



# H·CUP

HEALTHCARE COST AND UTILIZATION PROJECT

## **ANNUAL ACTIVITIES REPORT**

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## INTRODUCTION

The mission of the Agency for Healthcare Research and Quality (AHRQ) is to improve the quality, safety, efficiency, and effectiveness of health care for all Americans. AHRQ's research helps people make more informed decisions and improve the quality of health care services.

The Agency 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. This research evaluates both clinical services and the systems in which these services are provided. It also addresses both basic and applied research questions, including key aspects of individual and system behavior, as well as the application of interventions in practice settings.

The AHRQ-sponsored Healthcare Cost and Utilization Project (HCUP, pronounced “H-Cup”) is a vital resource helping the Agency achieve its research agenda, 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 the project's previous year's accomplishments and detail current plans for the upcoming year. This report is intended to inform HCUP Partners about project activities and ways in which HCUP data are currently used.

## Overview of the HCUP Project

HCUP is a family of health care databases and related software tools and products developed through a Federal-State-Industry partnership and sponsored by the Agency for Healthcare Research and Quality (AHRQ). HCUP databases would not be possible without the voluntary efforts of the HCUP “Partners”—State data organizations, hospital associations, private data organizations—and the Federal government to create a national information resource of encounter-level health care data. HCUP includes the largest collection of longitudinal hospital care data in the United States, with all-payer, encounter-level information beginning in 1988. The HCUP 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, regional, State, and local market levels.

HCUP databases include:

- **The Nationwide Inpatient Sample (NIS)** contains inpatient data from a nationwide sample of more than 1,000 hospitals.
- **The Kids' Inpatient Database (KID)** is a nationwide sample of pediatric inpatient discharges and is produced every three years.

- **The Nationwide Emergency Department Sample (NEDS)** includes data on emergency department visits from a nationwide sample of over 950 hospital-based emergency departments. The NEDS captures information for both treat-and-release visits and those resulting in a hospital admission.
- **The State Inpatient Databases (SID)** contain the universe of inpatient discharge abstracts from participating States.
- **The State Ambulatory Surgery Databases (SASD)** contain data from ambulatory care encounters from hospital-affiliated and, in some States, freestanding ambulatory surgery centers.
- **The State Emergency Department Databases (SEDD)** contain data from hospital-affiliated emergency departments for visits that do not result in hospitalizations.

## Highlights of 2011

In 2011, HCUP focused on expanding the type and number of data projects and resources available to researchers and policy makers. Project achievements during 2011 included:

- HCUP added two new HCUP Partner Organizations (Alaska and Mississippi), increasing the total number of Partners from 44 to 46 States.
- HCUP expanded the number of State ambulatory surgery databases from 29 to 30 (adding Oregon).
- HCUP produced and released the 2009 NIS, KID, and NEDS.
- HCUP created the 2010 SID, SASD, and SEDD as Partners completed and released their annual data files.
- HCUP continued to release the State databases via the Central Distributor. The Central Distributor released 53 new State databases in 2011.
- HCUP released the fifth annual HCUP Facts and Figures report, using data from the most recent releases of the NIS and NEDS.
- HCUP continued to produce the Statistical Briefs series on the HCUP User Support Website (HCUP-US), releasing 20 Statistical Briefs in 2011, covering topics such as hospital stays for patients with COPD, all-cause readmissions by payer and patient age, complications and hospitalizations related to childbirth, an update on adverse drug events, and others.
- AHRQ provided estimates from the HCUP data for the ninth annual National Healthcare Quality Report (NHQR) and the National Healthcare Disparities Report (NHDR), completed in 2011 with expected release in early 2012.
- AHRQ developed and released the State Snapshots Website using information from the eighth annual (2010) National Healthcare Quality Report (NHQR) in May 2011.
- HCUP continued to move toward the goal of producing more timely estimates, using 2010 quarterly data to generate projections and to identify utilization and outcome changes.
- HCUP completed two toolkits: A Laboratory Data Toolkit to add clinical data (lab values) to administrative data sets and a Present on Admission (POA) Indicator Toolkit to support collection and analysis of POA data.

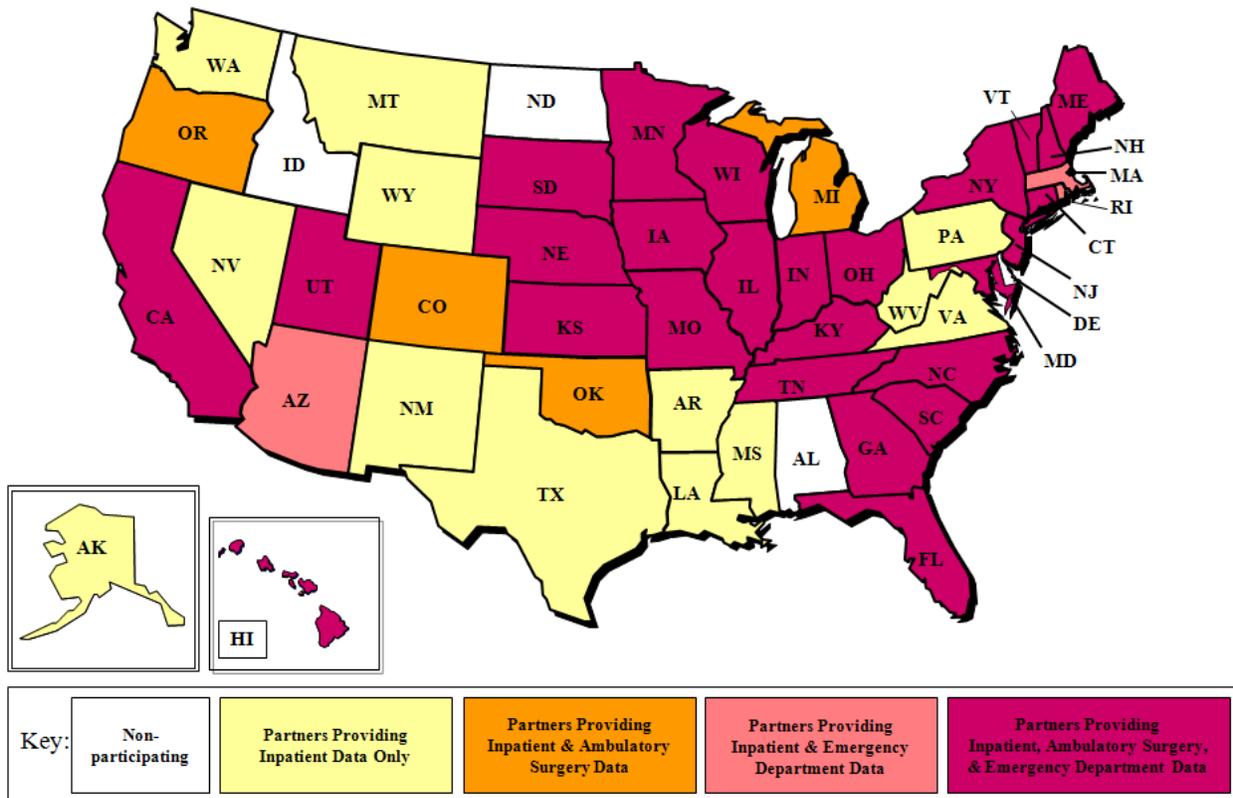
- HCUP updated *The Case for the Present on Admission Indicator*, which includes reporting requirements and related developments over the past five years.
- HCUP supported eight Partners to develop or improve unique encrypted patient numbers for use with administrative data sets and developed two encryption support tools.
- HCUP completed a report to provide information on approaches to using race/ethnicity data for reducing disparities in the quality of health and health care.
- AHRQ released MONAHRQ 2.0 (July 2011), a tool that allows organizations to input their own administrative data and generate a Website on quality and utilization of care.
- HCUP created new price-to-charge ratios to estimate the price of inpatient hospital care.
- HCUP continued to provide Partners with technical support, software tools, and reports aimed at enhancing the collection and use of both inpatient and outpatient data.

## Objectives for 2012

In 2012, HCUP will continue to expand the number of databases, tools, and reports as part of our commitment to assure 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 plans to:

- Add new HCUP Partners for data year 2011, which would increase participation to 47 or more States.
- Add ambulatory surgery databases and/or emergency department databases for data year 2011, which would increase outpatient participation to 60 or more databases.
- Complete the 2010 SID, SASD, and SEDD and begin production of 2011 State databases as participating Partner organizations complete and release their annual data files.
- Continue to produce HCUP Statistical Briefs – a series of online reports available on the HCUP-US Website that are designed to summarize HCUP data for a policy or non-technical audience.
- Release HCUP Projections – using historical inpatient data to project national estimates on health priorities for more recent time periods.
- Release MONAHRQ 3.0 and 4.0 for organizations to generate Web-based reports and summaries of health care utilization, cost, and quality measures. MONAHRQ 3.0 features integration with the latest version of WinQI, additional CMS measures for Imaging and Surgical Care, and usability enhancements. MONAHRQ 4.0 will feature separation of WinQI from MONAHRQ and enhanced reporting.
- Build on previous exploration with Partners about their capabilities for producing and providing more timely quarterly data to produce more timely information using “same-year” data.
- Release the State Ambulatory Surgery Database Evaluation Report for the 2010 data year.
- Produce and release the 2010 NIS and NEDS.

## HCUP Database Participation for 2010 Data Year



### HEALTHCARE COST AND UTILIZATION PROJECT

In 2011, AHRQ completed the final year of its HCUP five-year plan and extended the contract period for an additional year. In 2012, AHRQ will prepare for the next five-year plan, which will carry HCUP forward from 2013-2017. The scope of the current HCUP contract builds on and maintains a strong foundation of valuable data, useful analytic tools, and partnerships with hospital associations, State data organizations, and private data organizations.

HCUP's objectives are to:

- 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 five strategies to increase the impact of HCUP:

1. Maintain a strong core while enhancing data tools and measures.
2. Improve the timeliness of HCUP through information from the data, rather than the data themselves.
3. Prepare and implement a strategy for taking advantage of Electronic Health Records (EHRs) and Health Information Technology (HIT).
4. Emphasize data partnerships.
5. Expand outpatient data.

The 15<sup>th</sup> Annual Meeting of the HCUP Partners is planned for April 2012. Partners are invited to provide input regarding the priorities and changes they would like to see occur for the project. Among the input received from Partners at the 14<sup>th</sup> Annual Meeting, held in April 2011, was the need for a richer database including more clinical data, an improvement in the timeliness of data collection and database release, and better integrated data along the continuum of care. Notes from the HCUP Partners Meeting are available on the password-protected Partners Page of the HCUP-US Website (<http://www.hcup-us.ahrq.gov/login.jsp> to login and gain access to the Partners Page). AHRQ places great value on Partner input and will continue to seek Partner guidance on the use and development of HCUP data.

The HCUP Steering Committee met in September 2011. The HCUP Steering Committee, now in its fifth year, provides AHRQ the opportunity to engage a constituent group in addition to the HCUP Partners. The members have wide health care services expertise from a variety of backgrounds and represent a range of organizations and institutions. The Steering Committee assists AHRQ in identifying initiatives and opportunities for HCUP to evolve and grow. Determination of the allowable uses of the data will continue to be guided by the HCUP Partners. At the meeting in September, AHRQ updated the Committee on innovative projects using HCUP data and asked the Steering Committee for guidance on HCUP strategic planning.

## **SUMMARY OF HCUP ACTIVITIES FOR 2011 – 2012**

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 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 (DHHS) and with prominent health care organizations and institutions. The Agency's research agenda reflects current priorities and emerging policy issues. As an example, in support of AHRQ's research efforts, HCUP is undergoing a study to understand how using observation stay data with other hospital data can be used to strengthen analyses and facilitate research to yield a more complete picture of a patient's care and allow providers to formulate more accurate quality improvement initiatives. This study will evaluate the quality of observation stay data obtained from two HCUP Partner organizations.

Additionally, AHRQ consults with industry experts, public officials, and other researchers to select topics for study. AHRQ also solicits advice from data organizations participating in HCUP concerning product development and research. To learn more about AHRQ's research agenda, please visit <http://www.ahrq.gov/fund/ragendix.htm>.

In addition to exploratory studies conducted by the HCUP team to further enhance our administrative databases, HCUP produces software tools and supplemental files to improve the ease of use and value of these databases. HCUP also produces methods reports including statistics, findings, and special technical analyses aimed at communicating and disseminating information about HCUP data. Finally, AHRQ researchers use HCUP data to conduct their own research and engage in collaborations intended for publication in peer-reviewed journals or disseminated through other mediums. Additional information about HCUP software tools, supplemental files, and data reports is provided in the HCUP Project Overview Binder.

In 2011, AHRQ investigated several HCUP-related topics with the dual goals of developing data for research use and exploring health outcomes to inform policy decisions. Several key analyses were completed in 2011, while other topics continue to be researched. AHRQ expects to initiate several such studies in 2012 and will share results with Partners. Below are studies that were completed in 2011, or are continuing into or planned for 2012:

### Studies Using State Databases

- A/H1N1-Associated Health Care System Strain (SID,SEDD)
- Are Hospital Inpatient Costs Lower for Medicare Advantage Enrollees than Medicare Fee-for-Service Beneficiaries? (SID)
- Characteristics of Homeless and Non-homeless Individuals Using Inpatient and Emergency Department Services (SID, SEDD)
- Comparison of AHRQ QI Results Using Medicare Fee For Service and All Payer Inpatient Data (SID)
- Developing Hospital Efficiency Estimates (SID)
- Diagnosis and Surgical Procedures for the Measurement of Stress and Urge Incontinence 1998-2008 (SID,SASD)
- Did Massachusetts Health Reform Lower Hospital Inpatient Cost? (SID)
- Diffusion of Robot Facilities in U.S. Hospitals and Increased Use of Radical Prostatectomy and Hysterectomies (SID)
- Duration of Patients' Visits to the Emergency Department (SEDD)
- Evaluation of the Incidence of Infection After Ambulatory or Short-Stay Surgery (SID)
- Evaluating Massachusetts Health Care Reform Impact (SID, SEDD)
- Feasibility of Developing a National Ambulatory Surgery Database (SASD)
- Geographic Variation in Healthcare (SID)
- Hospital-Based Care for Racial/Ethnic Minority Populations: Is It Separate? Is It Equal? (SID)
- Hospital Readmission and Emergency Department Use Among Adults With Mental Health or Substance Abuse Disorders
- Hospital Use, Cost, and Quality for Medicare Advantage vs. Medicare FFS Beneficiaries (SID)
- Injury, Violence, and Substance Abuse in the U.S. (SID,SEDD)
- Misdiagnosis in Emergency Departments (SID, SEDD)
- National Readmissions Database Feasibility (SID)
- Observation Stay Data Analysis (OS data received for HCUP)
- Predicted Hospital Price-to-Charge Ratio
- Provide More Timely Healthcare Information (SID)
- Racial Variation in the Quality of Surgical Care for Prostate Cancer (SID)
- Readmission for Potentially Preventable Hospital Visits (SID, SEDD, Revisit)

- Relations Between Meningococcal Disease and Respiratory Pathogens: Is There an Underlying Infectious Risk Factor for Meningococcal Disease? (SID)
- Short-and Long-Term Effects of Smoking Bans on Four Important Health Outcomes (SID)
- The Role of Federally Qualified Health Centers on Potentially Preventable Hospitalizations: Independent and Interactive Effects of Medicaid (SID)
- Thirty-Day All-Cause Revisits to Emergency Department and Inpatient Hospital for Elderly Patients Who Have an Injury-Related Inpatient Stay (SID, SEDD)
- Trends in Preventable Hospitalization Patterns in the United States: Examining Small Area Variation in Primary Care Performance in the Last Decade (SID)
- Understanding Physician Behavior and Resource Use (SID)
- Understanding Variation in Admission from the Emergency Department (SID, SEDD)
- Using Detailed Charges to Estimate Hospital Cost
- Using Mortality Data to Compare Treatment Effectiveness

### Studies Using Nationwide Databases

- Alternate Nationwide Inpatient Sample Design (NIS)
- Health Care for Children and Youth in the United States: Disparities by Income, Insurance and Race (NIS)
- Nationwide Trends in Inpatient Pediatric Cardiac Interventional Procedures from 1997–2009 (NIS, KID)
- Reconciling Medical Expenditure Estimates from the Medical Expenditure Panel Survey and National Health Expenditure Accounts, 2007 (NIS)
- Refining the Definition of Carbon Monoxide Poisoning Identification Using Administrative Data (NIS)
- Substance Abuse and Mental Health Services Administration: Substance Emergency Department Visits Revision (NEDS)

### Studies Using both State Databases and Nationwide:

- Estimating Influenza-Associated Hospitalizations in the U.S. (SID, NIS)
- Examine the Treatment of Severely Injured Children at Trauma and Non-Trauma Hospitals for the Emergency Medical Services for Children Program (NIS, NEDS, SID, SEDD)
- National Healthcare Quality and Disparities Reports (NHQR/NHDR) Special Analyses (SID, SEDD, NIS, NEDS)
- Quality and Access to Care for Rural Populations (SID, NIS)

### Ongoing Studies

- National Healthcare Quality and Disparities Reports (NHQR/NHDR) and State Snapshots
- State Ambulatory Surgery Databases (SASD) Comparison Reports

Descriptions for these studies are provided below.

## Studies Using State Databases

### *A/H1N1-Associated Health Care System Strain*

Secretary Sebelius from the Department of Health and Human Services (HHS) has asked researchers from the Healthcare Cost and Utilization Project (HCUP) and the Assistant Secretary for Preparedness and Response to investigate the extent of the strain that was experienced by the health care system during the 2009 influenza A (H1N1) virus pandemic. The results will be used to help inform preparedness planning at the Federal level. The study also presents an opportunity to showcase the power of the HCUP databases to the HHS. The research team compared 2003–2008 and 2009 data to quantify: (1) the increased patient care burden at U.S. hospitals associated with the pandemic, and (2) the resultant strain on hospital capacity and operations that was caused by that patient surge. Proposed measures of *burden* include hospital encounters by diagnosis-related group (e.g., pneumonia and influenza) stratified by admission type (emergency/urgent/transfer), comorbidities, complications, and patient length of stay (overall and by location). Proposed measures of *strain* include hospital admission rate (e.g., general, intensive care unit, obstetric) by age category; capacity utilization (ratio of occupied beds to total beds); severity (change in acuity level overall in the hospital during peak weeks); unpredictability (increase in variability of length of stay); and overcapacity (increase or decrease in transfers). This project uses data from the American Hospital Association Annual Survey Database and HCUP State Inpatient Databases (SID) and State Emergency Department Databases (SEDD) for 2003–2009. Information on the A/H1N1 outbreak by week for 2009 comes from the Centers for Disease Control and Prevention. **Ryan L. Mutter, Ph.D., Lewis Rubinson, M.D., Ph.D., Nathaniel Hupert, M.D., M.P.H., and Frances Vaughn, Ph.D.**

### *Are Hospital Inpatient Costs Lower for Medicare Advantage Enrollees than for Medicare Fee-for-Service Beneficiaries?*

Propensity score matching, as originally documented by Rosenbaum and Rubin (1983), is being applied to study methods in many scientific areas (Thoemmes and Kim, 2011). In the present investigation, propensity score matching was used to compare the total health care costs for Medicare Advantage (MA) enrollees and Medicare fee-for-service (FFS) beneficiaries that have similar observable characteristics. We used the Healthcare Cost and Utilization Project State Inpatient Databases (SID) 2008–2009 from six States. Following Chernew et al. (2008) and Wong et al. (2005) we estimated a baseline risk-adjusted cost model. To assess the robustness of our baseline results, we estimated propensity scores that matched any group of MA enrollees to the comparison group of Medicare FFS beneficiaries that was closest in terms of the predicted value of MA enrollment. We then re-estimated our risk-adjusted cost model with propensity score adjustments. Finally, we re-estimated the model using a sub-population obtained through “nearest-neighbor matching method.” In our sample, inpatient cost for MA enrollees was generally lower than the inpatient cost for Medicare FFS beneficiaries when moral hazard and adverse selection were controlled. Preliminary results indicate wide geographic variations in total health care costs in inpatient settings between the two cohorts across States. We also observed geographic variation in prevalence of chronic conditions; the prevalence of many chronic conditions among MA enrollees was generally lower than among Medicare FFS beneficiaries.

**Zeynal Karaca, Ph.D., Herbert S. Wong, Ph.D., and Ryan L. Mutter, Ph.D.**

## ***Characteristics of Homeless and Non-Homeless Individuals Using Inpatient and Emergency Department Services***

Despite growing interest by public and private policymakers, information on health care utilization by homeless individuals is limited. We compared patient characteristics, insurance coverage, and disease prevalence of homeless and non-homeless people during inpatient and treat-and-release emergency department (T&R ED) hospital visits. The Healthcare Cost and Utilization Project State Inpatient Databases (SID) and State Emergency Department Databases (SEDD) for 2008 were used. The SID included data from 10 States on 8,343,420 inpatient visits (of which 177,056 were by homeless patients) and the SEDD included data on 10,733,532 T&R ED visits (of which 49,595 were by homeless patients). Preliminary results indicate that the profile of homeless and non-homeless patients differed substantially by patient demographics including age, gender, and insurance status in both the inpatient and ED settings. The proportions of inpatient hospital visits by homeless white, black/African-American, Hispanic, Asian, native, and other race groups were 19.5, 33.2, 15.1, 5.4, 0.8, and 25.5 percent, respectively, compared with the proportion of T&R ED visits at 60.2, 22.5, 10.6, 0.5, 0.6, and 4.3 percent, respectively. Females accounted for one-third of inpatient hospital visits and one-quarter of T&R ED visits by homeless patients. Over 73 percent of inpatient hospital visits by homeless patients were admitted from EDs. Homeless patients with mental disorders had a notably high prevalence in both settings. Patients with schizophrenia and other psychotic disorders accounted for 33.8 percent of inpatient homeless visits and 7.8 percent of T&R ED visits by homeless individuals diagnosed with mental disorders.

**Zeynal Karaca, Ph.D., Herbert S. Wong, Ph.D., and Ryan L. Mutter, Ph.D.**

## ***Comparison of AHRQ QI Results Using Medicare Fee for Service and All Payer Inpatient Data***

In 2011, Hospital Compare began to report 10 AHRQ Quality Indicators (QIs) for Medicare fee-for-service (FFS) claims. By definition, Medicare-only cases exclude uninsured, commercially insured, and Medicaid beneficiaries. Moreover, Medicare FFS excludes 22 percent of Medicare beneficiaries that are enrolled in Medicare Advantage plans. Interstate variation in enrollment ranges from 1 percent to 42 percent. At the present time, we do not know if judging a hospital's performance based on Medicare FFS-only discharges is representative of overall performance.

Our goal is to determine similarities or differences in performance results in the AHRQ QIs when measured with Medicare FFS cases only and with all-payer inpatient cases. We will use the Healthcare Cost and Utilization Project State Inpatient Databases (SID) for States where claims can be identified as Medicare FFS.

**John Bott, M.B.A., M.S.W.**

## ***Developing Hospital Efficiency Estimates***

Concerns about excessive expenditures have created a long-standing interest in understanding the causes of inefficiency in the U.S. health care sector. *Efficiency* is a strategic goal area of the Agency for Healthcare Research and Quality (AHRQ). Most of the studies on efficiency have used costs as an indirect measure. The implicit assumption has been that if costs are decreasing (or being contained), efficiency must be increasing. This assumption may not be correct. In addition to increasing efficiency, costs can be contained by reducing the number and/or quality of services or changing the product mix from more expensive to less expensive outputs. Thus, an examination of a direct measure of efficiency is important because it reduces reliance on tenuous assumptions, thereby clarifying the impact of environmental factors on efficiency. Inefficiency arises at multiple points in the health care delivery system. The present

project focuses on the hospital sector, the largest component of health care spending. It has been estimated that hospital costs due to inefficiency average between 7.5 and 33 percent. Researchers will: (1) review, identify, evaluate, and summarize best practices for using stochastic frontier analysis (SFA) to estimate the efficiency of hospitals; (2) use SFA to generate hospital-level efficiency measures for a panel of approximately 1,500 hospitals from 2004 to 2009; and (3) examine the effects of internal (i.e., hospital characteristics) and external (i.e., market forces) on hospital efficiency. The American Hospital Association Annual Survey Database, the Medicare Cost Reports, the AHRQ Quality Indicators, and Comorbidity Software applied to the Healthcare Cost and Utilization Project State Inpatient Databases (SID) will supply the data.

**Ryan L. Mutter, Ph.D. and Michael Rosko, Ph.D.**

### ***Diagnosis and Surgical Procedures for the Measurement of Stress and Urge Incontinence 1998-2008***

The prevalence of urinary incontinence among women has been reported to be between 6 percent and 50 percent. Although surgical procedures are often the last resort in treatment, there has been a substantial increase in the absolute number of surgical procedures for both inpatient and outpatient settings over the past two decades. It is not clear if this is because of an increase in prevalence, diagnosis, or management approaches. A recent study showed that there is a decline in inpatient hospitalizations and an increase in outpatient procedures. We will use the Healthcare Cost and Utilization Project State Inpatient Databases (SID) and State Ambulatory Surgery Databases (SASD) from 1998–2008 to examine the number of incontinence procedures conducted in each surgical setting. We will determine differences by demographic variables including geographic region, hospital type, insurance status, and age group. Only States participating in both databases will be included in the analysis.

**Sam Posner, Ph.D., Susan Meikle, M.D., and Claudia A. Steiner, M.D., M.P.H.**

### ***Did the Massachusetts Health Reform Lower Hospital Inpatient Costs?***

Massachusetts enacted a comprehensive health care reform bill in April 2006 to provide near-universal coverage for all residents with access to care and protection against financial uncertainty due to medical bills. We estimated the impact of the reform on the cost of inpatient visits. The Healthcare Cost and Utilization Project (HCUP) 2005–2009 State Inpatient Databases (SID) for Massachusetts were used in this analysis. Our key covariates of interest were the time for each patient’s hospital visit and the total associated costs. We retained hospital records where an individual patient had at least one inpatient visit before and after the enactment of health reform. To obtain costs, we applied hospital-specific HCUP cost-to-charge ratios to charges. We adjusted these costs with the Centers for Medicare & Medicaid Services’ area wage index. We developed a baseline cost model with risk adjustments and then conducted several empirical estimations and tested their significance. The preliminary results show that the Massachusetts health reform decreased the inpatient cost per visit when individual heterogeneity and risk-adjustments were controlled. Our estimates show that health reforms decreased the hospital inpatient cost (ranging from \$388 to \$974 per inpatient visit). Medicaid enrollees experienced the highest reduction (ranging from \$327 to \$1,366 per inpatient visit); Medicare beneficiaries experienced the lowest reduction (ranging from \$213 to \$270 per inpatient visit).

**Zeynal Karaca, Ph.D. and Herbert S. Wong, Ph.D.**

### ***Diffusion of Robot Facilities in U.S. Hospitals and Increased Use of Radical Prostatectomy and Hysterectomies***

Some recognized authorities have stated that robot-assisted procedures are not cost-effective or recommendable. Nevertheless, their use has been increasing in the United States and the United Kingdom. Our goals are to analyze the determinants of hospital adoption of a robot facility during 2005–2010, the effect on the numbers of prostatectomies and hysterectomies in relation to the number of years with a robot, and the rates of these procedures in an area over time relative to the number of robots installed. Data will come from the Healthcare Cost and Utilization Project State Inpatient Databases (SID) and the American Hospital Association. We are using conditional logistic regression and standard multivariate methods. Bed size of the hospital, proportion of adults with private insurance, proclivity to adopt new technologies, and the availability of surgical specialists in an area are significant determinants of robot adoption. The rates of procedures are affected by the years since installation, with a plateau effect.

**Gabi Barbash, M.D., Bernard Friedman, Ph.D., and Claudia A. Steiner, M.D., M.P.H.**

### ***Duration of Patients' Visits to the Emergency Department***

The purpose of the study was to explore the duration of patients' visits to an emergency department (ED) for which they are treated and released (T&R). We examined the differences between admission and discharge times using the Healthcare Cost and Utilization Project State Emergency Department Databases (SEDD) for 2008. The data came from 4.9 million T&R ED visits in three States. ED visit duration varied significantly by admission hour and day of the week. At the 95th percentile, the average duration was between 197.8–202.6 minutes. The average duration increased from 8 a.m. until noon and then decreased until midnight, at which time we observed an approximately 70-minute spike. We found 90-minute longer waits on Monday (especially between midnight and 2:00 a.m.) compared to other work days. Medicare patients had the longest average duration of visits (237.7 minutes). Patients under the age of 15 had the shortest average duration (142.2 minutes). Black/African American patients had a 21.4-minute longer duration of visits compared to white patients. There was significant variation in average duration across disease groups (e.g., 284.0 minutes for mental disorders and 159.6 minutes for injury and poisoning-related illness). The average duration of visits at teaching hospitals was significantly longer than at non-teaching hospitals (225.4 versus 166.2 minutes). Hospitals with large bed size were associated with the longest duration of visits (222.2 minutes) compared to small bed size (172.4 minutes) or medium bed size (166.5 minutes). The average duration at for-profit hospitals was 24.1 minutes less than at their non-profit counterparts.

**Zeynal Karaca, Ph.D., Herbert S. Wong, Ph.D., and Ryan L. Mutter, Ph.D.**

### ***Evaluation of the Incidence of Infection after Ambulatory or Short-Stay Surgery***

In 2011, researchers from the Healthcare Cost and Utilization Project (HCUP) explored the incidence of infection after ambulatory or short-stay inpatient surgery using the 2009 State Inpatient Databases (SID). According to the Centers for Disease Control and Prevention, healthcare-associated infections (HAIs) are among the top 10 leading causes of death in the United States. In response to increasing concerns about the public health impact of HAIs, the Department of Health and Human Services (DHHS) has developed an Action Plan to Prevent Healthcare-Associated Infections (HHS Action Plan). The family of HCUP databases is well suited to determine a baseline for the incidence of infections after short-stay surgeries. The recently developed HCUP revisit variables will be used in conjunction with the HCUP State databases for this analysis. The purpose is to determine if a patient is seen in the hospital (either as an inpatient stay or an emergency department visit) for an HAI day(s) or weeks after a

short-stay surgery. Although SID data are used, the analysis only reports combined-State results. In 2012, this analysis will be updated with 2010 data.

**Claudia A. Steiner, M.D., M.P.H., Marguerite L. Barrett, M.S., and Tim Kenney, M.A.**

### ***Evaluating Massachusetts Health Care Reform Impact***

Evaluation of the effects of existing health care reform initiatives is a growing area of interest in State and national health care reform discussions. Because HCUP produces population-based databases, these data are uniquely suited to provide a variety of health care information (e.g., charges, cost, price, quality, and access) by different geographic areas. This study analyzes State-level HCUP data in order to evaluate the early impact of Massachusetts Health Care Reform on hospital utilization and other characteristics relative to other geographic areas by comparing the years immediately before and after the reform (2005 and 2009 data years, respectively). AHRQ plans to complete this study in 2012.

**Bernard Friedman, Ph.D., William D. Marder, Ph.D., Rachel Henke, Ph.D., and Jared Maeda Ph.D.**

### ***Feasibility of Developing a National Ambulatory Surgery Database***

The steep rise in the number of ambulatory surgeries (AS) and the surgical centers performing them have made it increasingly important to understand care related to AS nationwide. Creation of a Nationwide Ambulatory Surgery Database (NASD) would aid researchers with an interest in AS and offer a potential growth area for the Healthcare Cost and Utilization Project (HCUP). The Agency for Healthcare Research and Quality (AHRQ) launched a study of the feasibility of constructing a NASD, derived from the HCUP State Ambulatory Surgery Databases (SASD). Researchers recommended that a pilot NASD be constructed to include only AS visits in hospital-owned AS settings. A NASD Feasibility Evaluation laid the foundation for the construction of an intramural multi-State SASD database and two intramural, pilot, nationwide hospital-owned AS databases. Tasks and analyses are currently focusing on finalizing the pilot sample designs and setting a path toward a public-use nationwide AS database. A multi-State SASD has been built for intramural use. New standard HCUP surgical flags are being developed to replace the current, overly broad AS flag. One or two pilot NASDs will be assembled using either visit-based or facility-based sample weights. We will also continue to create a listing of all facilities in the universe that include non-hospital-owned AS facilities.

**Claudia A. Steiner, M.D., M.P.H., Mahil Senathirajah, M.B.A., and Jennifer Podulka, M.P.Aff., Jon D. Busch, Ph.D., Robert Houchens, Ph.D.,**

### ***Geographic Variation in Healthcare***

Geographic variations in health care related to access, cost, quality, and resource intensity are increasingly relevant to current health policy discussions. The majority of previous research has focused on the Medicare fee-for-service population. Additional population-based data are needed. We examined the patient, population, and market factors that may influence the differences in inpatient resource use between Medicare and privately insured patients across Core Based Statistical Areas in 38 States, using the Healthcare Cost and Utilization Project State Inpatient Databases (SID) from 2003 and 2008. In another study, we examined how hospital market forces might affect resource use differently between payers using the 2008 SID. We are also examining the relationship between quality and cost at the regional level, determining the impact of unemployment on inpatient resource use using State time series data, and examining the variation of hospital prices across small geographic areas. Finally, we are

exploring variation in inpatient use by the uninsured and geographic variation in admission to the hospital from the emergency department.

**Herbert S. Wong, Ph.D., Bernard Friedman, Ph.D., Rachel Henke, Ph.D., Jared Maeda Ph.D., Ginger Carls, Ph.D., Emily Ehrlich M.P.H., Andriana Hohlbach M.P.H., and William D. Marder, Ph.D.**

### ***Hospital-Based Care for Racial/Ethnic Minority Populations: Is It Separate? Is It Equal?***

Research literature has shown disparities in hospital care for racial and ethnic minorities in the provision of surgical procedures or other processes of care, patient safety events, and mortality. The source of these disparities is not clear. The purposes of the present study are to examine: (1) the characteristics and quality of care of hospitals treating patients of different racial and ethnic backgrounds, and (2) the extent to which any national-level disparities are due to minority patients receiving care from poorer quality providers than those used by white patients (disparities between hospitals) or to minority patients receiving lower quality care than white patients within the same hospital (disparities within hospitals). The Healthcare Cost and Utilization Project State Inpatient Databases (SID) will be used for States that report racial and ethnicity groups. Characteristics of hospitals will be obtained from the American Hospital Association Annual Survey Database and Medicare Cost Reports. The Agency for Healthcare Research and Quality (AHRQ) Inpatient Quality Indicators (IQIs) for mortality and Patient Safety Indicators (PSI) software will be applied to the SID for the IQI measures. Hospital-level data on process of care measures and patient experience measures will be obtained from the agencies that collect these data for public reporting (e.g., CMS Hospital Compare project; individual State agencies; hospital associations that publish patient assessment of hospital ratings; the Hospital Consumer Assessment of Healthcare Providers and Systems project). These will be linked to SID data at the hospital level.

**Roxanne Andrews, Ph.D., Joanna Jiang, Ph.D., Anne Elixhauser, Ph.D., Ernest Moy, M.D., M.P.H., and Robert Baskin, Ph.D.**

### ***Hospital Readmission and Emergency Department Use Among Adults With Mental Health or Substance Abuse Disorders***

Inpatient and emergency department (ED) treatment of mental health and substance abuse (MH/SA) disorders is costly to patients and society. In some cases, it reflects a lack of appropriate outpatient treatment following discharge from inpatient treatment. Persons with MH/SA disorders are particularly vulnerable to readmissions because of a combination of factors that make follow-up care less likely, such as disproportionately high poverty rates and poor social support. The first objective of this study is to describe the incidence of community hospital readmissions and ED encounters over a 12-month horizon following an index discharge among persons with MH/SA disorders. Length of inpatient stays and costs of the encounters will also be characterized. The second objective is to analyze through regression analysis what factors are significantly correlated with the probability of hospital readmission or ED use. We will analyze encounter-level inpatient records from 12 States over the period 2007–2009 using the State Inpatient Databases (SID) and State Emergency Department Databases (SEDD). Regression analyses will be stratified by MH or SA and by age group (0–17, 18–44, 45–64, 65+ years).

**Sam Schildhaus, Ph.D., Carol Stocks, R.N., M.H.S.A., Patricia B. Santora, Ph.D., and Mark W. Smith, PhD.**

### ***Hospital Use, Cost, and Quality for Medicare Advantage vs. Medicare FFS Beneficiaries***

Between 1995 and 2007, enrollment in Medicare Advantage (MA) plans increased from 10 percent to 20 percent of beneficiaries (CBO, 2007; MedPAC, 2008). MA plans have flexibility in benefit design. It is not known whether MA plans are contracting with hospitals and physicians to achieve efficiencies that could be valuable in the Medicare fee-for-service (FFS) program. One possible measure of efficiencies is readmissions for chronic conditions, if clinical risk factors are controlled. We will compare Medicare FFS and MA hospitalized patients for their rate of readmission, demographic and clinical characteristics, and cost of care. We will assess their quality outcome indicators and whether MA patients are being referred to lower quality hospitals. The Healthcare Cost and Utilization Project (HCUP) partnership contains 13 States that distinguish whether a Medicare patient was in the mainstream FFS plan or an alternative plan. In six of those States, it is possible to track readmissions. The quality of the hospital will be measured for all adults by risk-adjusted mortality and by the rate of occurrence of at least one of nine selected safety events among patients at risk for at least one such event. Readmission rates within one, three, and six months will be calculated for persons with an index admission in one of several chronic illness categories.

**Bernard Friedman, Ph.D., Joanna Jiang, Ph.D., John Bott, M.H.A., and Claudia A. Steiner, M.D., M.P.H.**

### ***Injury, Violence, and Substance Abuse in the U.S.***

Internet-accessible, State-level fact sheets of incidence and cost on injury, violence, substance abuse, and other important public health issues are useful for needs and performance assessments, program planning and evaluation, and public and legislative education. Many of these fact sheets and tables exist with aging data obtained from State health department epidemiologists and program managers. The present collaborative project involves the Agency for Healthcare Research and Quality, the Pacific Institute for Research and Evaluation, and the West Virginia University Injury Control Research Center/Center for Rural Emergency Medicine (CREM). Healthcare Cost and Utilization Project State Inpatient Databases (SID) and State Emergency Department Databases (SEDD) will be used to update the tables and fact sheets, centralize their location, and eliminate the burden on the staff in each State. The fact sheets and tables will be posted primarily on the CREM Web site. In addition, this collaboration will support research studies that can make important contributions to the understanding of injury patterns and burden. This includes, but is not limited to, burden and costs of motorcycle and boating injuries, the effectiveness and efficiency of poison control centers, and prevention of suicide.

**Claudia A. Steiner, M.D., M.P.H., Ted Miller, Ph.D., and Jeffrey Coben, M.D.**

### ***Misdiagnosis in Emergency Departments***

Misdiagnosis for a target condition is defined as an incident in which a patient visits an emergency department (ED) with symptoms related to the condition, is discharged from the ED, and is subsequently admitted to a hospital with the target condition. Target conditions may include acute myocardial infarction and stroke. Diagnostic errors, including missed diagnoses, are complex, costly, and pose significant patient safety concerns. The goals of the study are to examine the association between misdiagnosis and patient, ED, and hospital characteristics and to estimate the rate and odds of a misdiagnosis. The Healthcare Cost and Utilization Project State Inpatient Databases (SID) and State Emergency Department Databases (SEDD) will be used for the analysis.

**Ernest Moy, M.D., M.P.H.**

### ***National Readmissions Database Feasibility***

In 2011, researchers from the Healthcare Cost and Utilization Project (HCUP) used the 2008 State Inpatient Databases (SID) to examine the feasibility of creating a pilot database that can be used to estimate national inpatient readmission rates. Reducing hospital readmissions is a key strategy for increasing the quality of health care, while reducing the associated cost. In 2012, the 2009 and 2010 SID will be used to augment the pilot database. Although patients may be readmitted to the hospital because of the severity and complexity of their underlying condition, high rates of repeat patient visits to the hospital may indicate deficiencies in the health care delivery system. Devising effective strategies to reduce the rate of multiple acute care hospital visits by the same person requires a thorough understanding of the factors that contribute to repeat visits. The HCUP SID have been used to build the pilot readmission database, but analyses using the data have been limited to combined-State results.

**Claudia A. Steiner, M.D., M.P.H., Marguerite L. Barrett, M.S., and Minya Sheng, M.S.**

### ***Observation Stay Data Analysis***

Observation stay care continues to increase in use, but it is often a missing component in health care data analyses. When combined with other hospital data, observation stay data can yield a more complete picture of a patient's care and allow providers to formulate more accurate quality improvement initiatives. The purpose of this analysis is to evaluate observation stay data obtained from two Healthcare Cost and Utilization Project (HCUP) Partner organizations, Nebraska and Washington, and to develop a study that will support the value of observation stay data.

**Ryan L. Mutter, Ph.D., Pamela Owens, Ph.D, Michael Ross, MD, Jason Hockenberry, PhD, Marguerite L. Barrett, M.S., and Judy Parlato, M.B.A., B.S.N., R.N.**

### ***Predicted Hospital Price-to-Charge Ratio***

Although hospital administrative data generally contain information on the amount that a facility charged for a hospital stay, the data lack information on the cost to provide care. Information on the amount reimbursed for care, which is the price paid, is also lacking from the data. In the past, the Agency for Healthcare Research and Quality (AHRQ) developed a set of hospital-level cost-to-charge ratios to estimate the cost of providing care. The current pilot study created new price-to-charge ratios (PCRs) for use in conjunction with charge information that was collected on hospital discharge records. The purpose was to estimate the price of inpatient hospital care, thus enabling researchers from the Healthcare Cost and Utilization Project (HCUP) to provide market-level charge, cost, and price information for hospital inpatient services. Price information will help customers make more informed choices about hospitalization for themselves and their families. The impetus for this pilot was to make health care information more transparent to consumers, but the results will also make the project valuable for researchers by providing alternatives to measuring resource use that may be better suited for their studies. In 2009, HCUP completed pilot PCR files for five HCUP States, along with an evaluation of the data. In 2010, HCUP created an additional pilot PCR file for five more States, continued the evaluation of the data, and prepared a journal article. In 2011, HCUP revised the journal article and studied the potential to develop pilot PCR files for five additional States. After reviewing the results of this investigation, HCUP ultimately decided against expanding the PCR to five additional States. HCUP also began development of a method to estimate PCRs for hospitals for which no financial data exist. In 2012, HCUP will estimate the PCRs for those

hospitals, submit the first journal article for publication, and develop a second journal article.  
**Herbert S. Wong, Ph.D., Bernard Friedman, Ph.D., Arpit Misra, M.A., and Mark W. Smith, Ph.D.**

### ***Provide More Timely Healthcare Information***

In an effort to provide more timely healthcare information, the Agency for Healthcare Research and Quality (AHRQ) is working with its data Partners to obtain early (e.g., quarterly) State data for the Healthcare Cost and Utilization Project (HCUP). These early data, which may be received a year or more in advance of the HCUP Partner's annual data, are used to project and explore current healthcare trends. In 2011, AHRQ received and processed early 2010 data from five HCUP Partners. These data were used to project 2010 and 2011 national trends in hospitalizations (e.g., trends in discharges, outcomes, costs, and mortality) for healthcare-associated infections (HAIs). The analyses included regional trends for *Clostridium difficile* infection and for cardiac conditions and procedures. The data also were used to identify trend changes in inpatient outcomes for a range of clinical diagnoses and procedures (defined by AHRQ Clinical Classifications Software). AHRQ began receiving and processing early 2011 data from a subset of Partners in the summer of 2011. This data collection and processing effort will continue in 2012, with up to 10 Partners contributing early 2011 data. These data will be used to project 2011 and 2012 trends in hospitalizations and to examine trend changes in inpatient outcomes.

**Claudia Steiner, M.D., M.P.H., Roxanne Andrews, Ph.D., Audrey Weiss, Ph.D., and Marguerite L. Barrett, M.S.**

### ***Racial Variation in the Quality of Surgical Care for Prostate Cancer***

Black patients are known to have less optimal prostate cancer treatment outcomes than white patients, but the causes are not fully understood. The objective of this study was to determine whether a racial gap exists in the quality of surgical care for prostate cancer, as evidenced by racial variation in the utilization of high-volume providers and facilities and in other potential outcome measures of health care quality. We conducted a cross-sectional analysis of administrative data from the Healthcare Cost and Utilization Project State Inpatient Databases (SID) from 1996–2007 in three States. Patients were 18 years or older with a diagnosis of prostate cancer and underwent radical prostatectomy. We examined use of surgeons and/or hospitals in the top quartile of annual volume for this procedure, inpatient blood transfusion, complications, mortality, and length of stay (LOS). Among 105,972 cases, 76.5% were white, 13.2% were black, 6.6% were Hispanic, and 3.6% were All Other. In mixed effects multivariate models, black patients had markedly lower *use of high-volume hospitals* (Odds Ratio [OR] = 0.73, 95% confidence interval [0.70, 0.76]), and *surgeons* (0.67 [0.64, 0.70]) compared to white patients. Black patients also had higher odds of receiving a blood transfusion (1.08 [1.01, 1.14]), of longer LOS (1.07 [1.06, 1.07]), and of inpatient mortality (1.73 [1.02, 2.92]). These are concerning potential quality-of-care gaps due to racial/ethnic characteristics.

**Daniel A. Barocas, M.D., M.P.H., Darryl T. Gray, M.D., ScD, FAHA, Jay H. Fowke, Ph.D., M.P.H., Nathan D. Mercaldo, M.S., Jeffrey D. Blume, Ph.D., Sam S. Chang, M.D., Michael S. Cookson, M.D., MMHC, Joseph A. Smith, Jr., M.D., and David F. Penson, M.D., M.P.H.**

### ***Readmission for Potentially Preventable Hospital Visits***

In 2011, researchers from the Healthcare Cost and Utilization Project (HCUP) used the State Inpatient Databases (SID), the State Emergency Department Databases (SEDD), and the HCUP revisit variables to examine hospital revisits for select chronic and acute conditions.

Conventional hospital readmissions studies focus on inpatient readmissions without factoring in multiple emergency department (ED) visits. In our analysis, including ED visits had a substantial impact on the number of patients seeking repeat hospital care and a relatively smaller effect on total hospital costs. Policy initiatives aimed at reducing unnecessary hospital care will benefit from understanding the significant role of this nation's EDs. In 2012, HCUP will update the results and draft a manuscript for publication.

**Claudia A. Steiner, M.D., M.P.H. and Marguerite L. Barrett, M.S., and Chaya Merrill, DrPH**

### ***Relations Between Meningococcal Disease and Respiratory Pathogens: Is There an Underlying Infectious Risk Factor for Meningococcal Disease?***

The temporal-spatial relationship between the incidence of hospitalizations from meningococcal disease and hospitalizations attributed to viral and bacterial respiratory pathogens in the United States is important to understanding the underlying causes and risk factors associated with the disease. Defining this relationship is the primary goal of a collaborative project between the Agency for Healthcare Research and Quality (AHRQ) and the National Institutes of Allergy and Infectious Diseases. The researchers are using State-based hospital discharge data from the Healthcare Cost and Utilization Project State Inpatient Databases (SID). A secondary goal of the study is to look for interactions and synchronicity between pairs of respiratory pathogens. Mathematical modeling and statistical packages will be used to investigate the relationships to the level of ZIP Code, by several age groups, and by calendar weeks.

**Cécile Viboud, Ph.D. and Claudia A. Steiner, M.D., M.P.H.**

### ***Short-and Long-Term Effects of Smoking Bans on Four Important Health Outcomes***

Clinical and epidemiological evidence of the risks posed by secondhand smoke led policy makers to enact legislation to reduce exposure in public places. As of 2009, a total of 17,059 municipalities were covered by 100% smoke-free laws, with jurisdictions ranging from municipalities to States. Large reductions in secondhand smoke exposure have been reported in the general population after implementation of smoking bans, but these studies have many limitations and more research is needed. We will use the Healthcare Cost and Utilization Project State Inpatient Databases (SID) 2001–2009 to study the short- and long-term effects of smoking bans on four important health outcomes: acute myocardial infarction, heart failure, pneumonia for adults, and respiratory disease for children. We will investigate inpatient discharge abstracts from participating States for patients of all ages, regardless of payer. Information detailing patients' ZIP Codes will show whether a person lived in an area where a smoking restriction was implemented. The longitudinal nature of the SID will additionally permit examination of long-term outcomes.

**Vivian Ho, Ph.D. and Claudia A. Steiner, M.D., M.P.H.**

### ***The Role of Federally Qualified Health Centers on Potentially Preventable Hospitalizations: Independent and Interactive Effects of Medicaid***

Federally Qualified Health Centers (FQHCs) and Medicaid are programs that provide increased access to health care for low-income, vulnerable populations. FQHCs give direct access to providers through local clinics, and Medicaid provides publicly funded health insurance benefits to pay for provider care. These are two different approaches that have an effect on the hospitalization rates of ambulatory care sensitive conditions (ACSCs). The purpose of this study is to examine the independent and interactive effects of access to primary care and rates of ACSC hospitalizations for uninsured and Medicaid populations. The researchers will determine what balance of FQHCs and Medicaid is most successful at reducing rates of ACSC

hospitalizations. Existing data from the Health Services Resource Administration and the Healthcare Cost and Utilization Project State Inpatient Databases (SID) will be used in a cross-sectional analysis.

**Carol Stocks, R.N., M.H.S.A.**

### ***Thirty-Day All-Cause Revisits to Emergency Department and Inpatient Hospital for Elderly Patients Who Have an Injury-Related Inpatient Stay***

Research on injury-related rehospitalizations is very limited. The main focus has been on understanding health risk factors for persons with hip fracture. In a cohort study of veterans admitted to Veterans Health Administration (VA) or non-VA hospitals following hip fracture, 18.3% of the patients had an all-cause rehospitalization within 30 days. An increased rate of readmission is associated with older age, male gender, longer length of initial hospital stay, and a large number of comorbidities such as fluid and electrolyte disorders, renal failure, cardiac arrhythmias, chronic pulmonary disease, and congestive heart failure (Bass et al., 2008). Persons with rehospitalizations after hip fracture repair are more ill and more functionally disabled after rehabilitation (Giusti et al., 2008; Moore & Leonardi-Bee, 2008). The goals of the present investigation are: (1) to broaden the patient sample from hip fracture to other injuries; and (2) to explore provider-related factors that may affect rehospitalizations, such as the role of long-term care, the patient's experience during the initial hospital visit, and the characteristics of the hospital. This is a retrospective cohort study of elderly persons that were admitted to the hospital for an injury-related admission in 2006. Data are from 11 States that provided encrypted patient identifiers to the 2006 Healthcare Cost and Utilization Project State Inpatient Databases (SID) and State Emergency Department Databases (SEDD). The States are: Arizona, California, Florida, Hawaii, Missouri, Nebraska, New Hampshire, New York, South Carolina, Tennessee, and Utah.

**Rhona Limcangco, Ph.D., William Spector, Ph.D., Ryan L. Mutter, Ph.D., and Pamela Owens, Ph.D.**

### ***Trends in Preventable Hospitalization Patterns in the United States: Examining Small Area Variation in Primary Care Performance in the Last Decade***

Trends in access to primary care may be determined by examining ambulatory care sensitive conditions or preventable hospitalization rates over a 10-year time interval. Researchers of the present investigation will compare hospital discharge data from the Healthcare Cost and Utilization Project State Inpatient Databases (SID) from 1995 and 2005. This time period marks the beginning and end of several legislative initiatives and policy changes that may have caused significant disruptions in the health care market. For example, this period spans several Medicare Modernization initiatives (including the Balance Budget Act in 1997) that resulted in substantial Medicare Health Maintenance Organization (HMO) disenrollment. This was followed by a major push to enroll more elderly in Medicare HMOs through the Medicare Modernization Act of 2003. We will examine the net result of such changes on the access to preventive care services among adults aged 18–64 years and 65 years or older from States in Eastern and Western regions (AZ, CA, OR, WA, MA, MD, NJ, and NY). This research will inform policymakers about the small-area variation in access to primary care and whether the access to preventive care services improved over time overall, for specific minority groups, or for Medicare HMO enrollees relative to fee-for-service enrollees. The association between trends and spatial patterns and various socio-demographic and contextual factors will also highlight some small areas where policy interventions might be targeted to improve the current system.

**Joy Basu, Ph.D., Vennela Thumula, B.S., and Lee Mobley, Ph.D.**

### ***Understanding Physician Behavior and Resource Use***

Disparities in physician “practice styles” have emerged as a viable explanation for the substantial variation in medical treatment patterns that exist across geographic regions. How physicians develop a practice style is not well understood. We explore a variety of research questions that contribute to our understanding about physician behavior and resource use, including: (1) Do specialty area, education, training, and location influence the intensity of services used? In particular, do physicians develop a “practice style” while attending medical school? (2) Do internationally trained physicians have different resource intensity than those trained in the United States? (3) Are female physicians more cost efficient than males? (4) Do female patients more often visit female physicians? (5) Is board certification considered when patients choose their physicians? We will use the Healthcare Cost and Utilization Project (HCUP) 2004–2009 State Inpatient Databases (SID) for six States. We have obtained data files with physician characteristics (e.g., age, gender, specialty, medical school, residency program) from the corresponding State Medical Board of Examiners. Using the physician identifier on the HCUP files, we plan to merge the physician characteristic information from the State Medical Board of Examiners to create analytic files. Supplemental information from the American Hospital Association Annual Survey and the Area Resource File will also be used.

**Herbert S. Wong, Ph.D. and Zeynal Karaca, Ph.D.**

### ***Understanding Variation in Admission from the Emergency Department***

In 2008, there were more than 19 million hospitalizations (43% of all admissions) from hospital-based emergency departments (EDs). This project will explore variations in hospital-level admission rates from the ED and assess which factors may explain this variation. We will study ED encounters in the Healthcare Cost and Utilization Project (HCUP) using the State Emergency Department Databases (SEDD) and State Inpatient Databases (SID) in 2008. We will map county-level variation in ED admission rates and conduct a multivariate analysis to assess other factors associated with ED admission (e.g., patient, hospital, and community characteristics; local standards of care). HCUP data will be linked to additional data from the American Hospital Association Annual Survey of Hospitals, Trauma Information Exchange Program, and the Area Resource File.

**Ryan Mutter, Ph.D. and Jesse Pines, M.D., M.B.A., M.S.C.E.**

### ***Using Detailed Charges to Estimate Hospital Costs***

The cost of health care repeatedly appears at the top of lists of concerns about the health system. Information about specific services that contribute disproportionately to cost growth would help to focus cost-containment efforts. The research team created a method for estimating hospital-specific costs of inpatient services when detailed charges from the Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID) and standardized Centers for Medicare & Medicaid Services (CMS) accounting data are available. The method involved: (1) creating cost-to-charge ratios (CCRs) for 13 cost-center or department-level buckets of services, and (2) mapping revenue code-level charges to a CCR using an internally developed crosswalk. After applying the newly developed method, the data were analyzed to assess the contribution of various inpatient service components on overall growth in the cost per medical and surgical discharge and for the conditions of congestive heart failure (CHF), septicemia, and osteoarthritis. HCUP SID data were analyzed at the detailed revenue-code level based on discharges from Kentucky, Maine, Minnesota, Nebraska, New York, Tennessee, Texas, Washington, and West Virginia for 2001 and 2006. UB-04 revenue codes were used to identify specific services, accommodations, and the accompanying charge

associated with each discharge. A manuscript containing the final results has been prepared for submission to a peer-reviewed journal in early 2012.

**Jared Maeda, PhD, MPH, Susan O. Raetzman, M.S.P.H., and Bernard Friedman, Ph.D.**

### ***Using Mortality Data to Compare Treatment Effectiveness***

This project, under the Healthcare Cost and Utilization Project (HCUP), involves a pilot test use of California linked discharge data and vital statistics death data files for comparative effectiveness research. The research team will compare open versus endoscopic surgery for an abdominal aortic aneurysm and evaluate the feasibility of using the linked data to analyze the comparative effectiveness of the two hospital procedures. With special permission from the California partner, HCUP obtained California's linked discharge and vital statistics death records data files for 2000–2007. Analyses of these data files are currently underway, and the results of this project will be submitted to a professional journal(s). HCUP selected California's linked data as a proof-of-concept that linked mortality data can support comparative effectiveness studies on in-hospital and post-hospital mortality and readmission. The team may also analyze Arizona linked discharge and death data. This database was developed by the HCUP Arizona Partner through an earlier initiative from the Agency for Healthcare Research and Quality (AHRQ). The purpose of the initiative was to provide technical support to HCUP Partners to link encounter-level administrative data to death records.

**Claudia Steiner, M.D., M.P.H., Rosanna M. Coffey, M.A., Ph.D. and Tami L. Mark, M.B.A., Ph.D.**

### **Studies Using Nationwide Databases**

#### ***Alternate Nationwide Inpatient Sample Design***

The Nationwide Inpatient Sample (NIS) is the largest all-payer inpatient care database that is publicly available in the United States. It contains data from 5 to 8 million hospital stays each year. The current NIS design includes all discharge data from approximately 1,000 hospitals that are sampled from States participating in the Healthcare Cost and Utilization Project (HCUP). These approximate a 20-percent stratified sample of U.S. community hospitals. For 2009, HCUP States represented 96 percent of the U.S. population. Unfortunately, there is variation between hospitals that is not captured by the current analysis design. The NIS Redesign Analysis conducted in 2011 showed that a sample of discharges from all hospitals would produce significantly better national estimates than the current design. The objective of the Alternate NIS Report is to improve the accuracy of NIS estimates and make the NIS more useful. The project will build on the prior analysis to develop specific recommendations for a new NIS design.

**Anne Elixhauser, Ph.D., Robert Houchens, Ph.D., and David Ross**

#### ***Community Hospital Admission from the Emergency Department by Persons with Substance Use Disorders***

Persons with a substance use disorder (SUD) are less likely to be insured and may have limited access to appropriate care, thereby increasing their reliance on emergency departments (EDs). The Nationwide Emergency Department Sample (NEDS) of the Healthcare Cost and Utilization Project (HCUP) provides the data needed to determine the relationship between insurance status and the probability of admission to a hospital following an ED encounter. Through collaboration with the Substance Abuse and Mental Health Services Administration, in 2011 the

HCUP investigated whether health conditions and insurance status were significant predictors of admission to a community hospital from an ED encounter with a SUD diagnosis. The study showed that lack of health insurance was disproportionately likely in ED encounters that carried a SUD diagnosis, whether alcohol- or drug-related. In regression analysis, insurance status was strongly tied to the probability of subsequent hospital admission. In 2012 a journal manuscript was developed and submitted for publication.

**Sam Schildhaus, Ph.D., Carol Stocks, R.N., M.H.S.A., Patricia B. Santora, Ph.D., and Mark W. Smith, PhD.**

### ***Health Care for Children and Youth in the United States: Disparities by Income, Insurance, and Race***

An Agency for Healthcare Research and Quality (AHRQ) series on health care for children and youth has been published each year in *Academic Pediatrics*. We will contribute to this series by preparing tables and charts of hospital utilization by children in 2005 and 2009. Data will be analyzed by average income in the residential area, insurance coverage, age, and race/ethnic category. The analyses are based on pediatric hospitalizations in the Nationwide Inpatient Sample (NIS) of hospital inpatient data from the Healthcare Cost and Utilization Project (HCUP) and on data from a nationally representative random sample of children in the United States from the Medical Expenditure Panel Survey (MEPS). AHRQ developed our indicators of potentially avoidable admissions and cost as well as indicators of patient safety. A special edition of the NIS, constructed for the National Hospital Disparities Report will be used. AHRQ plans to submit the manuscript to *Academic Pediatrics* in early 2012.

**Terceira Berdahl, Ph.D., Bernard Friedman, Ph.D., Roxanne Andrews, Ph.D., Marie McCormick, M.D., Sc.D., and Lisa Simpson, M.B., B.Ch., M.P.H.**

### ***Nationwide Trends in Inpatient Pediatric Cardiac Interventional Procedures from 1997–2009***

The growth and success of treatment for pediatric heart disease highlight the increasing importance of tracking patterns of this care. This investigation was a retrospective cross-sectional/cohort study of all-payer discharges of 0- through 17-year-old patients with International Classification of Diseases, 9<sup>th</sup> Revision, Clinical Modification principal procedure codes for surgery or interventional catheterizations of the heart/great vessels from 1997–2009. The Healthcare Cost and Utilization Project (HCUP) Nationwide Inpatient Sample (NIS) and Kids' Inpatient Database (KID) provided the data. We queried HCUP's on-line system (HCUPnet) to estimate nationwide outcomes. Sampling considerations made the on-line KID a more robust source of pediatric cardiac procedure data than the NIS. KID data identified considerable volumes, with stable procedure rates for 1997–2009. Mean length of stay (MLOS) and inflation-adjusted costs and charges rose, but unadjusted mortality fell. Infants had higher procedure rates, mortality, MLOS, and costs than did 1- through 17-year-old patients. Medicaid's relative involvement increased. Uninsured patients (more than 10% of U.S. children) may have been under-represented. These findings merit further study.

**Darryl T. Gray, M.D., Sc.D., Kamal Pourmoghadam, M.D., Alan Hsu, B.A., Vivian Dicks, M.P.H., Jeffrey Jacobs, M.D., Jennifer Moore, M.P.H., Claudia Steiner, M.D., M.P.H., and Marshall Jacobs, M.D.**

## ***Reconciling Medical Expenditure Estimates from the Medical Expenditure Panel Survey and National Health Expenditure Accounts, 2007***

It is important to have reliable estimates of national health spending to be used as a baseline for analyzing the impact of policy changes on health care costs. In this study, we compare health care expenditure estimates from the Medical Expenditure Panel Survey (MEPS) and the National Health Expenditure Accounts (NHEA). Reconciling MEPS and NHEA estimates is an important quality-assurance exercise for improving and ensuring the integrity of each source's estimates. Reconciliation also provides a consistent baseline of health expenditure data for policy simulations. Based on the study results, analysts can adjust MEPS to be consistent with the NHEA so that the projected costs as well as budgetary and tax implications of any policy change are consistent with national health spending estimates. Although each source provides a measure of total national spending on personal health care, at first glance the estimates appear to diverge significantly. We made adjustments to account for the differences in underlying populations, covered services, and other measurement concepts to reconcile the expenditure estimates. Once we adjusted the NHEA to make it consistent with MEPS, we compared and discuss potential reasons for the differences for each service category and source of payment. We also discuss how the expenditure estimates have changed since the previous reconciliation in 2002. Identifying service types and sources of payment with larger gaps will help the Agency for Healthcare Research and Quality (AHRQ) and Centers for Medicare & Medicaid Services focus future research efforts aimed at improving expenditure estimates from the MEPS and NHEA. Furthermore, our findings will enable researchers to adjust the MEPS for underreporting so that the projected costs of any policy change will be consistent with national health spending estimates.

**Didem Bernard, Ph.D., Jessica Banthin, Ph.D., Tom Selden, Ph.D., Cathy Cowan, MBA, Liming Cai, Ph.D., Aaron Catlin, MSM, and Stephen Heffler, MBA**

## ***Refining the Definition of Carbon Monoxide Poisoning Identification Using Administrative Data***

In our previous study on this topic, we used the Healthcare Cost and Utilization Project Nationwide Inpatient Sample (NIS) to monitor carbon monoxide poisoning that is not related to a fire. During the course of this study, we identified several limitations to the standard International Classification of Diseases code-based definition of carbon monoxide poisoning. The purpose of the present analysis is to refine the definition of carbon monoxide poisoning based on administrative data. The Agency for Healthcare Research and Quality and the Centers for Disease Control and Prevention (CDC) will collaborate to use multiple years of the NIS and Nationwide Emergency Department Sample (NEDS) to test alternative definitions. If our hypotheses are correct, the results should assist the CDC in promulgating a new set of codes that can be used to identify carbon monoxide poisoning.

**Anne Elixhauser, Ph.D. and Fuyuen Yip, Ph.D.**

## ***Studies Using both Nationwide and State Databases***

### ***Estimating Influenza-Associated Hospitalizations in the U.S.***

AHRQ, in collaboration with researchers at the Centers for Disease Control and Prevention analyzed National Hospital Discharge Survey (NHDS) data to estimate the annual rates and numbers of influenza-associated hospitalizations from 1979–2001. This was the most recent

22-year period for which national influenza isolate data were available. Analytic models using respiratory and circulatory (R&C) hospitalizations as the outcome have shown significantly more influenza-associated hospitalizations than models using pneumonia and influenza (P&I) hospitalizations as the outcome. The objectives of this study are to: (1) use weekly Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID) to estimate numbers and rates of influenza-associated R&C hospitalizations for nine States contributing data during 1989–2010; (2) weight the State-level estimates of influenza-associated R&C hospitalizations to be nationally representative; (3) use monthly HCUP Nationwide Inpatient Sample (NIS) data to estimate the numbers and rates of influenza-associated R&C deaths; (4) compare the SID and NIS weighted national estimates of influenza-associated R&C hospitalizations to estimates of numbers and rates of influenza-associated R&C hospitalizations using the NHDS.

**William W. Thompson, Ph.D., Cori Ringholz, Ph.D., Holly Zhou, M.P.H., Ashley Fowlkes, M.P.H., Cecile Viboud, Ph.D., Lynnette Brammer, M.P.H., Claudia A. Steiner, M.D., M.P.H., Eileen Schneider, M.D., M.P.H., and David K. Shay, M.D., M.P.H.**

### ***Examine the Treatment of Severely Injured Children at Trauma and Non-Trauma Hospitals for the Emergency Medical Services for Children Program***

In 2011, the Agency for Healthcare Research and Quality (AHRQ) examined hospital utilization at trauma and non-trauma hospitals for severely injured children aged 10 years and younger. Four Healthcare Cost and Utilization Project (HCUP) databases were used for the analysis, with the study period from 2005-2008: Nationwide Inpatient Sample (NIS), Nationwide Emergency Department Sample (NEDS), State Inpatient Databases (SID), and State Emergency Department Databases (SEDD). Researchers of this study considered the nationwide prevalence of hospitalizations and emergency department visits for pediatric severe injuries and evaluated whether there are differences in the types of cases and type of care at trauma and non-trauma hospitals. AHRQ is summarizing the results into a manuscript. In 2012, AHRQ will update the analysis to include data from the 2009 NIS, NEDS, SID, and SEDD.

**Ryan L. Mutter, Ph.D. and Marguerite L. Barrett, M.S., and Chaya Merrill, DrPH**

### ***National Healthcare Quality and Disparities Reports (NHQR/NHDR) Special Analyses***

In support of the National Healthcare Quality Report (NHQR) and National Healthcare Disparities Report (NHDR), various Healthcare Cost and Utilization Project databases are being used for special analyses that are directed by the Agency for Healthcare Research and Quality (AHRQ). The 2008 HCUP State Inpatient Databases (SID) will be used to examine differences in hospital readmissions for congestive heart disease across States, income quartile, and race/ethnicity. The 2008–2009 HCUP Nationwide Inpatient Sample (NIS) and Nationwide Emergency Department Sample (NEDS) will be used to examine national and regional differences in inpatient and emergency department use for selected prevention quality indicators. The 2007 SID and State Emergency Department Databases (SEDD) for nine States with reliable person linkages and race/ethnicity data are being used to determine if hospital administrative data are a reasonable source for estimating rates of missed acute myocardial infarction diagnoses and if there is variation across types of hospital and patients; a separate study using the 2008 SID will examine the rate of missed diagnosis for stroke.

In response to recommendations by the Institute of Medicine (IOM), AHRQ charged Thomson Reuters with creating a User's Guide for the NHQR/NHDR Web sites (State Snapshots and NHQRDRnet), which is available at <http://statesnapshots.ahrq.gov/userguide/>. This product serves as an intermediary aid between the current Web sites and future integrated Web site. Thomson Reuters also used IOM recommendations and results of usability testing to design an

integrated Web product. The design focused on merging the NHQR/NHDR products into a cohesive health care quality story that was easily accessible to users. Thomson Reuters completed the design and mock-up in 2011. Development of the integrated site in 2012 is dependent on funding.

AHRQ continues to support activities to disseminate information to State policymakers and program officials about State use of patient race/ethnicity data to reduce disparities in health and health care quality. Information from this effort is available at [https://www.hcup-us.ahrq.gov/reports/r\\_e\\_disparities.jsp](https://www.hcup-us.ahrq.gov/reports/r_e_disparities.jsp). Finally, AHRQ asked Thomson Reuters to identify additional private and public data sources that might be useful in setting health care quality benchmarks. Thomson Reuters developed a benchmarking inventory and an online benchmarking database design in 2011.

**Ernest Moy, M.D., M.P.H., Anika Hines, Ph.D., and Marguerite L. Barrett, M.S.**

### ***Quality and Access to Care for Rural Populations***

Rural communities face health care challenges that are somewhat different from urban areas because of the distances to health care facilities, fewer health professionals and other health care resources per capita, and patient demographics. The Institute of Medicine (2005) report, *Quality through Collaboration - The Future of Rural Health*, noted that information on the quality of health care services in rural areas is sparse. The researchers of this project will examine differences between urban and rural populations in hospital mortality for selected conditions using Agency for Healthcare Research (AHRQ) and Quality Inpatient Quality Indicators (IQIs). The project primarily will use Healthcare Cost and Utilization Project (HCUP) statistics developed for the National Healthcare Quality Report. Thus, recent years of the State Inpatient Databases (SID) and the Nationwide Inpatient Sample (NIS) will be the source of data.

**Roxanne Andrews, Ph.D. and Claudia A. Steiner, M.D., M.P.H**

### **Ongoing Studies**

#### ***National Healthcare Quality and Disparities Reports (NHQR/NHDR) and State Snapshots***

Since 2003, the Agency for Healthcare Research and Quality (AHRQ) has produced a Congressionally-mandated annual report on health care quality in the United States. The National Healthcare Quality Report (NHQR) includes a broad set of measures that are used to monitor the nation's progress toward improved health care quality. Information is provided by numerous organizations, including the Centers for Disease Control and Prevention (CDC), the National Center for Health Statistics (NCHS), the Centers for Medicare & Medicaid Services (CMS), and AHRQ.

For the 2011 NHQR, Healthcare Cost and Utilization Project (HCUP) data were used, where appropriate, to report on inpatient care. The AHRQ Quality Indicators (QIs) were applied to the 1994, 1997, and 2000-2008 Nationwide Inpatient Sample (NIS). The 2000-2008 NIS was also used to report national statistics on subpopulations of patients (e.g., age, gender, urban-rural location, and median household income) and on hospital characteristics (e.g., ownership, teaching status, bed size, and urban-rural location). State-level statistics for selected AHRQ QIs were generated using the 2000, 2004, 2007, and 2008 SID. The State-level statistics included rates for HCUP Partners that volunteered to participate in the report.

For the 2012 NHQR, HCUP will contribute statistics generated from the 2009 HCUP databases. AHRQ will again release State-level reporting of QI rates for Partners that previously volunteered to participate in the report and for new participants.

AHRQ produces several derivative products from the NHQR statistics to highlight important issue areas and provide wider and more targeted dissemination of NHQR statistics. Some of these derivative products include HCUP statistics extracted from the working tables used to develop the report tables.

As part of a National effort to eliminate health care disparities, Congress directed AHRQ to produce an additional annual publication, the National Healthcare Disparities Report (NHDR). AHRQ developed the NHDR as a companion report to the NHQR and has published it with the annual NHQR since 2003. The NHDR documents and tracks racial/ethnic and socioeconomic disparities in the quality and access to care over time across rural, urban, and inner-city areas. HCUP is one of many data sources used for the NHDR.

For the 2011 NHDR, HCUP created analysis files using the 2001-2008 SID from up to 31 Partner States. These analysis files were used to create national estimates by race/ethnicity. Statistics are presented within race and include breakdowns by income categories, age, gender, urban-rural location, and expected primary payer. Through the 2007 report, the NHDR contained only national statistics based on HCUP data and did not include State-level reporting. Beginning with the 2008 report, AHRQ releases State-level rates by community income categories and race/ethnicity groups for HCUP Partners that volunteered to participate. For the 2012 NHDR, HCUP will contribute statistics generated from the 2009 HCUP SID.

As with the NHQR, AHRQ produces several derivative products from the NHDR to facilitate the dissemination of report findings. Some of these derivative products include HCUP statistics extracted from the report.

Beginning in 2004, AHRQ has used the information from the NHQR to produce annual Web-based State Resources for all 50 States and the District of Columbia, also known as State Snapshots. This Web site was designed to help promote health care quality awareness at the State and regional levels (<http://statesnapshots.ahrq.gov/>). The State Snapshots are dashboards of health care quality measures, illustrating States' strengths, weaknesses, and opportunities for improvement. At this time, it is undetermined whether the State Snapshots will be updated with information from the 2011 NHQR and NHDR.

**Rosanna M. Coffey, M.A., Ph.D., Marguerite L. Barrett, M.S., and Ernest Moy M.D., M.P.H**

### ***State Ambulatory Surgery Databases (SASD) Evaluation Reports***

The Healthcare Cost and Utilization Project (HCUP) completed the *Evaluation of the State Ambulatory Surgery Databases Available through the HCUP Central Distributor, 2009*, released in September of 2011. The purpose of this report, produced for each data year beginning with 1999, is to benchmark and provide insight into the data available in the HCUP SASD. The reports compare the SASD to information from the American Hospital Association (AHA) Annual Survey Database (for hospital-based ambulatory surgery).

There are two parts to the report: the Intramural SASD Comparison Report, which includes all States providing ambulatory surgery data to HCUP, and a Central Distributor version that includes all States whose SASD data is made available for purchase through the HCUP Central Distributor.

In late 2012, HCUP will release a State Ambulatory Surgery Database Evaluation Report for 2010 data. All Comparison Reports are available on the HCUP-US Web site as a part of the HCUP Methods Series; they can be accessed at <http://www.hcup-us.ahrq.gov/reports/methods.jsp>.

**Claudia A. Steiner, M.D., M.P.H, Pamela Owens, Ph.D., Mahil Senathirajah, M.B.A., Leslie Preti, B.S., and Clare Sun, M.S.**

## TRENDS FILES AND REVISIT ANALYSES

The following files derived from HCUP data are available to facilitate research:

### Nationwide Inpatient Sample Trends (NIS-Trends) Supplemental Files

The Nationwide Inpatient Sample Trends (NIS-Trends) Files are discharge-level files that provide the NIS data user with both the trend weights and data elements that are consistently defined across data years. The purpose of the NIS-Trends Files is to ease the burden on researchers conducting analyses that span multiple years and account for sample design changes. HCUP recommends using the trends files for NIS data years 1988-2002. The weights available beginning with the 2003 NIS are valid for trends analysis and require no adjustments.

### Kids' Inpatient Database Trends (KID-Trends) File

Beginning in 2000, KID weights calculations were changed in order to make national estimates of the number of discharges more accurate:

- Rehabilitation hospitals were excluded from the KID hospital universe and sample.
- American Hospital Association (AHA) hospital unit discharges were used instead of total facility discharges, which include nursing home unit discharges.

In order to facilitate analysis of trends using multiple years of KID data, an alternate set of KID discharge weights for the 1997 HCUP KID were developed. These alternate weights were calculated in the same way as the weights for the 2000 and later years of the KID. The KID-Trends file includes details regarding the alternate weights and other recommendations for trends analysis.

### HCUP Supplemental Variables for Revisit Analyses

The HCUP State databases are often characterized as being “discharge-level” files, meaning that each record in a database represents one discharge abstract from a hospital setting, which can be an inpatient, emergency department, or ambulatory surgery visit. Thus, if the same individual visited the hospital three times in a given year, the HCUP databases would include three separate records in the respective HCUP database. Many times researchers may be interested in knowing how many visits a distinct patient had rather than simply the number of overall hospital visits. In order to track an individual patient over time, it is necessary to have a unique identifier for an individual that remains consistent across different facilities and hospital settings in a State.

The HCUP Supplemental Files for Revisit Analyses can be used to track sequential visits for a patient within a State and across facilities and hospital settings (inpatient, emergency

department, ambulatory surgery) while adhering to strict privacy guidelines. These HCUP supplemental files contain the following:

- Synthetic person-level identifiers that have been verified against the patient's date of birth and gender and examined for completeness.
- A timing variable that can be used to determine the days between hospital events for an individual. Actual dates (admission, discharge, or birth) are not part of the supplemental files and are not needed.

Starting with 2009, the revisit variables are available directly on the SID, SASD, or SEDD.

## USING HCUP DATA IN CONJUNCTION WITH OTHER DATA SOURCES

To enhance the value of HCUP data as a research tool, AHRQ supplements the HCUP databases with information about hospital and community characteristics obtained from external sources. This augmentation is done for two reasons: 1) to create derivative data elements to enhance research value, and 2) to supplement information available to AHRQ intramural researchers and their contractors on specific, approved research projects. 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 from external data that are designed to supplement the data elements in the NIS, KID, and SID databases. The HCUP Cost-to-Charge Ratio (CCR) Files provide a conversion between the total charge information (representing the amount hospitals billed for services) and the cost for hospital services. CCR measures are available at the hospital-level and are developed using CMS Hospital Cost Report Data.

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 AHA Annual Survey Database, Area Resource File (ARF), Linkage to Urban/Rural Indicators, and ZIP-Code based data 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.

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

### American Hospital Association (AHA) Annual Survey Database

Annual linkage of the AHA Annual Survey 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 hospitals for the NIS, NEDS, 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. The resulting HCUP databases, with linkage to supplemental hospital characteristics, greatly enrich the discharge data for intramural research at AHRQ.

2. HCUP adds hospital information from the AHA Annual Survey Database to the NIS, NEDS, and KID. Where data organizations permit, this includes the AHA hospital identifier, hospital name, and address. The AHA hospital identifier is also included on the Central Distributor State databases, where data organizations permit. Approved research purposes, such as linking to other institutional information from non-HCUP data sets for analysis and aggregate statistical reporting, are permitted, though users of the HCUP data are prohibited from identifying individual facilities directly or by inference in disseminated material as a condition of use for any HCUP database. 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 and NEDS sampling frames from all community, non-rehabilitation hospitals in the SID that can be matched to the corresponding hospitals in the AHA Annual Survey Database. The NIS and NEDS are stratified probability samples of hospitals in the frame, with sampling probabilities calculated to select 20% of the universe contained in each stratum. To obtain nationwide estimates, HCUP develops discharge and hospital weights using the AHA universe as the standard. These are developed separately for hospital- and discharge-level analyses. Inclusion of the AHA identifier in the NIS and Central Distributor State data is at the discretion of the participating data organization. AHA identifiers are not included in the NEDS.

### [Area Resource File \(ARF\)](#)

Researchers may enhance the analytic capabilities of HCUP by linking the Area Resource File (ARF) to the HCUP databases. The ARF is a publicly available database containing county-level statistics on health care professions, hospitals and health care facilities, and population and environmental classifications. ARF's county level data can be linked to the HCUP databases, for example, yielding demographic data on patient county of residence or hospital county. The ARF is developed by the Health Resources and Services Administration's (HRSA) Bureau of Health Professions. It is not part of the HCUP databases; researchers are required to obtain the ARF separately.

### [The Centers for Medicare & Medicaid Services \(CMS\) Hospital Cost Report Data Files](#)

Using hospital identifiers, AHRQ links the cost information obtained from Hospital Cost Report data files collected by CMS to the intramural HCUP data to create the annual HCUP Cost-to-Charge Ratio (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, or KID databases.

## Hospital-Level and County-Level Data from the Centers for Medicare & Medicaid Services (CMS)

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

### Linkage to Urban/Rural Indicators

AHRQ also links files that provide measures of “urban character” or “rural character” of the patient residence or hospital location in the HCUP data. This includes the county-based Metropolitan Statistical Areas (MSA), Core-Based Statistical Areas (CBSA), Urban Influence Codes, and Rural Urban Continuum Codes. These codes are available through files maintained by the U.S. Census Bureau, U.S. Department of Agriculture, and the Health Resources and Services Administration (HRSA). Linkages to these files are made using the patient county or hospital county. Another urban-rural measure developed through linkage is the ZIP Code-based Rural Urban Commuting Areas available from the Washington, Wyoming, Alaska, Montana, Idaho (WWAMI) Rural Health Research Center. This linkage is made using the patient ZIP Code of residence or the hospital 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 non-core counties by population size. Population counts from the ZIP Code-level Claritas file are assigned to a county and then aggregated to the NCHS urban-rural designation. Both patient and hospital location are reported by NCHS designation.

Any patient ZIP Code linkage would conform to the same restrictions described below — the patient ZIP Code can be accessed only with approval of the HCUP Project Officer.

### National Association of Children's Hospitals and Related Institutions (NACHRI)

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

### Trauma Information Exchange Program (TIEP)

For certain intramural research projects, AHRQ may link hospital level data from the Trauma Information Exchange Program (TIEP) to HCUP SEDD and SID. Trauma level is also used as one of the stratifiers for the NEDS. The TIEP data is maintained by the American Trauma Society and the Johns Hopkins Center for Injury Research and Policy and receives 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).

## SDI Outpatient Surgery Centers Profiling Solution

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

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

For database development and specific, approved research, AHRQ links ZIP Code-based and county-based census data to the discharge 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.

When needed for linkage to the census data, the patient ZIP Code in the HCUP Data Development files can be accessed only with approval of the HCUP Project Officer. Census data linked to the discharge data are not included in any restricted access public release data, with the exception described below for the NIS, KID, and NEDS.

During construction of the HCUP NIS, KID, and NEDS, AHRQ uses the patient's ZIP Code to link to the ZIP Code-based Census data to create a derived data element on median income category for patient's ZIP Code (based on national distribution). This median is a set of four income categories designed to be broad enough to protect patient confidentiality. Ultimately, no category contains fewer than two ZIP Codes in a State.

## TECHNICAL SUPPORT TO HCUP USERS

Users of HCUP data, software tools, and products include health services researchers, policy makers, consumers, providers, and other constituent groups. They 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.

Technical Support staff 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 applications in areas of research and policy analysis. Technical Support to HCUP Users assists the public, government, and our HCUP Partners in the following ways:

1. Expand knowledge about HCUP via educational seminars, on-line tutorials, exhibit booths, and poster sessions.
2. Provide HCUP documentation on the HCUP-US Website that details methods for using HCUP databases, software tools, linkable files, and HCUPnet.
3. Produce a series of descriptive and analytic HCUP reports.
4. Identify peer-reviewed and lay publications based on HCUP resources.

5. Maintain a catalogue of available HCUP databases and products.
6. Explain ordering procedures and requirements for obtaining and using HCUP databases and methods of acquiring other HCUP products.

The HCUP-US Website (<http://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 Website.

As part of the Technical Support service, senior research personnel are available to answer questions regarding HCUP databases and the application of HCUP tools and products. Technical Support staff are trained in epidemiology, health services research, statistics, economics, and medicine. Senior programming staff are also available to advise on technical issues related to HCUP data and programs. The Technical Support staff may be reached through a dedicated toll-free telephone number and e-mail address:

- 1-866-290-HCUP
- [hcup@ahrq.gov](mailto:hcup@ahrq.gov)

Messages are reviewed daily, and the Technical Support team responds to inquiries within three business days.

#### **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 additional 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 technical support section of Benefits of Partnership provided with this Annual Activities Report.

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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 2012. We value and welcome your feedback and suggestions. Please contact Jenny Schnaier or Carol Stocks at AHRQ to share your comments or pose questions about the project.

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