survey

The U.S. Census Bureau’s American Community Survey is linked to HCUP data by ZIP code information to obtain population estimates in a given ZIP code by insurance status and federal poverty level.

American Hospital Association

Annual linkage of the AHA Annual Survey of Hospitals Database to HCUP data is necessary for the creation of the HCUP databases. HCUP uses the AHA data for three principal purposes: (1) to obtain characteristics of the hospitals for intramural research; (2) to add hospital characteristics to restricted-access, public release data; and (3) to sample and weight hospital discharges for the NIS, NEDS, NRD, and KID.

1. HCUP develops a separate AHA file for intramural research that contains basic institutional characteristics such as size, ownership, teaching status, location, utilization, finance, and personnel. A “crosswalk” file is developed to link the State’s hospital identifier to the AHA identifier, which also links the HCUP and AHA data sets. This linkage of supplemental hospital characteristics to HCUP databases greatly enriches the discharge data for intramural research at AHRQ.

2. HCUP adds hospital information from the AHA Annual Survey Database to the NIS, NEDS, NRD, and KID. Hospital identifiers have never been included in the NEDS or NRD, but prior to 2012 data when permitted by the data organizations, the NIS and KID included the AHA hospital identifier, hospital name, and address. Beginning with 2012 data, hospital identifiers, name, and address are no longer included in the NIS or KID. AHA hospital identifiers are included on the Central Distributor State Databases when
permitted by the data organizations. Use of the data for approved research purposes is permitted, such as linking to other institutional information from non-HCUP data sets for analysis and aggregate statistical reporting. However, users of any HCUP data are prohibited from identifying individual facilities directly or by inference in disseminated material. This restriction is listed in all HCUP Data Use Agreements (DUAs). In addition, users of the data must not contact establishments directly concerning data in the HCUP databases.

3. HCUP creates the NIS, KID, and NRD sampling frames from all community, nonrehabilitation hospitals in the SID. The NEDS sampling frame includes hospital-owned EDs for which both SEDD and SID data are available. Information on hospital characteristics was provided in the AHA Annual Survey Database. To obtain national estimates, HCUP develops discharge weights using information from the AHA Annual Survey of Hospitals Database. Beginning with 2012 data, the NIS contains a sample of approximately 20 percent of inpatient discharges from all community, nonrehabilitation hospitals participating in HCUP. The NEDS contains all emergency department (ED) visits from a stratified sample representing 20 percent of hospital-owned EDs in U.S. community, nonrehabilitation hospitals. The NRD contains a sample of discharges for patients treated at community nonrehabilitation hospitals in States where verified patient linkage numbers are available.

The AHA’s Hospital Information Technology Database is a supplement to the American Hospital Association (AHA) Annual Survey of Hospitals. The AHA Annual Survey IT Database, formerly called the Hospital Electronic Health Record (EHR) Adoption Database, contains current information on healthcare technology adoption and indicators in response to the HITECH Act in terms of clinical documentation, lab reports and test results, computerized provider order entry, and decision support and bar coding. The database also pinpoints where in the hospital these functions are implemented. These data can be linked to the HCUP databases by the AHA hospital identifier. The results help users understand the capabilities of the hospitals’ EHR systems, and they reveal the major and minor barriers to implementation. The databases include only those hospitals that respond to the supplemental information technology survey.

The American Hospital Association (AHA) Survey of Care Systems and Payment is a supplement to the American Hospital Association (AHA) Annual Survey of Hospitals Database. All U.S. community hospitals are invited to participate in the Survey. In addition, responses are gathered from non-hospital organizations, such as payers. This database allows hospitals and researchers to track and monitor the evolution of new systems of care, including Accountable Care Organizations (ACO), Patient-Centered Medical Homes, clinically integrated networks, and other systems innovations. These data can be linked to the HCUP databases by the AHA hospital identifier. Databases enhanced with this information facilitates research on a variety of policy-relevant issues such as: identifying which types of hospitals are engaged in new care models; ascertaining current and expected payment structures; understanding current care coordination models; and recognizing risk arrangements, governance, and physician arrangements.

Bureau of Economic Analysis (BEA)

Bureau of Economic Analysis (BEA) Gross Domestic Product (GDP) deflator data is used to adjust HCUP cost data for inflation. The GDP deflator is a measure of the level of prices of all new, domestically produced, final goods and services in an economy. GDP is the total value of all final goods and services produced within that economy during a specified period.
Bureau of Labor Statistics (BLS)

The Bureau of Labor Statistics (BLS) of the U.S. Department of Labor is the principal federal agency responsible for measuring labor market activity, working conditions, and price changes in the economy. The BLS is used in conjunction with HCUP data to determine unemployment rates for a given area.

CDC Wonder Web site – Bridged-Race Population Estimate

Bridged-Race Population Estimates are produced by the U.S. Census Bureau in collaboration with the National Center for Health Statistics (NCHS) and released by NCHS. This data bridges 31 race categories accounted for in the 2000 Census down to the four race categories in the 1977 Census. These population estimates are used to calculate rates with HCUP NIS race variables.

Centers for Medicare & Medicaid Services

Using hospital identifiers, AHRQ links the cost information obtained from the Centers for Medicare & Medicaid Services (CMS) Hospital Cost Report data files, which are collected by CMS, to the intramural HCUP data to create the annual HCUP Cost-to-Charge Ratio Files (CCR Files). The HCUP CCR Files are hospital-level files that enable the conversion of charges into costs for nearly every hospital in the corresponding NIS, SID, NRD, or KID.

The CMS Hospital Compare tool provides information about the quality of care for over 4,000 Medicare-certified hospitals in the United States. Using the tool, AHRQ examines the role of various hospital factors, such as nurse-to-patient ratio and surgical quality, on racial and ethnic disparities in inhospital postsurgical complications identified in HCUP data.

For certain research projects, AHRQ links county-level and hospital-level information obtained from CMS to the HCUP data. County-level databases contain such information as the number of beneficiaries in the county, the number of beneficiaries by type of plan coverage, and the area wage index. These data are linked to the discharge files using the patient’s or hospital’s county. Hospital-level files maintained by CMS include the Medicare Cost Reports, area wage index, and case-mix index. These data are linked using the hospital identifier. The State’s hospital identifier is crosswalked to the identifier on the AHA Annual Survey of Hospitals Database, which contains the Medicare hospital identifier.

The CMS Medicare Hospital Service Area File (HSAF) is used for the community-level statistics initiative to estimate the impact of missing hospitals on HCUP community-level statistics. The HSAF identifies counties with incomplete data. It provides the universe of Medicare discharges in the United States and contains the patient’s residential ZIP Code, Medicare provider identification number (ID), and a sum of patient discharges, days, and charges for all Medicare patients. Capture rates computed from the HSAF and SID allowed HCUP to examine several thresholds for suppression of county information that is due to missing hospitals in the SID.

The CMS Denominator File, CMS County to core Based Statistical Area (CBSA) Crosswalk, CMS Medicare Provider Analysis and Review (MedPAR) Hospital File, and the CMS National Physician Fee Schedule Relative Value File data sources are also used in HCUP studies.

Children’s Hospital Association (formerly National Association of Children’s Hospitals and Related Institutions)
During the construction of the KID, the AHA hospital identifier is used to link this database to a list of children’s hospitals provided to AHRQ by the Children’s Hospital Association. The Children’s Hospital Association data are used to help identify children’s hospitals and to determine the teaching status of these facilities.

**Dartmouth Atlas of Care – Hospital Market Definitions (Hospital Service Area)**

AHRQ uses the Hospital Market Definitions (Hospital Service Area) from Dartmouth Atlas of Health Care to compare hospital markets. This information helps map geographic areas to hospital markets to determine which ZIP variables are most appropriate to use when using the HCUP data.

**Decision Resources Group (DRG) Managed Market Surveyor (formerly HealthLeaders–Interstudy Managed Market Surveyor County Database)**

The Managed Market Surveyor Database, contains State, county-level, and Metropolitan Statistical Area (MSA) enrollment in managed care plans, including health maintenance organization (HMO) and preferred provider organization (PPO) penetration. For specific projects, AHRQ links this database to HCUP data at the county level on the basis of the hospital’s location.

**Environmental Files**

AHRQ links county-level data to HCUP county-level hospitalization and emergency department data using two external data sets: (1) weather station data maintained by the National Oceanic and Atmospheric Administration (NOAA); (2) modeled data covering the entire county from the North American Land Data Assimilation System (NLDAS), which is obtained from the National Aeronautics and Space Administration (NASA); (3) disaster declaration information from the Federal Emergency Management Agency (FEMA).

The Aerometric Information Retrieval System (AIRS) is the largest database documenting air pollutant concentrations across the country. This database is maintained by the United States Environmental Protection Agency (EPA). For some research projects, AHRQ links nationwide air pollutant data from the AIRS to HCUP nationwide hospitalization data using admission data and patient ZIP code.

**Healthcare Information and Management Systems Society (HIMSS) Analytics © Database**

The HIMSS Analytics® Database provides information on health IT adoption. HIMSS Analytics, a subsidiary of the Healthcare Information and Management Systems Society, annually surveys a sample of U.S. non-Federal hospitals affiliated with integrated health care delivery systems (IHDSs). The HIMSS data include information about the extent of electronic medical records functionality, which is reflected in a score from 0 to 7. This database was used with the HCUP SID and SEDD to track Health Information Exchanges and other information technology variables.

**Health Resources and Services Administration Products**

Researchers may enhance the analytic capabilities of HCUP by using the Area Health Resource File (AHRF), a publicly available database developed by the Health Resources and Services Administration (HRSA) Bureau of Health Professions. The AHRF contains county-level statistics on health care professions, hospitals and health care facilities, and population and environmental classifications. The AHRF county-level data can be linked to the HCUP...
databases to provide additional information such as demographic data on the hospital’s county or patient’s county of residence. The AHRF is not part of the HCUP databases; researchers are required to obtain the AHRF separately.

The HRSA Data Warehouse (HDW) integrates data with various external sources, enabling researchers to collect relevant and meaningful information on health care programs and the associated populations they serve. For some research projects, AHRQ links primary care service area (PCSA) data from the HDW—which contains nationwide data on U.S. primary health care resources, populations, and utilizations—with patient PCSA-level data in the HCUP SID.

**Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) Survey**

HCAHPS patient survey responses at U.S. hospitals are aggregated for each hospital and reported publicly by the Centers for Medicare and Medicaid Services (CMS) on their Hospital Compare Web site starting March 2008. AHRQ links these data with hospital-level characteristics to control for patients’ perceptions of the quality of hospitals. In these studies, AHRQ typically “controls” for the percent of patients that replied in a certain way to a particular question or group of questions by entering hospital percentages as they vary across time and hospitals in a regression model.

**Kaiser Family Foundation Web site**

The Kaiser Family Foundation (Web site) is a non-profit organization that focuses on health policy issues at the national and State level. HCUP extracted Medicaid program information by State from the Kaiser Family Foundation Web site and was used in conjunction with HCUP and other data sources to estimate changes in hospital inpatient and emergency department (ED) utilization rates, cost, and acuity by payer.

**Medicare Patient Safety Monitoring System**

For certain research projects, AHRQ enhances the analytical capabilities of HCUP by linking to the Medicare Patient Safety Monitoring System (MPSMS). MPSMS is a national surveillance project aimed at identifying the rates of specific adverse events that occur in the hospital for Medicare patients. MPSMS includes a subset of hospitals participating in the Medicare Hospital Payment Monitoring Program. The project conducts a chart abstraction of randomly selected, all-payer adult discharges. MPSMS is a de-identified, record-level database that includes information abstracted about the patient’s stay in the hospital, including health care associated injury or harm. MPSMS hospital level information can be linked to the HCUP data to provide a more robust understanding of the frequency and epidemiology of health care associated injury or harm for the inpatient population. The MPSMS hospital identifier must first be linked to the CMS Provider of Services (POS) file, which then can be crosswalked to the identifier on the AHA Annual Survey Databases and then linked to HCUP. Individual records can be linked using a probabilistic approach; linking does not identify patients because both HCUP data and the MPSMS are de-identified databases.

**Merchant Medicine**

Merchant Medicine is a research and consulting firm specializing in the field of walk-in medicine, tracks the location of all retail clinics in the United States on an ongoing basis in an effort to inform businesses specializing in walk-in medicine. The data, available starting in 2005, can also be purchased for research purposes. These data include the dates of opening and closing and geocoded addresses of all retail clinics in the United States. These data can be linked to
HCUP databases at the ZIP Code level by calculating the percentage of ED catchment areas (ZIP Codes that accounted for three-quarters of all ED visits for low-acuity conditions in the pre-study period) that overlapped with the geographic area within a 10-minute drive from a retail clinic.

**QuintilesIMS Outpatient Surgery Centers Profiling Solution**

For certain intramural research projects, AHRQ may link facility-level data from the Outpatient Surgery Centers Profiling Solution database (formerly called SDI Freestanding Outpatient Surgery Center (FOSC) database) to freestanding ambulatory surgery data in the HCUP SASD. The Outpatient Surgery Centers Profiling Solution, created by SDI (now QuintilesIMS), contains facility-level data on free-standing ambulatory care centers in the United States. Data include operational characteristics (e.g., number of operating rooms, number of physicians), surgical characteristics (e.g., types and number of surgeries performed), purchasing patterns, facility name and address, and personnel information.

**Small Area Health Insurance Estimates for Counties and States**

Census Bureau Small Area Health Insurance Estimates (SAHIE) produces and disseminates model-based estimates of health insurance coverage for counties and states. SAHIE data are included in the study of the relationship between Medicare Advantage enrollment rates and overall utilization (e.g., hospital admission and readmission rates, types of hospitalizations, and associated costs).

**SK&A Data Products**

QuintilesIMS’ SK&A Data Products provides the largest telephone-verified national dataset of 7 million profiles of health care providers and over 1 million profiles of health care organizations. The profiles include detail characteristics about individual providers and organizations, such as affiliations with health systems and Accountable Care Organizations. This supplemental database allows for analyses to understand how organizational structures and market forces influence the delivery, costs, and quality of health care.

**State Board of Medical Examiners Physician Data**

In order to understand physician practice styles for specific research, AHRQ links the HCUP SID to State-specific Board of Medical Examiners physician data in order to create files for analysis. AHRQ contacted and received permission from select State Partners to conduct this study.

**Surescripts**

Surescripts®, an e-prescribing network, links to the HCUP data by geographical market, or Hospital Referral Region (HRR). Surescripts is an e-prescription network used by the majority of all community pharmacies in the U.S. routing prescriptions, excluding closed systems such as Kaiser Permanente. This includes chain, franchise, and independently owned pharmacies. Surescripts network data exclude controlled substances.

**Trauma Information Exchange Program**

For certain intramural research projects, AHRQ may link hospital-level data from the Trauma Information Exchange Program (TIEP) to the HCUP SEDD and SID. The TIEP data are maintained by the American Trauma Society and the Johns Hopkins Center for Injury Research and Policy, which receive funding from the CDC. The database maintains a national inventory
of trauma centers in the United States and designates the trauma level (I, II, III, IV, or V). Trauma-level data are also used for the NEDS as one of the sample selection criteria and for post-stratification for weighting.

**Urban/Rural Indicators**

AHRQ also links files in the HCUP data that provide measures of the *urban character* or *rural character* of the patient’s residence or hospital’s location. This information includes the county-based Core-Based Statistical Area (CBSA), Urban Influence Code, and the Rural Urban Continuum Code. These codes are available through files maintained by the U.S. Census Bureau, the U.S. Department of Agriculture, and the Health Resources and Services Administration (HRSA). Linkages to these files are made using the patient’s county or hospital’s county. Another urban/rural measure has been developed through linkage to the ZIP Code-based Rural Urban Commuting Area (RUCA) codes available from the Washington, Wyoming, Alaska, Montana, Idaho (WWAMI) Rural Health Research Center. This linkage is made using the patient’s ZIP Code of residence or the hospital’s ZIP Code.

HCUP creates a version of the urban/rural codes through linkage to National Center for Health Statistics (NCHS) data available from the CDC. The NCHS provides county-level classifications of urban/rural location, which includes gradations of metropolitan, micropolitan, and noncore counties by population size. Population counts from the ZIP Code-level The Nielsen Company Claritas file are assigned to a county and then aggregated to the NCHS urban/rural designation. Both patient and hospital locations are reported by NCHS designation.

Any patient ZIP Code linkage would conform to Partner and Data Use Agreement (DUA) restrictions.

**U.S. Department of Housing and Urban Development (HUD)**

The U.S. Department of Housing and Urban Development Comprehensive Housing Affordability Strategy (CHAS) data which links to HCUP data at the county level. This data provides information on housing problems and housing needs, particularly for low income households.

**ZIP Code-Based and County-Based Census Data**

For database development and specific research, AHRQ links data from the U.S. Census to the HCUP intramural data to obtain additional characteristics of the patient’s community, such as the demographics, the urban or rural character, and the longitude and latitude for calculations of distance and travel times. AHRQ frequently uses the population ZIP-Code-level counts from Demographic Update Files provided by The Nielsen Company, formerly Claritas (a vendor that compiles and adds values to the U.S. Bureau of Census data).

During construction of the HCUP State Databases, AHRQ uses the patient’s ZIP Code to link to the ZIP Code-based Nielsen data to create two derived data elements representing median income categories for the patient’s ZIP Code. One data element is based on the distribution of the U.S. population; the other data element is based on the distribution of the population in the State. For each variable, the four median income categories are designed to be broad enough to protect patient confidentiality. Ultimately, no category contains fewer than two ZIP Codes in a State. The data element with the national income quartiles is included on the restricted-access, public release NIS, KID, NEDS, and NRD. ZIP-Code-based and county-based census data cannot be linked to the restricted-access public release NIS, KID, NEDS, and NRD because
neither the ZIP Code or county of the patient or hospital are included in the databases (as of 2012 data).

The U.S. Census Bureau’s ZIP Code Tabulation Area (ZCTA) is used with HCUP data for population counts of uninsured people for studies that require ZIP code information.

**HCUP Statistics provided to Agencies**

Federal and other agencies rely on AHRQ for statistics to fulfill some of their program data needs. These are usually recurring, annual requests. The table below lists the agencies to which AHRQ provided statistics in 2017, what they are used for and the statistics provided.

<table>
<thead>
<tr>
<th>Agency</th>
<th>Use</th>
<th>Description of HCUP Statistics</th>
</tr>
</thead>
</table>
| Center for Medicare & Medicaid Innovation, Department of Health and Human Services (DHSS) | Partnership for Patients (PfP) | • Readmissions to U.S. community hospitals for all conditions combined as well as specific conditions, used as benchmarks, so that clinicians and policymakers can accurately measure improvements in the rate of readmissions for patients as interventions are implemented under the Partnership-for-Patients (PfP) initiative.  
• Several measures in support of the PfP health care associated condition initiative including the maternal safety indicator.  
• Support to the active evaluation of the impact of PfP nationally.  
• Four additional Patient Safety Indicators (PSI) that go into a summary measure of Hospital-Acquired Conditions (HAC) of the PfP initiative.  
• Discharge denominator of patients receiving surgery in a U.S. hospital derived from the NIS each year and used by CDC to calculate Supplemental Social Security Income (SSI) national rate. |
<p>| Centers for Disease Control, DHHS | Million Hearts Initiative | National and State-level statistics of treated cardiovascular and cerebrovascular conditions to Million Hearts – a national initiative to prevent one million heart attacks and strokes over the next five years. Statistics are age- and sex-adjusted hospitalization rates of five conditions: acute myocardial infarction (AMI), acute stroke, AMI or acute stroke, acute cerebrovascular disease (CVD), and broad screen for CVD. |</p>
<table>
<thead>
<tr>
<th>Agency</th>
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<th>Description of HCUP Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Center for Health Statistics,</td>
<td>Health U.S. Publication</td>
<td>Mean and total all-payer costs per hospitalization for common operating room procedures using estimates from the HCUP NIS.</td>
</tr>
<tr>
<td>DHHS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| National Center for Health Statistics,     | Healthy People 2020 Publication          | • Rate of hospitalization per 100,000 population for pressure ulcers in older adults for Healthy People 2020 monitoring. The statistics are based on the HCUP NIS and are provided by age, gender, urban/rural residence.  
• Cochlear implants  
• PSI 12 (Perioperative Pulmonary Embolism and Deep Vein Thrombosis Rate) |
| DHHS                                       |                                          |                                                                                        |
| Health Resources and Services Administration, Emergency Medical Services for Children, DHHS | Aggregate tables on emergency medical services to children | Trends in the number of severely injured children treated in acute care settings, where the treatments are occurring (eg, Level I/II/III trauma centers) and the associated outcomes. Uses NEDS, NIS, SID, and SEDD. |
| Health Resources and Services Administration, Maternal and Child Health, DHHS | National Performance Measures and National Outcome Measures mandated by Title V legislation for State Block Grant Program | • Rates of hospital admission for injuries for children  
• Rates of childbirth hospitalizations with an indication of severe maternal morbidity (e.g. heart or kidney failure, stroke, embolism, hemorrhage)  
• Rates of newborn infants diagnosed with neonatal abstinence syndrome |
| Office of the Assistance Secretary for Planning and Evaluation, DHHS | Identification of systematic and substantive relationship between foster care rates and substance use | County level statistics on eight different substance use categories, from SID and SEDD, for their model |

**TECHNICAL SUPPORT TO HCUP USERS**

Users of HCUP data, software tools, and products include health services researchers, policymakers, consumers, providers, and other constituent groups. These users have varied backgrounds including public health, health policy, medicine, economics, and other social sciences. They represent a variety of sectors including academia, private industry, the media, and government.

HCUP technical support provides a bridge between the project and its users by facilitating and promoting the use of HCUP data, software tools, and products. This support is intended to increase awareness of the value of HCUP resources, educate individuals on appropriate uses of HCUP data, and showcase the myriad of potential research and policy analysis applications.
Technical support to HCUP users assists the public, government, and our HCUP Partners in the following ways:

1. Expands knowledge about HCUP via educational seminars, online tutorials, exhibit booths, presentations, and poster sessions.
2. Provides HCUP documentation on the HCUP-US Web site that includes answers to Frequently Asked Questions and detailed methods for using HCUP databases, software tools, linkable files, and HCUPnet.
3. Produces a series of descriptive and analytic HCUP reports.
4. Identifies peer-reviewed publications that use HCUP resources.
5. Maintains a catalog of available HCUP databases and products.
6. Provides online information about ordering procedures, requirements for obtaining and using HCUP databases, and methods of acquiring other HCUP products.

The HCUP-US Web site (www.hcup-us.ahrq.gov) is integral in providing technical support to HCUP users. Please refer to the HCUP Online Resources section of the HCUP Project Overview Binder for more detailed information about the Web site.

As part of technical support, the Technical Assistance team answers user questions about HCUP databases and the application of HCUP tools and products. Complex questions are answered by research personnel trained in epidemiology, health services research, statistics, economics, and medicine. Programming staff provide advice on technical issues related to HCUP data and HCUP-provided programs. The Technical Assistance team forwards specific user questions, such as media and interagency requests and high-profile inquiries, to AHRQ staff. The Technical Assistance staff may be reached through a dedicated toll-free telephone number and email address: 1-866-290-HCUP or hcup@ahrq.gov.

**TECHNICAL SUPPORT FOR HCUP PARTNERS**

HCUP is made possible through the voluntary participation of State data organizations, hospital associations, and private data organizations that have partnered with AHRQ.

In addition to the products and technical support that are available to all HCUP users, the Partners are afforded other benefits for their participation in the project. HCUP creates analytic tools, data products, and reports for Partners; provides subject-matter expertise on data issues to Partners; promotes communication and information exchange among Partners about inpatient and outpatient data collection and use; and returns complimentary copies of the HCUP databases to participating data organizations.

For more information on technical support for HCUP Partners, see the section on Benefits of Partnership provided with this Annual Activities Report.
We hope you and your affiliates find this report helpful. AHRQ values the extensive contributions of each HCUP Partner and will continue to seek Partner guidance on the use and development of HCUP data in 2018. We value and welcome your feedback and suggestions. Please contact Carol Stocks or Bill Freeman at AHRQ to share your comments or pose questions about the project.

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