

STATISTICAL BRIEF #142

September 2012

Post-Surgical Readmissions among Patients Living in the Poorest Communities, 2009

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Introduction

Over 15 million inpatient surgeries are performed annually representing over one-fourth of US hospitalizations and nearly half of inpatient costs.¹ Surgical patients experiencing postoperative complications² or inadequate follow-up care following discharge from the hospital may be readmitted. Evidence from the Medicare population indicates that there has been little improvement in national surgical 30-day readmissions in recent years.³ Although a recent analysis showed that surgical patients had a lower readmission rate than medical patients,⁴ general surgical readmissions are more frequently avoidable than general medical and geriatric readmissions,⁵ so preventing surgical readmission represents an opportunity to improve the quality of care for patients and reduce hospital costs.

This Statistical Brief examines readmissions for 10 high volume surgeries and focuses on differences by the income level of the patient's community. Low income individuals are a vulnerable population who often face problems in accessing health care and, on average, do not receive as high quality care as higher income individuals.⁶ Examining differences in readmission rates for this population provides valuable information that may be used to target efforts and research to improve post-surgical outcomes.

Highlights

- Readmission rates varied across 10 high volume surgeries, from 2.0 percent for Cesarean section to 15.7 percent for coronary artery bypass surgery (CABG).
- Costs associated with readmissions were generally lower than the costs of the original (index) admission. The exceptions were for Cesarean section and hysterectomy, where the costs of readmissions were 10 to 20 percent higher than the index admission.
- Readmission rates were consistently higher for patients residing in the poorest communities than for patients residing in the richest communities for all 10 surgical procedures examined. The biggest differences—the readmission rate was 60 percent higher for patients residing in low income communities for Cesarean section and nearly 30 percent higher for hip replacement.
- Eight of the ten surgical procedures had at least a 10 percent higher readmission rate for patients from low income communities than for patients from high income communities. The smallest differences in readmission rates by community income level were observed for CABG and treatment, fracture, or dislocation of hip and femur.

¹ Elixhauser A, Andrews RM. Profile of inpatient operating room procedures in US hospitals in 2007. *Arch Surg.* 2010 Dec;145(12):1201-8.

² Kassir MT, Owen RM, Perez SD, Leeds I, Cox JC, Schnier K, Sadiraj V, Sweeney JF. Risk Factors for 30-Day Hospital Readmission among General Surgery Patients. *J Am Coll Surg.* 2012 Sep;215(3):322-30.

³ Dartmouth Atlas. Post-acute care. Retrieved from <http://www.dartmouthatlas.org/data/topic/topic.aspx?cat=30>. (Accessed September 12, 2012).

⁴ Podulka, J, Barrett, M., Jiang, HJ, and Steiner, C. 30-Day Readmissions following Hospitalizations for Chronic vs. Acute Conditions, 2008. HCUP Statistical Brief #127. February 2012. Agency for Healthcare Research and Quality, Rockville, MD. Available at <http://www.hcup-us.ahrq.gov/reports/statbriefs/sb127.pdf>. (Accessed September 12, 2012).

⁵ Clarke A. Are readmissions avoidable? *BMJ.* 1990 Nov 17;301(6761):1136-8.

⁶ Agency for Healthcare Research and Quality. National Healthcare Disparities Report, 2011. AHRQ Publication No. 12-0006. March 2012. www.ahrq.gov/qual/qdr11.htm.

This Statistical Brief provides all-payer, national estimates of surgical readmissions within 30 days for any cause for the following high volume procedures: appendectomy, cesarean section (C-section), coronary artery bypass graft (CABG), abdominal and vaginal hysterectomy, percutaneous coronary angioplasty (PTCA), hip replacement, knee replacement, laminectomy (excision of intervertebral disc), spinal fusion, and treatment of fracture or dislocation of the hip and femur. To provide some context for these surgical hospitalizations, the Statistical Brief includes statistics for hospitalizations for 3 common medical conditions that typically do not involve surgery during the hospital stay.

The readmission rate is defined as a subsequent hospital admission within 30 days following an original (or index) admission that occurs between January and November 2009. Readmissions are tracked across the same or different hospitals within a 30 day period. Information is presented on the number of index stays, cost of index stays, percentage of readmissions and cost of readmissions. Differences in post-surgical readmissions are presented for patients residing in low income as compared to high income communities, as measured by the lowest and highest quartiles of median household income of the patient's ZIP Code. Differences noted in the text are at least 10 percent.

Findings

Table 1 lists 10 high volume surgeries that accounted for 5,075,500 index stays during January through November in 2009 (table 1), accounting for about one-third of all inpatient surgeries. Readmission rates varied by procedure, from 2.0 percent for C-sections to 15.7 percent for CABG (also shown in figure 1). The readmission rates for the 3 common medical conditions were generally higher however, ranging from 15.3 percent for pneumonia to 25.1 percent for congestive heart failure (CHF).

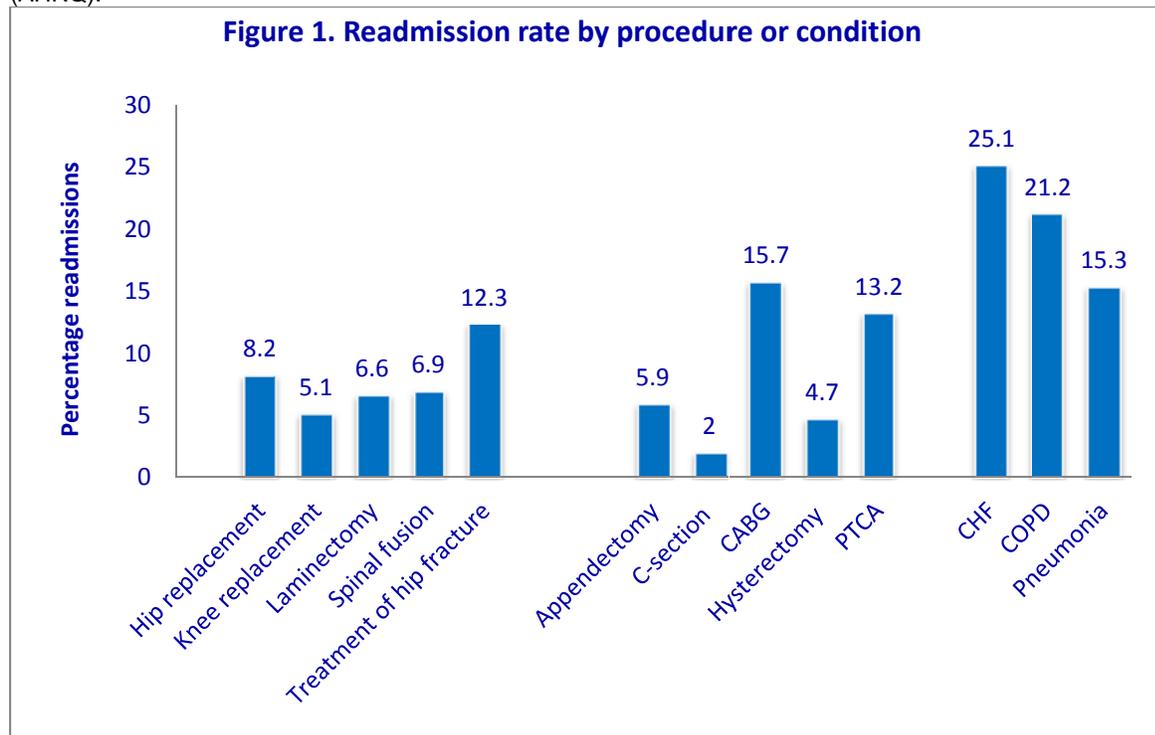
Costs associated with readmissions varied by procedure, and with a few exceptions, were lower than the cost of the index stay. Average costs associated with readmission were 10–20 percent higher than the index stay for only 2 procedures—hysterectomy and C-section. In contrast, average costs of readmission associated with the 3 common medical conditions were higher than index stay costs.

Average costs associated with readmissions were lowest for C-section (\$6,600) and highest for laminectomy and spinal fusion (\$13,400). The costs of readmissions following orthopedic procedures ranged from \$10,200 (knee replacement) to \$13,400 (spinal fusion). The average costs of readmissions following non-orthopedic procedures ranged from \$6,600 (C-section) to \$13,200 (CABG). The average costs of readmissions following common medical conditions ranged from \$11,200 (COPD) to \$13,000 (CHF and pneumonia).

Table 1. Readmissions within 30 days by surgical procedure and common medical conditions, 2009

	Index stays		Readmitted within 30 days for any cause	
	Number	Mean cost per stay	Percentage readmitted	Mean cost per stay
Orthopedic procedure				
Hip replacement	411,700	\$18,500	8.2%	\$12,300
Knee replacement	611,900	\$16,500	5.1%	\$10,200
Laminectomy	453,900	\$21,100	6.6%	\$13,400
Spinal fusion	414,200	\$29,900	6.9%	\$13,400
Treatment of fracture or dislocation of hip and femur	285,000	\$20,600	12.3%	\$12,900
Non-orthopedic procedure				
Appendectomy	322,400	\$11,200	5.9%	\$10,800
Cesarean section (C-section)	1,249,700	\$5,400	2.0%	\$6,600
Coronary artery bypass graft (CABG)	251,600	\$42,000	15.7%	\$13,200
Hysterectomy	448,200	\$8,500	4.7%	\$9,400
Percutaneous coronary angioplasty (PTCA)	626,900	\$20,100	13.2%	\$11,600
Common medical condition				
Congestive heart failure (CHF)	870,400	\$11,100	25.1%	\$13,000
Chronic obstructive pulmonary disease (COPD)	626,300	\$7,700	21.2%	\$11,200
Pneumonia	973,900	\$9,600	15.3%	\$13,000

Source: Weighted national estimates from a readmissions analysis file derived from the Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID), 2009, Agency for Healthcare Research and Quality (AHRQ).



Source: Weighted national estimates from a readmissions analysis file derived from the Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID), 2009, Agency for Healthcare Research and Quality (AHRQ).

Post-surgical readmissions by community income

As shown in table 2, readmission rates for 10 high volume surgeries for patients residing in the poorest communities ranged from 2.4 percent (C-section) to 16.2 percent (CABG), while readmission rates for patients residing in the richest communities ranged from 1.5 percent (cesarean section) to 15.7 percent (CABG).

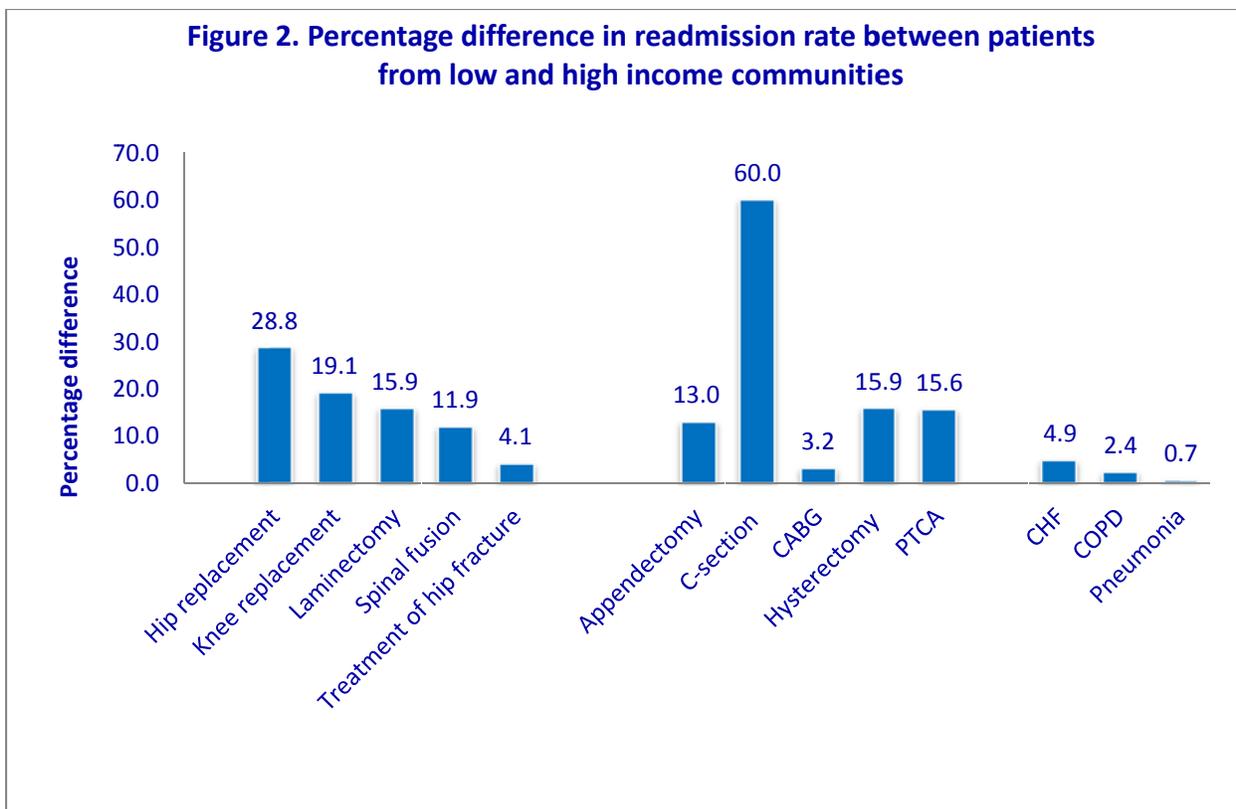
With the exception of CABG and treatment for hip or femur fracture, readmission rates for individuals residing in low income communities were at least 10 percent higher than those residing in high income communities. Notably, readmission rates for patients from low income communities were 60 percent higher for C-sections (though the readmission rates for both were very low at less than 3 percent) and nearly 30 percent higher for hip replacement when compared to the highest income communities. Other notable differences in readmission rates were for knee replacement (19 percent higher for patients in low income communities), hysterectomy (16 percent higher), laminectomy (16 percent higher), PTCA (16 percent higher), appendectomy (13 percent higher), and spinal fusion (12 percent higher) (figure 2).

Table 2. Readmissions within 30 days by community income, 2009

	Low-income		High-income	
	Number of Stays	Percentage readmitted	Number of Stays	Percentage readmitted
Orthopedic procedure				
Hip replacement	96,600	9.4%	96,900	7.3%
Knee replacement	150,100	5.6%	128,600	4.7%
Laminectomy	112,000	7.3%	94,600	6.3%
Spinal fusion	107,800	7.5%	78,600	6.7%
Treatment of fracture or dislocation of hip and femur	79,600	12.6%	55,700	12.1%
Non-orthopedic procedure				
Appendectomy	82,200	6.1%	73,900	5.4%
Cesarean section (C-section)	358,700	2.4%	256,700	1.5%
Coronary artery bypass graft (CABG)	70,900	16.2%	44,400	15.7%
Hysterectomy	118,200	5.1%	94,300	4.4%
Percutaneous coronary angioplasty (PTCA)	184,300	14.1%	116,500	12.2%
Common medical condition				
Congestive heart failure (CHF)	312,300	25.9%	141,300	24.7%
Chronic obstructive pulmonary disease (COPD)	238,100	21.6%	82,800	21.1%
Pneumonia	350,600	15.3%	148,800	15.2%

Source: Weighted national estimates from a readmissions analysis file derived from the Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID), 2009, Agency for Healthcare Research and Quality (AHRQ)

Figure 2. Percentage difference in readmission rate between patients from low and high income communities



Source: Weighted national estimates from a readmissions analysis file derived from the Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID), 2009, Agency for Healthcare Research and Quality (AHRQ)

Data Source

The estimates in this Statistical Brief are based upon a readmission analysis file that was created using the HCUP State Inpatient Databases (SID) from 16 States (AR, CA, FL, GA, HI, LA, MA, MO, NE, NH, NM, NY, SC, TN, UT, and WA) with reliable, verified synthetic patient identifiers that can be used to track a person across hospitals within a State. These 16 States were geographically dispersed and account for 43 percent of the total U.S. resident population and 42 percent of the total U.S. hospitalizations. The study population in this readmission analysis file included discharges from community, non-rehabilitation, non-specialty hospitals. Weights for national estimates were developed using post-stratification on hospital characteristics (Census region, urban-rural location, teaching capabilities, bed size, and control/ownership) and patient age groups. The readmission analysis file included 12.7 million unweighted discharges.

Procedures, ICD-9-CM, and Clinical Classifications Software (CCS)

ICD-9-CM is the International Classification of Diseases, Ninth Revision, Clinical Modification, which assigns numeric codes to procedures. There are about 4,000 ICD-9-CM procedure codes.

CCS categorizes ICD-9-CM procedure codes into clinically meaningful categories.⁷ This "clinical grouper" makes it easier to quickly understand patterns of procedure use.

This Statistical Brief examines all-listed operating room (OR) procedures. Only one occurrence of a CCS category was counted per index stay because multiple codes may be used for related procedures during a single operation. OR procedures were defined using procedure classes, which categorize each ICD-9-

⁷HCUP Clinical Classifications Software (CCS). Healthcare Cost and Utilization Project (HCUP). U.S. Agency for Healthcare Research and Quality, Rockville, MD. Available at <http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp>. Updated March 2012. (Accessed September 12, 2012).

CM procedure code as either major therapeutic, major diagnostic, minor therapeutic or minor diagnostic. Major procedures are valid OR procedures according to the Diagnosis-Related Groups as determined by physician panels who classify procedure codes based on whether the procedure would be performed in an OR in most hospitals.

Diagnoses, ICD-9-CM, and Clinical Classifications Software (CCS)

ICD-9-CM is the International Classification of Diseases, Ninth Revision, Clinical Modification, which assigns numeric codes to diagnoses. There are about 14,000 ICD-9-CM diagnosis codes. CCS categorizes ICD-9-CM diagnoses into a manageable number of clinically meaningful categories. This "clinical grouper" makes it easier to quickly understand patterns of diagnoses.

The diagnoses examined in this Statistical Brief are based on the CCS for the principal diagnosis. The principal diagnosis is that condition established after study to be chiefly responsible for the patient's admission to the hospital. Secondary diagnoses are concomitant conditions that coexist at the time of admission or that develop during the stay.

Readmission

The 30-day readmission rate is defined as the number of admissions for each procedure (as defined above) for which there was at least one subsequent hospital admission within 30 days divided by the total number of admissions between January and November 2009. That is, when a patient is discharged from the hospital following one of the specified surgeries, they are followed for 30 days in the data. If any readmission to the same or different hospital occurs during this time period, the admission is counted as having a readmission. No more than one readmission is counted within the 30-day period since the outcome measure assessed here is "percentage of admissions who are readmitted." If a patient was transferred to a different hospital on the same day or was transferred within the same hospital, the two events were combined as a single stay and the second event was not counted as a readmission. That is, transfers were not considered a readmission. In the case of admissions for which there was more than one readmission in the 30-day period, the data presented in this Statistical Brief reflect the characteristics and costs of the first readmission.

Every qualifying hospital stay with the specified procedure is counted as a separate index (starting point) admission. Thus a single patient can be counted multiple times during the course of the January to November observation period. In addition, index admissions do not require a prior "clean period" with no hospitalizations; that is, a hospital stay may be both a readmission for a prior stay and the index admission for a subsequent readmission. Admissions were disqualified from the analysis as index admissions if they could not be followed for 30 days for one of the following reasons: (1) admissions in which the patient died in the hospital, (2) admissions missing information on length of stay, and (3) admissions discharged in December of 2009.

Types of hospitals included in HCUP

HCUP is based on data from community hospitals, defined as short-term, non-Federal, general and other hospitals, excluding hospital units of other institutions (e.g., prisons). Excluded are long-term care, rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals. The readmission analysis file used for this Statistical Brief also excludes specialty hospitals such as obstetrics-gynecology, cancer, cardiac, orthopedic, surgical, ear-nose-throat, and other specialty hospitals because these hospitals have unique patient mix and a disproportionately large number of out-of-state patients.

Costs and charges

Total hospital charges were converted to costs using HCUP Cost-to-Charge Ratios based on hospital accounting reports from the Centers for Medicare & Medicaid Services (CMS).⁸ Costs will reflect the actual expenses incurred in the production of hospital services, such as wages, supplies, and utility costs; charges represent the amount a hospital billed for the case. For each hospital, a hospital-wide cost-to-

⁸HCUP Cost-to-Charge Ratio Files (CCR). Healthcare Cost and Utilization Project (HCUP). 2001–2009. U.S. Agency for Healthcare Research and Quality, Rockville, MD. Available at <http://www.hcup-us.ahrq.gov/db/state/costtocharge.jsp>. Updated August 2011. (Accessed September 12, 2012).

charge ratio is used. Hospital charges reflect the amount the hospital billed for the entire hospital stay and do not include professional (physician) fees. For the purposes of this Statistical Brief, costs are reported to the nearest hundred.

Median community-level income

Median community-level income is the median household income of the patient's ZIP Code of residence. The cut-offs for the quartile designation are determined using ZIP Code demographic data obtained from Claritas. The income quartile is missing for homeless and foreign patients.

About HCUP

HCUP is a family of powerful health care databases, software tools, and products for advancing research. Sponsored by the Agency for Healthcare Research and Quality (AHRQ), HCUP includes the largest all-payer encounter-level collection of longitudinal health care data (inpatient, ambulatory surgery, and emergency department) in the United States, beginning in 1988. HCUP is a Federal-State-Industry Partnership that brings together the data collection efforts of many organizations—such as State data organizations, hospital associations, private data organizations, and the Federal government—to create a national information resource.

HCUP would not be possible without the contributions of the following data collection Partners from across the United States:

Alaska State Hospital and Nursing Home Association
Arizona Department of Health Services
Arkansas Department of Health
California Office of Statewide Health Planning and Development
Colorado Hospital Association
Connecticut Hospital Association
Florida Agency for Health Care Administration
Georgia Hospital Association
Hawaii Health Information Corporation
Illinois Department of Public Health
Indiana Hospital Association
Iowa Hospital Association
Kansas Hospital Association
Kentucky Cabinet for Health and Family Services
Louisiana Department of Health and Hospitals
Maine Health Data Organization
Maryland Health Services Cost Review Commission
Massachusetts Division of Health Care Finance and Policy
Michigan Health & Hospital Association
Minnesota Hospital Association
Mississippi Department of Health
Missouri Hospital Industry Data Institute
Montana MHA - An Association of Montana Health Care Providers
Nebraska Hospital Association
Nevada Department of Health and Human Services
New Hampshire Department of Health & Human Services
New Jersey Department of Health
New Mexico Department of Health
New York State Department of Health
North Carolina Department of Health and Human Services
Ohio Hospital Association
Oklahoma State Department of Health
Oregon Association of Hospitals and Health Systems
Oregon Health Policy and Research
Pennsylvania Health Care Cost Containment Council
Rhode Island Department of Health

South Carolina State Budget & Control Board
South Dakota Association of Healthcare Organizations
Tennessee Hospital Association
Texas Department of State Health Services
Utah Department of Health
Vermont Association of Hospitals and Health Systems
Virginia Health Information
Washington State Department of Health
West Virginia Health Care Authority
Wisconsin Department of Health Services
Wyoming Hospital Association

About the SID

The HCUP State Inpatient Databases (SID) are hospital inpatient databases from data organizations participating in HCUP. The SID contains the universe of the inpatient discharge abstracts in the participating HCUP States, translated into a uniform format to facilitate multistate comparisons and analyses. Together, the SID encompasses 95 percent of all U.S. community hospital discharges in 2009. The SID can be used to investigate questions unique to one State; to compare data from two or more States; to conduct market area variation analyses; and to identify State-specific trends in inpatient care utilization, access, charges, and outcomes.

For More Information

For more information about HCUP, visit <http://www.hcup-us.ahrq.gov/>.

For additional HCUP statistics, including statistics on readmissions, visit HCUPnet, our interactive query system, at <http://hcupnet.ahrq.gov/>.

For information on other hospitalizations in the United States, download *HCUP Facts and Figures: Statistics on Hospital-Based Care in the United States in 2009*, located at <http://www.hcup-us.ahrq.gov/reports.jsp>.

For more information on the SID and using HCUP files to examine readmissions, please refer to the following publications:

Introduction to the HCUP State Inpatient Databases. Online. September 2011. U.S. Agency for Healthcare Research and Quality. Available at http://hcup-us.ahrq.gov/db/state/siddist/Introduction_to_SID.pdf. (Accessed September 12, 2012).

Overview of the HCUP Supplemental Files for Revisit Analyses. Available at <http://www.hcup-us.ahrq.gov/toolsoftware/revisit/revisit.jsp>. (Accessed September 12, 2012).

For additional details on this analysis of readmissions see *HCUP Standard for Readmission Analyses: A Guide to Studying Readmissions Using HCUP State Files* at <http://hcupnet.ahrq.gov/HCUPnet.app/HCUP%20Standard%20for%20Readmission%20Analyses.pdf?JS=Y>. (Accessed September 12, 2012).

Suggested Citation

Qasim M, Andrews RM. *Post-Surgical Readmissions among Patients Living in the Poorest Communities, 2009*. HCUP Statistical Brief #142. September 2012. Agency for Healthcare Research and Quality, Rockville, MD. Available at <http://www.hcup-us.ahrq.gov/reports/statbriefs/sb142.pdf>.

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AHRQ welcomes questions and comments from readers of this publication who are interested in obtaining more information about access, cost, use, financing, and quality of health care in the United States. We also invite you to tell us how you are using this Statistical Brief and other HCUP data and

tools, and to share suggestions on how HCUP products might be enhanced to further meet your needs. Please e-mail us at hcup@ahrq.gov or send a letter to the address below:

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