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Trends in Potentially Preventable Inpatient Hospital Admissions and Emergency Department Visits

Kathryn R. Fingar, Ph.D., M.P.H., Marguerite L. Barrett, M.S., Anne Elixhauser, Ph.D., Carol Stocks, Ph.D., R.N., and Claudia A. Steiner, M.D., M.P.H.

Introduction

Reducing potentially preventable hospitalizations is important for increasing quality of care and containing hospital costs. Medical conditions such as asthma, urinary tract infections, and complications of diabetes are considered *ambulatory care sensitive conditions*, meaning that when those conditions are present, primary or preventive health care can reduce the need for emergency department (ED) visits and inpatient hospitalization. From 2000 through 2012, the rate of potentially preventable hospitalizations among adults aged 18 years and older decreased by 25 percent.[1]

Although the decrease in potentially preventable hospitalizations could reflect improvements in access to quality ambulatory care, it also may be an artifact of an overall decrease in inpatient admissions in recent years. The total rate of inpatient hospital stays decreased by 0.3 percent per year from 2003 through 2008 and by 1.9 percent per year from 2008 through 2012.[2] The Great Recession, which officially began in December 2007, was associated with a decrease in inpatient stays as unemployment increased and access to health insurance decreased.[3] For those who had health insurance during the Recession, copayments and deductibles increased.[4]

Recent initiatives that penalize hospitals for high readmission rates are leading to more scrutiny over potentially preventable

Highlights

- The rate of potentially preventable adult inpatient (IP) stays decreased 19 percent between 2005 and 2012, from 1,941 to 1,582 stays per 100,000 population—more than twice the decrease in rate of all adult IP stays.
- This decrease in potentially preventable IP stays among adults was greater for acute conditions (25 percent) than for chronic conditions (14 percent).
- Although the rate of potentially preventable IP stays decreased, the rate of treat-and-release emergency department (ED) visits for the same conditions increased from 2008 through 2012 by 11 percent (from 2,350 to 2,618 visits per 100,000 population).
- From 2008 through 2012, potentially preventable IP stays decreased and ED visits increased for chronic obstructive pulmonary disease (12 percent IP decrease, 12 percent ED increase) and uncontrolled diabetes (25 percent IP decrease, 32 percent ED increase).
- During the same 5-year period, the rate of potentially preventable IP stays decreased 31 percent for dehydration, 15 percent for bacterial pneumonia, 14 percent for congestive heart failure, and 15 percent for asthma. The rate of treat-and-release ED visits for these conditions remained stable.
- The rate of treat-and-release ED visits increased 17 percent for urinary tract infection and 23 percent for hypertension, while the rate of IP stays for these conditions remained stable.
- Rates of IP stays and treat-and-release ED visits for diabetes with short-term complications both increased more than 20 percent.

[1] U.S. Department of Health & Human Services, Health System Measurement Project. Rate of Hospitalization for Ambulatory Care-Sensitive Conditions per 100,000 People as Defined by the Prevention Quality Indicator Composite for Adults (18+). 2012. https://healthmeasures.aspe.hhs.gov/measure/3a. Accessed September 10, 2015.
[2] Weiss AJ, Elixhauser A. Overview of Hospital Stays in the United States, 2012. HCUP Statistical Brief #180. October 2014. Agency for Healthcare Research and Quality, Rockville, MD. http://www.hcup-us.ahrq.gov/reports/statbriefs/sb180-Hospitalizations-United-States-2012.pdf. Accessed July 17, 2015.
[3] Sussman JB, Halasyamani LK, Davis MM. Hospitals during recession and recovery: vulnerable institutions and quality at risk. Journal of Hospital Medicine. 2010;5(5):302–5.
[4] Frontstin P. The Impact of the Recession on Employment-Based Health Coverage. EBRI Issue Brief #342. May 2010. Employee Benefit Research Institute, Washington, DC.

hospitalizations.[5] EDs and observation services play an important role in evaluating whether hospitalization is necessary. Although overall inpatient hospital stays have declined, increasingly patients are being seen in EDs and placed under observation, which may result in more individuals being discharged home rather than admitted as an inpatient.[6,7] From 2006 through 2012, the total rate of ED visits, including those that resulted in the patient being treated and released and those that resulted in the patient being admitted to the hospital, increased by 5 percent from 40,200 to 42,100 per 100,000 population.[8]

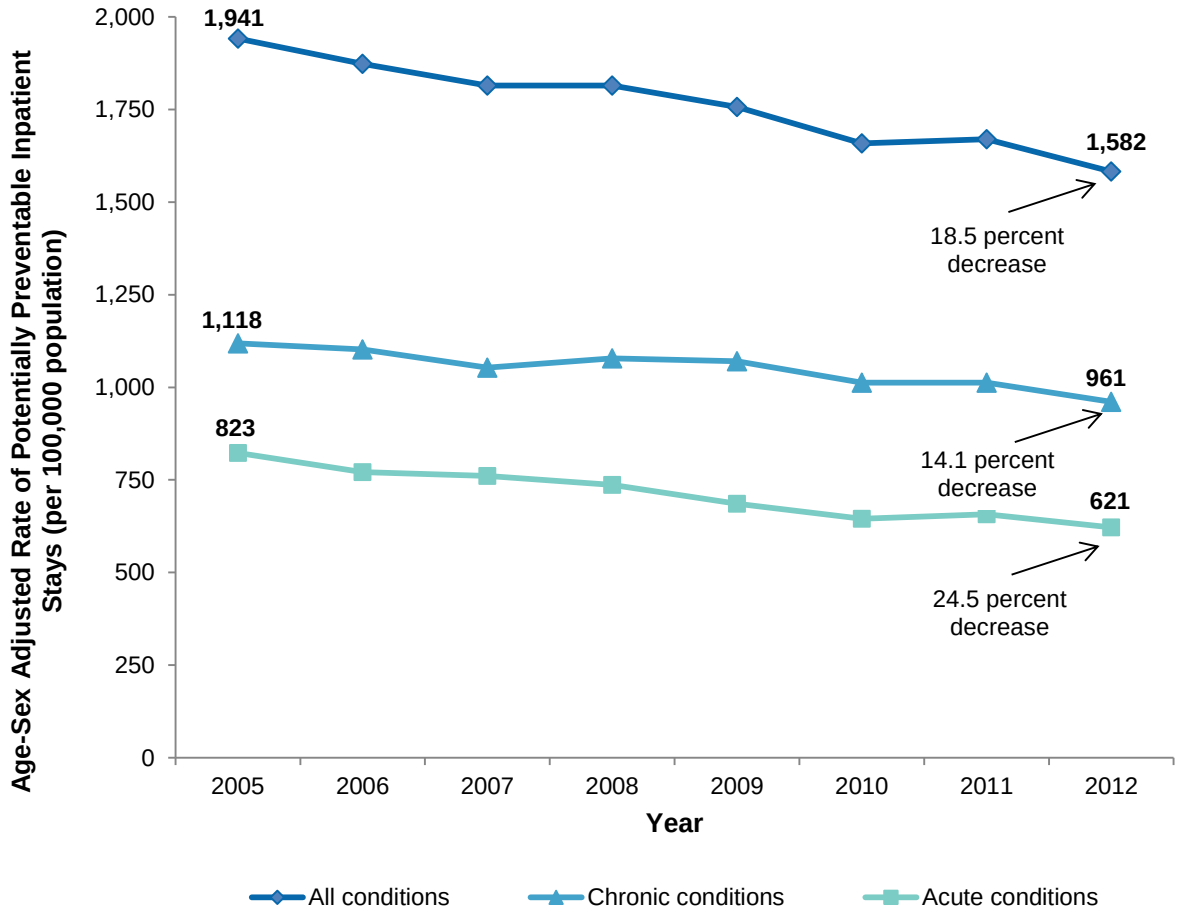
This Healthcare Cost and Utilization Project (HCUP) Statistical Brief presents rates of potentially preventable inpatient hospital stays from 2005 through 2012 and rates of potentially preventable ED visits that did not result in inpatient admission (i.e., *treat-and-release visits*) from 2008 through 2012. Potentially preventable stays and ED visits were estimated using the Agency for Healthcare Research and Quality (AHRQ) Prevention Quality Indicators (PQIs) software version 4.4. We examined the rate of potentially preventable inpatient stays for all conditions and for acute and chronic conditions grouped together. We also examined potentially preventable stays and visits for each underlying individual condition separately. Rates of potentially preventable hospitalizations and ED visits are age-sex adjusted and calculated among adults aged 18 years and older. Because the PQIs are defined using the first-listed diagnosis, they exclude records that fall in the maternal/neonatal service line that have a pregnancy-related first-listed diagnosis. For comparison, we present age-sex adjusted rates of total inpatient stays and treat-and-release ED visits, which also were calculated among adults aged 18 years and older and exclude records that fall in the maternal/neonatal service line. Only differences greater than 10 percent are noted in the text.

[5] Minott J. Reducing Hospital Readmissions. 2008. Washington, DC: Academy Health. http://www.academyhealth.org/files/publications/ReducingHospitalReadmissions.pdf. Accessed July 17, 2015.
[6] Morganti-Gonzalez K, Baufman S, Blanchard J, Abir M, Iyer N, Smith A, et al. The Evolving Role of Emergency Departments in the United States. RAND Corporation Research Report Series RR-280-ACEP. Santa Monica, CA: Rand Corporation; May 2013.
[7] Venkatesh AK, Geisler BP, Gibson Chambers JJ, Baugh CW, Bohan JS, et al. Use of Observation Care in US Emergency Departments, 2001 to 2008. PLoS ONE. 2011;6(9):e24326.
[8] Skinner H, Blanchard J, Elixhauser A. Trends in Emergency Department Visits, 2006–2011. HCUP Statistical Brief #179. September 2014. Agency for Healthcare Research and Quality, Rockville, MD. http://www.hcup-us.ahrq.gov/reports/statbriefs/sb179-Emergency-Department-Trends.pdf. Accessed July 17, 2015.

Findings

Trends in potentially preventable hospital inpatient stays, 2005–2012
Figure 1 presents the age-sex adjusted rate of potentially preventable inpatient stays among adults aged 18 years and older, for all conditions and for acute and chronic conditions separately, from 2005 through 2012.

Figure 1. Age-sex adjusted rate of potentially preventable inpatient stays among adults aged 18 years and older, overall and for acute and chronic conditions, 2005–2012



Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Inpatient Sample (NIS), 2005–2011; State Inpatient Databases (SID), 2012, weighted to provide national estimates using the same methodology as the 2005–2011 NIS; and the AHRQ Quality Indicators, version 4.4

- **The rate of potentially preventable inpatient stays for all conditions decreased by 19 percent from 2005 through 2012, with the largest decline among stays with acute conditions (by 25 percent).**

  The rate of potentially preventable inpatient stays for all conditions among adults aged 18 years and older decreased by 18.5 percent, from 1,941 stays per 100,000 population in 2005 to 1,582 stays per 100,000 population in 2012. Compared with potentially preventable stays for chronic conditions, those for acute conditions decreased more, by 24.5 percent, from 823 stays per 100,000 population in 2005 to 621 stays per 100,000 population in 2012. In comparison, the rate of potentially preventable inpatient stays for chronic conditions decreased by 14.1 percent, from 1,118 to 961 stays per 100,000 population.

Table 1 presents the cumulative change in the rate of all nonmaternal inpatient hospital stays among adults aged 18 years and older from 2005 through 2012, by hospital service line, compared with potentially preventable stays for acute and chronic conditions.

Table 1. Age-sex adjusted rate of nonmaternal inpatient hospital stays among adults aged 18 years and older, by hospital service line, compared with potentially preventable stays, 2005–2012

Type of inpatient stay	Age-sex adjusted rate per 100,000 population			% change in rate		
	2005	2008	2012	2005–2008	2008–2012	2005–2012
All nonmaternal inpatient stays by service line						
Total	12,303	12,227	11,385	–0.6	–6.9	–7.5
Medical	7,382	7,291	6,913	–1.2	–5.2	–6.4
Surgical	3,466	3,421	2,980	–1.3	–12.9	–14.0
Mental health	752	780	799	3.7	2.5	6.3
Injury	701	707	681	0.9	–3.7	–2.8
Potentially preventable inpatient stays						
All conditions	1,941	1,815	1,582	–6.5	–12.8	–18.5
Acute conditions	823	736	621	–10.5	–15.6	–24.5
Chronic conditions	1,118	1,078	961	–3.6	–10.9	–14.1

Notes: Each discharge was assigned to a single hospital service line hierarchically, based on the following order: maternal and neonatal (excluded), mental health, injury, surgical, and medical. All nonmaternal inpatient stays include potentially preventable stays.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Inpatient Sample (NIS), 2005 and 2008; State Inpatient Databases (SID), 2012, weighted to provide national estimates using the same methodology as the 2005 and 2008 NIS; and the AHRQ Quality Indicators, version 4.4

- **Potentially preventable inpatient stays decreased at a faster rate than inpatient stays overall.**

  From 2005 through 2012, the 18.5 percent decrease in the rate of potentially preventable inpatient stays for all conditions among adults aged 18 years and older was more than 2 times greater than the 7.5 percent decrease in the total rate of nonmaternal adult inpatient stays.

- **The decrease in the rate of all inpatient stays was largest for surgical stays.**

  For inpatient stays by service line, surgical was the only service line that decreased by more than 10 percent from 2005 through 2012. From 2005 through 2012, surgical inpatient stays among adults aged 18 years and older decreased by 14.0 percent, from 3,466 to 2,980 per 100,000 population. Mental health was the only service line for which inpatient stays increased during this time period, although not by more than 10 percent.

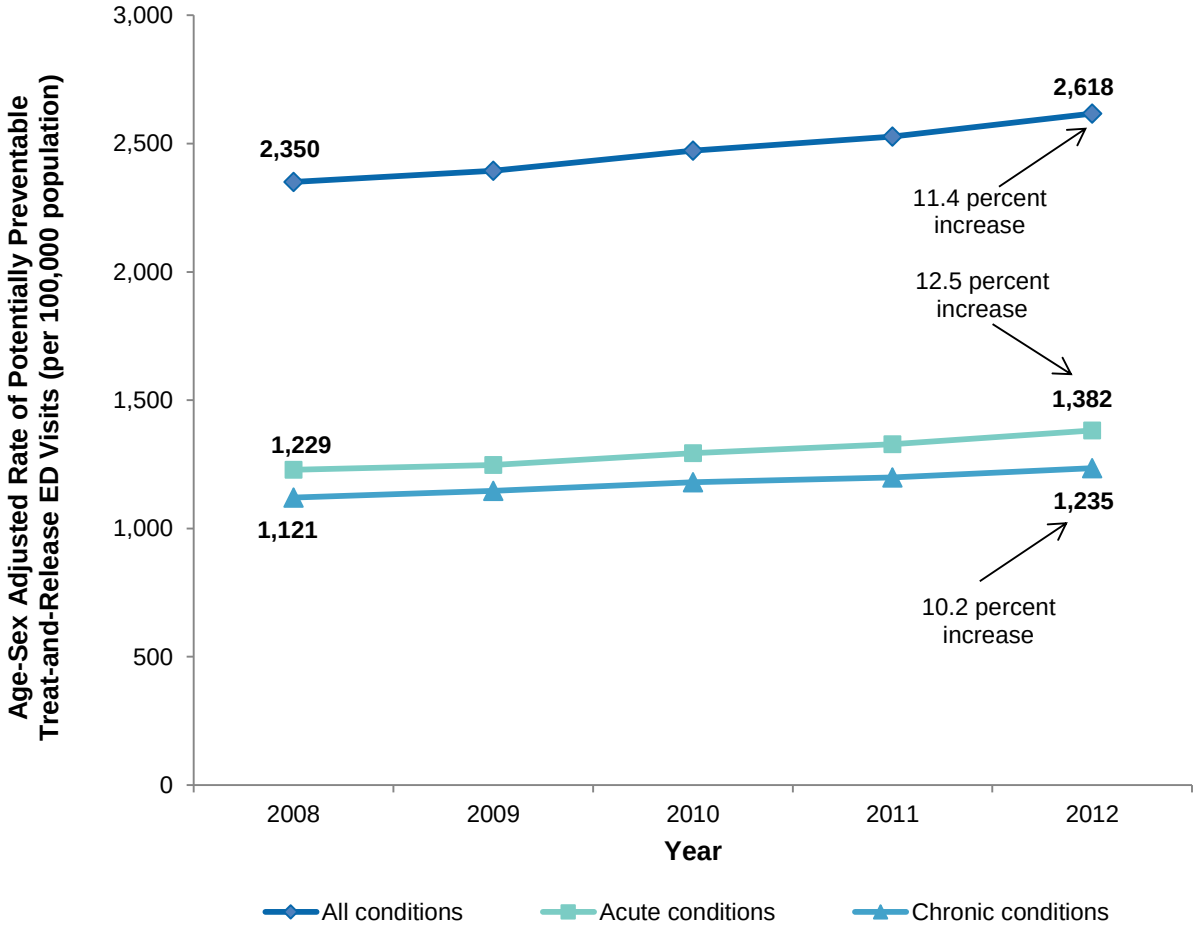
- **The rate of potentially preventable inpatient stays decreased more quickly after 2008.**

  The rate of potentially preventable inpatient stays for all conditions remained relatively stable from 2005 through 2008, decreasing by less than 10 percent. Subsequently, the rate decreased by 12.8 percent from 2008 through 2012.

Trends in potentially preventable ED visits, 2008–2012

Figure 2 presents the age-sex adjusted rate of potentially preventable treat-and-release ED visits among adults aged 18 years and older, for all conditions and for acute and chronic conditions separately, from 2008 through 2012.

Figure 2. Age-sex adjusted rate of potentially preventable treat-and-release ED visits among adults aged 18 years and older, overall and for acute and chronic conditions, 2008–2012



Abbreviation: ED, emergency department

Note: Although ED data are available starting in 2006, this Statistical Brief uses data from 2008 that were compiled for the National Healthcare Quality and Disparities Reports.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Emergency Department Sample (NEDS), 2008–2012, and the AHRQ Quality Indicators, version 4.4

- **The rate of potentially preventable treat-and-release ED visits for all conditions increased by 11 percent from 2008 through 2012, with the largest increase among visits for acute conditions (by 13 percent).**

  From 2008 through 2012, the rate of potentially preventable treat-and-release ED visits among adults aged 18 years and older increased by 11.4 percent for all conditions, by 12.5 percent for acute conditions, and by 10.2 percent for chronic conditions.

Table 2 presents the cumulative change in the rate of nonmaternal treat-and-release ED visits among adults aged 18 years and older from 2008 through 2012, by hospital service line, compared with potentially preventable visits for acute and chronic conditions.

Table 2. Age-sex adjusted rates of nonmaternal treat-and-release ED visits among adults aged 18 years and older, by hospital service line, compared with potentially preventable visits, 2008–2012

Type of ED visit	Age-sex adjusted rate per 100,000 population		% change in rate, 2008–2012
	2008	2012	
All nonmaternal treat-and-release ED visits by service line			
Total	33,692	36,208	7.5
General medical	24,275	26,837	10.6
Injury	8,000	7,681	–4.0
Mental health	1,417	1,690	19.3
Potentially preventable treat-and-release ED visits			
All conditions	2,350	2,618	11.4
Acute conditions	1,229	1,382	12.5
Chronic conditions	1,121	1,235	10.2

Abbreviation: ED, emergency department

Notes: Because the surgical and medical groups are defined using diagnosis-related groups, which are not available in the ED data, ED visits not classified as maternal/neonatal, mental health, or injury were grouped into a general medical category. All nonmaternal treat-and-release ED visits include potentially preventable visits.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Emergency Department Sample (NEDS), 2008 and 2012, and the AHRQ Quality Indicators, version 4.4. Although the NEDS is available starting in 2006, this Statistical Brief uses data from 2008 that were compiled for the 2008–2012 National Healthcare Quality and Disparities Reports.

- **Potentially preventable ED visits increased at a faster rate than ED visits overall.**

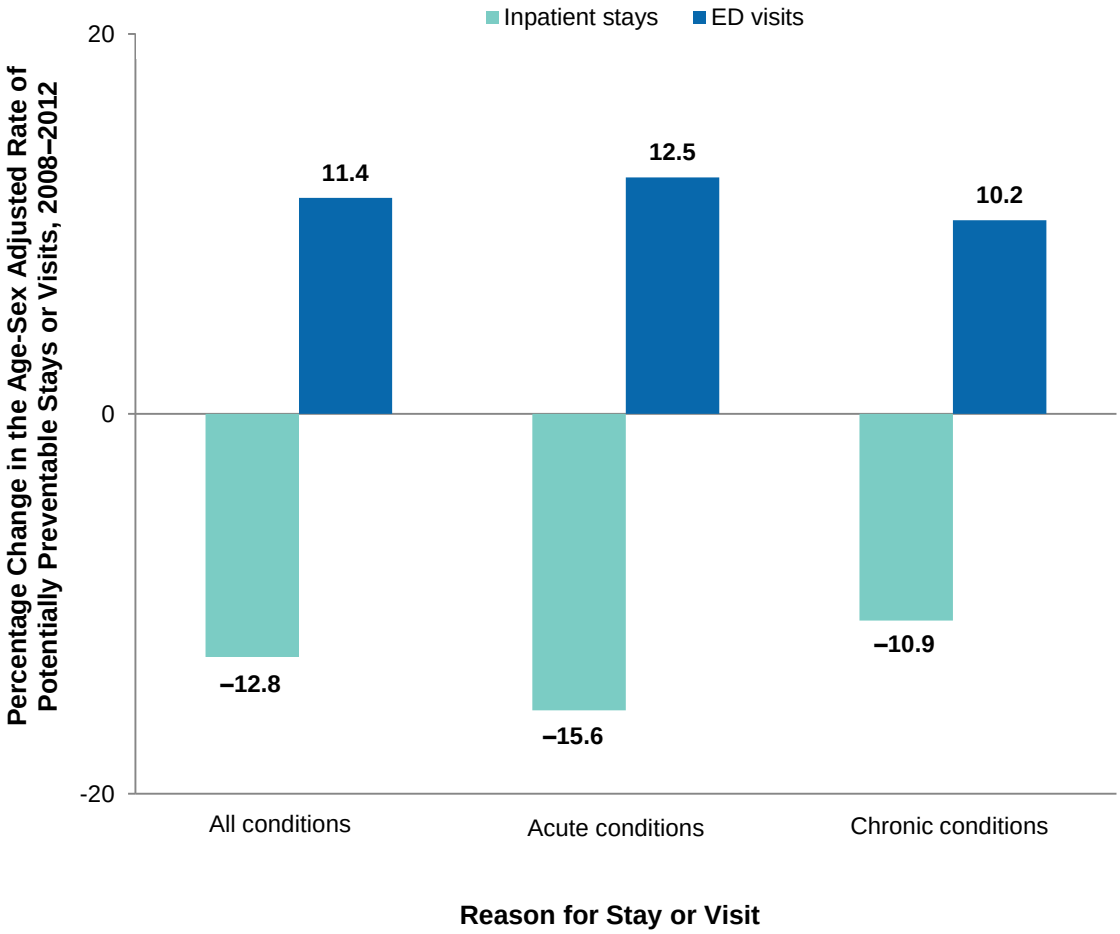
  From 2008 through 2012, the 11.4 percent increase in the rate of potentially preventable treat-and-release ED visits for all conditions among adults aged 18 years and older was 1.5 times greater than the 7.5 percent increase in the total rate of nonmaternal adult treat-and-release ED visits.

- **The increase in the rate of treat-and-release ED visits was largest for mental health-related visits.**

  From 2008 through 2012, the rate of adult treat-and-release ED visits for mental health increased by 19.3 percent, from 1,417 to 1,690 visits per 100,000 population. The rate of all other nonmaternal adult treat-and-release ED visits for reasons other than injury and mental health increased by 10.6 percent, from 24,275 to 26,837 per 100,000 population.

Comparison of trends in potentially preventable hospital inpatient stays and ED visits, 2008–2012
Figure 3 presents the cumulative percentage change from 2008 through 2012 in the age-sex adjusted rate of potentially preventable inpatient stays and treat-and-release ED visits among adults aged 18 years and older, for all conditions and for acute and chronic conditions separately.

Figure 3. Cumulative percentage change in the age-sex adjusted rate of potentially preventable inpatient stays and treat-and-release ED visits among adults aged 18 years and older, 2008–2012



Abbreviation: ED, emergency department

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Inpatient Sample (NIS), 2008; State Inpatient Databases (SID), 2012, weighted to provide national estimates using the same methodology as the 2008 NIS; Nationwide Emergency Department Sample (NEDS), 2008 and 2012; and the AHRQ Quality Indicators, version 4.4

- **Whereas the rate of potentially preventable inpatient stays decreased from 2008 through 2012, the rate of potentially preventable treat-and-release ED visits for the same conditions increased.**

  The rate of potentially preventable inpatient stays among adults aged 18 years and older decreased by 12.8 percent for all conditions, by 15.6 percent for acute conditions, and by 10.9 percent for chronic conditions. In contrast, the rate of potentially preventable treat-and-release ED visits for the same conditions increased by 11.4, 12.5, and 10.2 percent, respectively.

Table 3 presents the cumulative change in the rate of potentially preventable inpatient stays and treat-and-release ED visits among adults aged 18 years and older from 2008 through 2012, by condition that was the reason for the stay or visit. Figure 4 compares the cumulative percentage change from 2008 through 2012 for rates of potentially preventable inpatient stays and ED visits among adults aged 18 years and older.

Table 3. Age-sex adjusted rate of potentially preventable inpatient stays and treat-and-release ED visits among adults aged 18 years and older, by condition, 2008–2012

Condition	Rate of potentially preventable inpatient stays per 100,000 population		% change in rate of inpatient stays, 2008–2012	Rate of potentially preventable ED visits per 100,000 population		% change in rate of ED visits, 2008–2012
	2008	2012		2008	2012	
All conditions	**1,815**	**1,582**	**–12.8**	**2,350**	**2,618**	**11.4**
Acute conditions	**736**	**621**	**–15.6**	**1,229**	**1,382**	**12.5**
Dehydration	174	121	–30.5	171	179	4.9
Bacterial pneumonia	360	306	–15.0	218	223	2.1
Urinary tract infection	202	195	–3.9	841	981	16.7
Chronic conditions	**1,078**	**961**	**–10.9**	**1,121**	**1,235**	**10.2**
Diabetes with short-term complications	60	73	21.7	7	9	20.2
Diabetes with long-term complications	129	116	–9.7	123	116	–6.3
Uncontrolled diabetes without complications	23	17	–24.5	17	23	32.3
Lower extremity amputations for diabetes	18	17	–1.1	DSU	DSU	DSU
Chronic obstructive pulmonary disease[a]	575	507	–12.0	629	703	11.8
Asthma[b]	59	50	–15.3	527	572	8.6
Hypertension	61	60	–1.9	258	318	23.3
Congestive heart failure	397	341	–14.2	83	81	–3.0

Abbreviations: ED, emergency department; DSU, data statistically unreliable.

[a] Rate per 100,000 adults aged 40 years or older.

[b] Rate per 100,000 adults aged 18–39 years.

Notes: All rates are per 100,000 population aged 18 years and older, unless otherwise noted. Although angina is included in the rate of potentially preventable stays and visits overall and for chronic conditions grouped together, the individual rate is not presented because this measure is soon to be retired; rates of angina are low in frequency, and coding changes over time make trends less reliable.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Inpatient Sample (NIS), 2008; State Inpatient Databases (SID), 2012, weighted to provide national estimates using the same methodology as the 2008 NIS; Nationwide Emergency Department Sample (NEDS), 2008 and 2012; and the AHRQ Quality Indicators, version 4.4

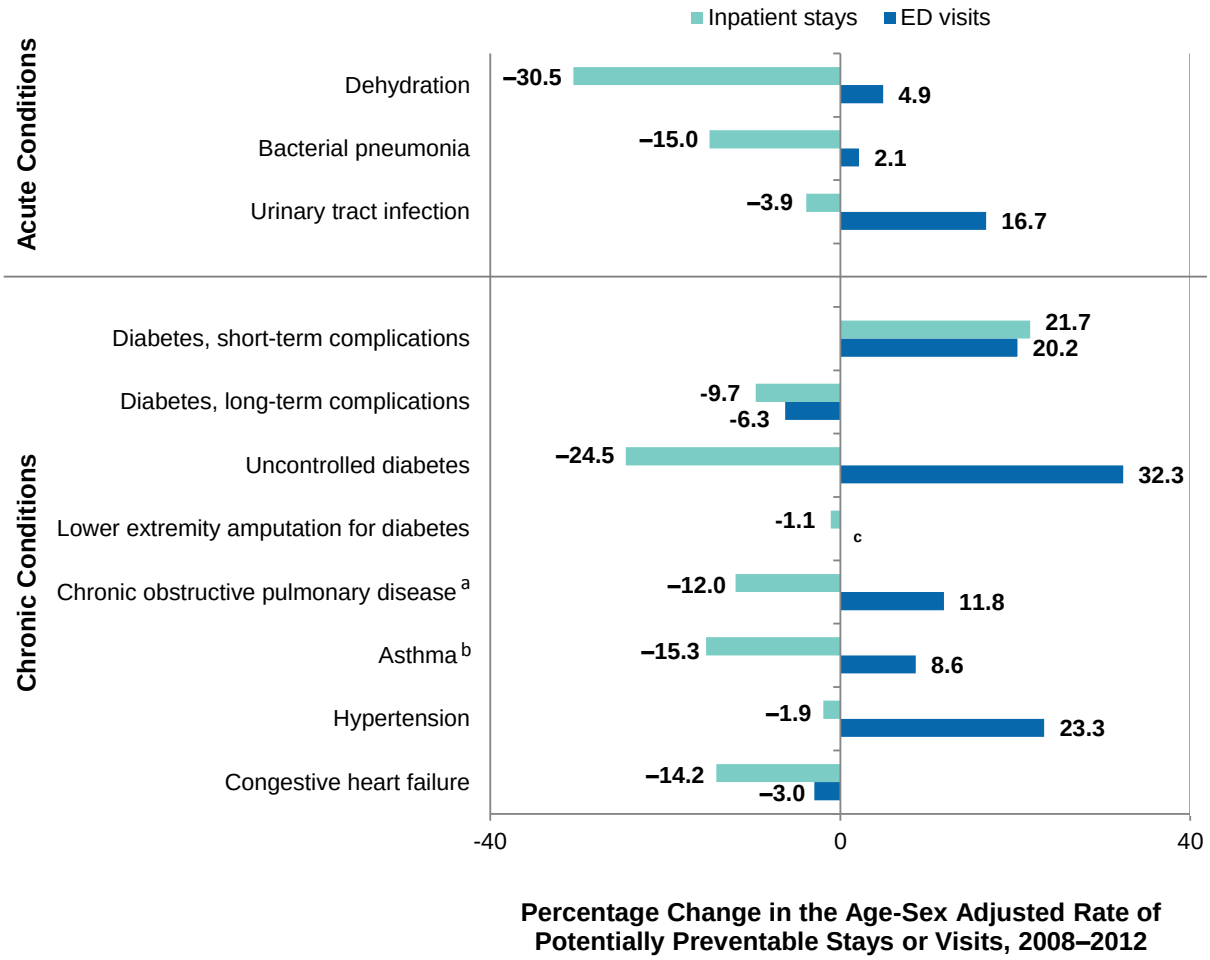
- **In 2008 and 2012, chronic obstructive pulmonary disease was the most common condition among potentially preventable inpatient admissions and the second most common condition among potentially preventable treat-and-release ED visits.**

  The highest rate of potentially preventable inpatient stays among adults was for chronic obstructive pulmonary disease, accounting for 575 stays per 100,000 population in 2008. This condition was the second most common condition among potentially preventable treat-and-release ED visits, accounting for 629 visits per 100,000 population in 2008. From 2008 through 2012, the rate of potentially preventable inpatient stays for chronic obstructive pulmonary disease decreased by 12.0 percent, while the rate of potentially preventable treat-and-release ED visits for this condition increased by 11.8 percent.

- **Urinary tract infection was the most common condition among potentially preventable treat-and-release ED visits.**

  The highest rate of potentially preventable treat-and-release ED visits among adults was for urinary tract infection, accounting for 841 stays per 100,000 population in 2008. From 2008 through 2012, the rate of potentially preventable treat-and-release ED visits for urinary tract infection increased by 16.7 percent, while the rate of potentially preventable inpatient stays for the same condition remained relatively stable.

Figure 4. Cumulative percentage change in the age-sex adjusted rate of potentially preventable inpatient stays and treat-and-release ED visits among adults aged 18 years and older, by specific condition, 2008–2012



Abbreviation: ED, emergency department

[a] Includes adults aged 40 years or older.

[b] Includes adults aged 18–39 years.

[c] Percentage change was not calculated for ED visits for this condition because the rate was statistically unreliable.

Note: All measures are among adults aged 18 years and older, unless otherwise noted.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), Nationwide Inpatient Sample (NIS), 2008; State Inpatient Databases (SID), 2012, weighted to provide national estimates using the same methodology as the 2008 NIS; Nationwide Emergency Department Sample (NEDS), 2008 and 2012; and the AHRQ Quality Indicators, version 4.4

- **The rate of potentially preventable inpatient stays for dehydration, bacterial pneumonia, asthma, and congestive heart failure decreased by more than 10 percent, with no increase 10 percent or greater in the rate of treat-and-release ED visits for the same conditions.**

  From 2008 through 2012, the rate of potentially preventable adult inpatient stays decreased by 30.5 percent for dehydration, 15.0 percent for bacterial pneumonia, 15.3 percent for asthma, and 14.2 percent for congestive heart failure. At the same time, the rate of treat-and-release ED visits for these same conditions remained relatively stable, changing less than 10 percent.

- **Although the rate of potentially preventable inpatient stays decreased by more than 10 percent for uncontrolled diabetes and chronic obstructive pulmonary disease, the increase in treat-and-release ED visits was similar to or larger than the decrease in inpatient stays for these conditions.**

  From 2008 through 2012, the rate of potentially preventable adult inpatient stays decreased by 24.5 percent for uncontrolled diabetes, while the rate of treat-and-release ED visits for the same condition increased by 32.3 percent. Similarly, the rate of potentially preventable inpatient stays for chronic obstructive pulmonary disease decreased by 12.0 percent, while the rate of treat-and-release ED visits for the same condition increased by 11.8 percent.

- **The rate of potentially preventable treat-and-release ED visits increased by more than 10 percent for urinary tract infection, diabetes with short-term complications, and hypertension, while the rate of inpatient stays for these same conditions remained stable or increased.**

  From 2008 through 2012, the rate of treat-and-release ED visits increased by 16.7 percent for urinary tract infection and by 23.3 percent for hypertension, whereas the rate of inpatient stays for these conditions remained relatively stable, changing by less than 10 percent. The rate of treat-and-release ED visits for diabetes with short-term complications increased by 20.2 percent, and the rate of inpatient stays for this condition also increased, by 21.7 percent.

Data Source

The estimates in this Statistical Brief are based upon an analysis done for the National Healthcare Quality and Disparities Reports (QDR). Inpatient data came from the Healthcare Cost and Utilization Project (HCUP) 2005–2011 Nationwide Inpatient Sample (NIS). For data year 2012, we used an analysis file derived from the HCUP State Inpatient Databases (SID) that was designed to provide national estimates with weighted records from a sample of hospitals from 44 States via the same methodology employed for the 2003–2011 NIS. We did not use the 2012 National Inpatient Sample (NIS) because the sampling design and universe definition was revised. At the time of this analysis, NIS trend weights to make national estimates compatible between 2003–2011 and 2012 were unavailable. Treat-and-release emergency department (ED) data came from the HCUP 2008–2012 Nationwide Emergency Department Sample (NEDS). Although the NEDS is available starting in 2006, this Statistical Brief uses data from 2008 that were compiled for the 2008–2012 QDR. Supplemental sources included population denominator data from Nielsen, a vendor that compiles and adds value to the U.S. Bureau of Census data.[9] If a patient received observation services (OS) prior to being admitted to the hospital or after being seen in the ED, he or she would be included in the inpatient or ED treat-and-release data used in this analysis. OS were not examined in this Statistical Brief because of variation in how these data are collected across States.

Definitions

Prevention Quality Indicators

The Prevention Quality Indicators (PQIs; version 4.4), a component of the AHRQ Quality Indicators (QIs), are a set of measures that can be used with hospital inpatient discharge data to identify access to and quality of care for "ambulatory care-sensitive conditions." These are conditions for which good outpatient care can potentially prevent the need for hospitalization or for which early intervention can prevent complications or more severe disease. PQI rates can also be affected by other factors such as disease prevalence. The PQIs are adjusted for age and sex using the total U.S. resident population for 2010 as the standard population. Although the PQI software was developed to be used with inpatient data, it was applied to ED data in this Statistical Brief to look at utilization across settings. Several other studies have examined ambulatory care-sensitive conditions across acute care settings.[10,11,12]

Note that the PQI for angina is scheduled to be retired in the next version of the PQI software. A review of angina-related hospitalization using Medicare data found that declines were associated with shifts in coding practices, namely, the increased use of codes specific to coronary artery disease (the underlying disease) rather than angina (the manifestation of that disease).

Further information on the AHRQ QIs, including documentation and free software downloads, is available at http://www.qualityindicators.ahrq.gov/. This Web site also includes information on the Pediatric Quality Indicators (PDIs, formerly known as PedQIs). The PDIs contain measures of potentially preventable hospitalizations for children with asthma, gastroenteritis, diabetes with short-term complications, and perforated appendix. Additional information on how the QI software was applied to the HCUP data for the statistics reported in this Statistical Brief is available in Coffey et al., 2012.[13]

[9] Barrett M, Lopez-Gonzalez L, Coffey R, Levit K. Population Denominator Data for Use With the HCUP Databases (Updated With 2013 Population Data). HCUP Methods Series Report #2014-02. August 18, 2014. U.S. Agency for Healthcare Research and Quality. http://www.hcup-us.ahrq.gov/reports/methods/2014-02.pdf. Accessed January 7, 2015.

[10] Blecker S, Ladapo JA, Doran KM, Goldfeld KS, Katz S. Emergency department visits for heart failure and subsequent hospitalization or observation unit admission. American Heart Journal. 2014 Dec;168(6):901–8.e1

[11] Galarraga JE, Mutter R, Pines JM. Costs associated with ambulatory care sensitive conditions across hospital-based settings. Academic Emergency Medicine. 2015 Feb;22(2):172–81

[12] Morganti-Gonzalez K, Baufman S, Blanchard J, Abir M, Iyer N, Smith A, et al. The Evolving Role of Emergency Departments in the United States. RAND Corporation Research Report RR-280-ACEP. Santa Monica, CA: Rand Corporation; May 2013.

[13] Coffey R, Barrett M, Houchens R, Moy E, Andrews R, Coenen N. Methods Applying AHRQ Quality Indicators to Healthcare Cost and Utilization Project (HCUP) Data for the Eleventh (2013) National Healthcare Quality Report (NHQR) and National Healthcare Disparities Report (NHDR). HCUP Methods Series Report #2012-03. November 12, 2012. U.S. Agency for Healthcare Research and Quality. http://www.hcup-us.ahrq.gov/reports/methods/2012_03.pdf. Accessed January 7, 2015.

Case definition
Coding criteria for the five hospital service lines are provided in Table 4 and are based on International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes, Clinical Classifications Software (CCS) categories, and diagnosis-related groups (DRGs) (see definitions below). Each discharge or visit was assigned to a single hospital service line hierarchically, based on the following order: maternal and neonatal (which were excluded from this Statistical Brief because the PQIs are calculated for nonmaternal stays), mental health, injury, surgical, and medical. Because the surgical and medical groups are defined using DRGs, which are not available in the NEDS, ED visits not classified as maternal/neonatal, mental health, or injury were grouped into an "general medical" category.

Diagnoses, ICD-9-CM, Clinical Classifications Software (CCS), and diagnosis-related groups (DRGs)
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 develop during the stay. *All-listed diagnoses* include the principal diagnosis plus these additional secondary conditions.

ICD-9-CM is the International Classification of Diseases, Ninth Revision, Clinical Modification, which assigns numeric codes to diagnoses. There are approximately 14,000 ICD-9-CM diagnosis codes.

CCS categorizes ICD-9-CM diagnosis codes into a manageable number of clinically meaningful categories.[14] This clinical grouper makes it easier to quickly understand patterns of diagnoses. CCS categories identified as Other typically are not reported; these categories include miscellaneous, otherwise unclassifiable diagnoses that may be difficult to interpret as a group.

DRGs comprise a patient classification system that categorizes patients into groups that are clinically coherent and homogeneous with respect to resource use. DRGs group patients according to diagnosis, type of treatment (procedures), age, and other relevant criteria. Each hospital stay has one assigned DRG.

[14] HCUP Clinical Classifications Software (CCS). Healthcare Cost and Utilization Project (HCUP). U.S. Agency for Healthcare Research and Quality, Rockville, MD. Updated November 2014. http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp. Accessed January 7, 2015.

Table 4. Coding criteria for the five hospital service lines analyzed in this research

Maternal and neonatal service line
Maternal and neonatal stays are defined using the following CCS principal diagnosis categories: *Maternal* • 176: Contraceptive and procreative management • 177: Spontaneous abortion • 178: Induced abortion • 179: Postabortion complications • 180: Ectopic pregnancy • 181: Other complications of pregnancy • 182: Hemorrhage during pregnancy; abruptio placenta; placenta previa • 183: Hypertension complicating pregnancy; childbirth and the puerperium • 184: Early or threatened labor • 185: Prolonged pregnancy • 186: Diabetes or abnormal glucose tolerance complicating pregnancy; childbirth; or the puerperium • 187: Malposition; malpresentation • 188: Fetopelvic disproportion; obstruction • 189: Previous C-section • 190: Fetal distress and abnormal forces of labor • 191: Polyhydramnios and other problems of amniotic cavity • 192: Umbilical cord complication • 193: OB-related trauma to perineum and vulva • 194: Forceps delivery • 195: Other complications of birth; puerperium affecting management of mother • 196: Normal pregnancy and/or delivery *Neonatal* • 218: Liveborn • 219: Short gestation; low birth weight; and fetal growth retardation • 220: Intrauterine hypoxia and birth asphyxia • 221: Respiratory distress syndrome • 222: Hemolytic jaundice and perinatal jaundice • 223: Birth trauma • 224: Other perinatal conditions

Mental health service line

Mental health visits are defined using the following CCS principal diagnosis categories:

Starting in 2007

- 650: Adjustment disorders
- 651: Anxiety disorders
- 652: Attention-deficit, conduct, and disruptive behavior disorders
- 653: Delirium, dementia, and amnestic and other cognitive disorders
- 654: Developmental disorders
- 655: Disorders usually diagnosed in infancy, childhood, or adolescence
- 656: Impulse control disorders, NEC
- 657: Mood disorders
- 658: Personality disorders
- 659: Schizophrenia and other psychotic disorders
- 660: Alcohol-related disorders
- 661: Substance-related disorders
- 662: Suicide and intentional self-inflicted injury
- 663: Screening and history of mental health and substance abuse codes
- 670: Miscellaneous disorders

2003 through 2006

- 65: Mental retardation
- 66: Alcohol-related mental disorders
- 67: Substance-related mental disorders
- 68: Senility and organic mental disorders
- 69: Affective disorders
- 70: Schizophrenia and related disorders
- 71: Other psychoses
- 72: Anxiety; somatoform; dissociative; and personality disorders
- 73: Pre-adult disorders
- 74: Other mental conditions
- 75: Personal history of mental disorder; mental and behavioral problems; observation and screening for mental condition

Injury service line

Injuries are identified using the principal diagnosis and a scheme recommended by Safe States Alliance, which was previously known as the State and Territorial Injury Prevention Directors Association (STIPDA). The diagnosis codes in the range 800–999 listed below are used to identify injuries.

Included

- **800–909.2, 909.4, 909.9**: Fractures; dislocations; sprains and strains; intracranial injury; internal injury of thorax, abdomen, and pelvis; open wound of the head, neck, trunk, upper limb, and lower limb; injury to blood vessels; late effects of injury, poisoning, toxic effects, and other external causes, excluding those of complications of surgical and medical care and drugs, medicinal or biological substances
- **910–994.9**: Superficial injury; contusion; crushing injury; effects of foreign body entering through orifice; burns; injury to nerves and spinal cord; traumatic complications and unspecified injuries; poisoning and toxic effects of substances; other and unspecified effects of external causes
- **995.5–995.59**: Child maltreatment syndrome
- **995.80–995.85**: Adult maltreatment, unspecified; adult physical abuse; adult emotional/psychological abuse; adult sexual abuse; adult neglect (nutritional); other adult abuse and neglect

Excluded

- **909.3, 909.5**: Late effect of complications of surgical and medical care and late effects of adverse effects of drug, medicinal, or biological substance
- **995.0–995.4, 995.6–995.7, 995.86, 995.89**: Other anaphylactic shock; angioneurotic edema; unspecified adverse effect of drug, medicinal and biological substance; allergy, unspecified; shock due to anesthesia; anaphylactic shock due to adverse food reaction; malignant hyperpyrexia or hypothermia due to anesthesia
- **996–999**: Complications of surgical and medical care, not elsewhere classified

It should be noted that the above definition of injury includes five diagnosis codes that also are included under two CCS diagnosis categories used for the definition of the mental health service line:

- CCS = 660 (Alcohol-related disorders): Diagnosis 9800 (toxic effect of ethyl alcohol)
- CCS = 661 (Substance-related disorders): Diagnoses 96500 (poisoning by opium), 96501 (poisoning by heroin), 96502 (poisoning by methadone), 96509 (poisoning by other opiate)

Because of the hierarchical ordering used to assign discharges to service lines, discharges with one of these five principal diagnosis codes were assigned to the mental health service line and not the injury service line.

Surgical service line

Surgical stays are identified by a surgical DRG. The DRG grouper first assigns the discharge to a major diagnostic category (MDC) based on the principal diagnosis. For each MDC, there is a list of procedure codes that qualify as operating room procedures. If the discharge involves an operating room procedure, it is assigned to one of the surgical DRGs within the MDC category; otherwise, it is assigned to a medical DRG.

Medical service line

Medical stays are identified by a medical DRG. The DRG grouper first assigns the discharge to an MDC, based on the principal diagnosis. For each MDC, there is a list of procedure codes that qualify as operating room procedures. If the discharge involves an operating room procedure, it is assigned to one of the surgical DRGs within the MDC category; otherwise, it is assigned to a medical DRG.

Abbreviations: CCS, Clinical Classifications Software; DRG, diagnosis-related group; NEC, necrotizing enterocolitis; OB, obstetrics

Types of hospitals included in the HCUP National (Nationwide) Inpatient Sample
The National (Nationwide) Inpatient Sample (NIS) is based on data from community hospitals, which are defined as short-term, non-Federal, general, and other hospitals, excluding hospital units of other institutions (e.g., prisons). The NIS includes obstetrics and gynecology, otolaryngology, orthopedic, cancer, pediatric, public, and academic medical hospitals. Excluded are long-term care facilities such as rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals. Beginning in 2012, long-term acute care hospitals are also excluded. However, if a patient received long-term care, rehabilitation, or treatment for psychiatric or chemical dependency conditions in a community hospital, the discharge record for that stay will be included in the NIS.

Types of hospitals included in the HCUP Nationwide Emergency Department Sample
The Nationwide Emergency Department Sample (NEDS) is based on data from community hospitals, which are defined as short-term, non-Federal, general, and other hospitals, excluding hospital units of other institutions (e.g., prisons). The NEDS includes specialty, pediatric, public, and academic medical hospitals. Excluded are long-term care facilities such as rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals. Hospitals included in the NEDS have hospital-owned emergency departments and no more than 90 percent of their ED visits resulting in admission.

Types of hospitals included in HCUP State Inpatient Databases
This analysis used State Inpatient Databases (SID) limited to data from community hospitals, which are defined as short-term, non-Federal, general, and other hospitals, excluding hospital units of other institutions (e.g., prisons). Community hospitals include obstetrics and gynecology, otolaryngology, orthopedic, cancer, pediatric, public, and academic medical hospitals. Excluded for this analysis are long-term care facilities such as rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals. However, if a patient received long-term care, rehabilitation, or treatment for psychiatric or chemical dependency conditions in a community hospital, the discharge record for that stay was included in the analysis.

Unit of analysis
The unit of analysis is the hospital discharge (i.e., the hospital stay) or the ED encounter, not a person or patient. This means that a person who is admitted to the hospital or seen in the ED multiple times in 1 year will be counted each time as a separate discharge from the hospital or encounter in the ED.

About HCUP

The Healthcare Cost and Utilization Project (HCUP, pronounced "H-Cup") 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 bring together the data collection efforts of State data organizations, hospital associations, and private data organizations (HCUP Partners) 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. These databases enable research on a broad range of health policy issues, including cost and quality of health services, medical practice patterns, access to health care programs, and outcomes of treatments at the national, State, and local market levels.

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
District of Columbia 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 Center for Health Information and Analysis
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
North Dakota (data provided by the Minnesota Hospital Association)
Ohio Hospital Association
Oklahoma State Department of Health
Oregon Association of Hospitals and Health Systems
Oregon Office of Health Analytics
Pennsylvania Health Care Cost Containment Council
Rhode Island Department of Health
South Carolina Revenue and Fiscal Affairs Office
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 Statistical Briefs

HCUP Statistical Briefs are descriptive summary reports presenting statistics on hospital inpatient and ED use and costs, quality of care, access to care, medical conditions, procedures, patient populations, and other topics. The reports use HCUP administrative health care data.

About the NIS

The HCUP National (Nationwide) Inpatient Sample (NIS) is a national (nationwide) database of hospital inpatient stays. The NIS is nationally representative of all community hospitals (i.e., short-term, non-Federal, nonrehabilitation hospitals). The NIS includes all payers. It is drawn from a sampling frame that contains hospitals comprising more than 95 percent of all discharges in the United States. The vast size of the NIS allows the study of topics at the national and regional levels for specific subgroups of patients. In addition, NIS data are standardized across years to facilitate ease of use. Over time, the sampling

frame for the NIS has changed; thus, the number of States contributing to the NIS varies from year to year. The NIS is intended for national estimates only; no State-level estimates can be produced.

The 2012 NIS was redesigned to optimize national estimates. The redesign incorporates two critical changes:

- Revisions to the sample design—starting with 2012, the NIS is now a *sample of discharge records from all HCUP-participating hospitals*, rather than a sample of hospitals from which all discharges were retained (as is the case for NIS years before 2012).

- Revisions to how hospitals are defined—the NIS now uses the *definition of hospitals and discharges supplied by the statewide data organizations* that contribute to HCUP, rather than the definitions used by the American Hospital Association (AHA) Annual Survey of Hospitals.

The new sampling strategy is expected to result in more precise estimates than those that resulted from the previous NIS design by reducing sampling error: for many estimates, confidence intervals under the new design are about half the length of confidence intervals under the previous design. The change in sample design for 2012 necessitates recomputation of prior years' NIS data to enable analysis of trends that uses the same definitions of discharges and hospitals.

About the NEDS

The HCUP Nationwide Emergency Department Database (NEDS) is a unique and powerful database that yields national estimates of ED visits. The NEDS was constructed using records from both the HCUP State Emergency Department Databases (SEDD) and the State Inpatient Databases (SID). The SEDD capture information on ED visits that do not result in an admission (i.e., treat-and-release visits and transfers to another hospital); the SID contain information on patients initially seen in the ED and then admitted to the same hospital. The NEDS was created to enable analyses of ED utilization patterns and support public health professionals, administrators, policymakers, and clinicians in their decisionmaking regarding this critical source of care. The NEDS is produced annually beginning in 2006. Over time, the sampling frame for the NEDS has changed; thus, the number of States contributing to the NEDS varies from year to year. The NEDS is intended for national estimates only; no State-level estimates can be produced.

About the SID

The HCUP State Inpatient Databases (SID) are hospital inpatient databases from data organizations participating in HCUP. The SID contain 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 encompass more than 95 percent of all U.S. community hospital discharges. 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.

About the QDR

The *National Healthcare Quality and Disparities Report (QDR)* measures and tracks trends in quality and disparities in seven key areas of health care: patient safety, person-centered care, care coordination, effective treatment, healthy living, care affordability, and access to health care. The QDR is an annual report that was commissioned by Congress in 1999 and first published in 2003. Beginning with the 2014 report, findings that previously appeared in two separate reports (the *National Healthcare Quality Report* and the *National Healthcare Disparities Report*) have been integrated into a single document that provides a comprehensive overview of the quality of health care received by the general population and disparities in care experienced by different racial, ethnic, and socioeconomic groups. Information on individual measures will available through chartbooks, which will be posted monthly. The QDR is designed and produced by AHRQ, with support from the Department of Health and Human Services (HHS) and private sector partners.

For More Information

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

For additional HCUP statistics, visit HCUPnet, our interactive query system, at http://hcupnet.ahrq.gov/.

For information on other hospitalizations in the United States, refer to the following HCUP Statistical Briefs located at http://www.hcup-us.ahrq.gov/reports/statbriefs/statbriefs.jsp:

- Statistical Brief #180, Overview of Hospital Stays in the United States, 2012
- Statistical Brief #181, Costs for Hospital Stays in the United States, 2012
- Statistical Brief #186, Most Frequent Operating Room Procedures Performed in U.S. Hospitals, 2012
- Statistical Brief #162, Most Frequent Conditions in U.S. Hospitals, 2011

For a detailed description of HCUP, more information on the design of the National (Nationwide) Inpatient Sample (NIS), the Nationwide Emergency Department Sample (NEDS), and the State Inpatient Databases (SID) and methods to calculate estimates, please refer to the following database documentation:

Agency for Healthcare Research and Quality. Overview of the National (Nationwide) Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated November 2014. http://www.hcup-us.ahrq.gov/nisoverview.jsp. Accessed January 7, 2015.

Agency for Healthcare Research and Quality. Overview of the Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated December 2014. http://www.hcup-us.ahrq.gov/nedsoverview.jsp. Accessed January 7, 2015.

Agency for Healthcare Research and Quality. Overview of the State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated November 2014. http://www.hcup-us.ahrq.gov/sidoverview.jsp. Accessed January 7, 2015.

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http://www.hcup-us.ahrq.gov/reports/statbriefs/sb195-Potentially-Preventable-Hospitalizations.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:

Virginia Mackay-Smith, Acting Director
Center for Delivery, Organization, and Markets
Agency for Healthcare Research and Quality
540 Gaither Road
Rockville, MD 20850