



H·CUP

HEALTHCARE COST AND UTILIZATION PROJECT



Agency for Healthcare
Research and Quality



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Introduction

Cardiovascular and cerebrovascular diseases are significant health care issues, affecting 35 percent of Americans.¹ Heart disease is the leading cause of death, accounting for 1 in every 4 deaths, and stroke is the fourth leading cause of death in the United States.^{2,3} These diseases are among the most common and costly reasons for hospital admissions.^{4,5} The prevalence of cardiovascular and cerebrovascular diseases increases with age, with cardiovascular disease occurring in fewer than 15 percent of adults aged 20–39 years but more than 70 percent of adults aged 60 years and older.⁶ Sex differences in these diseases also exist; for example, women tend to have a lower mortality rate following a stroke compared with men.⁷

A variety of national initiatives are underway that aim to reduce the prevalence of cardiovascular and cerebrovascular diseases in the United States. The Affordable Care Act provides up to \$100 million for community programs targeted at reducing chronic diseases, including heart disease and stroke, and another \$40 million for statewide efforts focused on chronic diseases.⁸ The Million Hearts® initiative, co-led by the Centers for Disease Control and Prevention (CDC) and the Centers for Medicare & Medicaid Services (CMS), was initiated in 2012 with the goal “to prevent 1 million heart attacks and strokes by 2017.”⁹

Timely information on trends for cardiovascular and cerebrovascular conditions provides analysts and policymakers with baseline information and can be used to help evaluate the impact of health improvement efforts. A forward-looking initiative from the Agency for Healthcare Research and Quality’s (AHRQ) Healthcare Cost and Utilization Project (HCUP) is used in this report to produce timely, current inpatient statistics on two specific cardiovascular and cerebrovascular conditions, acute myocardial infarction (AMI) and acute stroke.

¹ Go AS, Mozaffarian D, Roger VL, Benjamin EJ, Berry JD, et al. Executive summary: Heart disease and stroke statistics—2014 update: A report from the American Heart Association. *Circulation*. 2014;129:399–410.

² Million Hearts initiative website. <http://millionhearts.hhs.gov/aboutmh/overview.html>. Accessed May 8, 2015.

³ Murphy SL, Xu JQ, Kochanek JD. Deaths: Final Data for 2010. *National Vital Statistics Reports*; vol 61 no 4. Hyattsville, MD: National Center for Health Statistics, 2013.

⁴ Pfuntner A, Wier LM, Stocks C. Most Frequent Conditions in U.S. Hospitals, 2011. HCUP Statistical Brief #162. September 2013. Agency for Healthcare Research and Quality. Rockville, MD. <http://www.hcup-us.ahrq.gov/reports/statbriefs/sb162.pdf>. Accessed April 24, 2015.

⁵ Pfuntner A, Wier LM, Steiner C. Costs for Hospital Stays in the United States, 2011. HCUP Statistical Brief #168. December 2013. Agency for Healthcare Research and Quality. Rockville, MD. <http://www.hcup-us.ahrq.gov/reports/statbriefs/sb168-Hospital-Costs-United-States-2011.pdf>. Accessed April 24, 2015.

⁶ Go et al., 2014.

⁷ Ibid.

⁸ Department of Health and Human Services, press releases dated May 13, 2011 (<http://wayback.archive-it.org/3926/20140108162204/http://www.hhs.gov/news/press/2011pres/05/20110513c.html>) and June 7, 2011 (<http://wayback.archive-it.org/3926/20140108162147/http://www.hhs.gov/news/press/2011pres/06/20110607a.html>). Accessed April 24, 2015.

⁹ Million Hearts initiative website.

Introduction (continued)

The HCUP State Inpatient Databases (SID) from 2004 to 2013 include about 339 million inpatient discharges from 47 States. The list of statewide data organizations that contribute to HCUP is available in Appendix I. In this report we use the historical SID data with early 2014 data from 15 HCUP States to develop national quarterly projections of 2014 and 2015 inpatient statistics for:

- Acute myocardial infarction (AMI),
- Acute stroke, and
- AMI or acute stroke.

Statistics for each condition are reported in total and separately by adult age group (18–44 years, 45–64 years, and 65 years and older) and by sex. The two cardiovascular and cerebrovascular conditions, AMI and acute stroke, reported in this study are identified by the principal diagnosis on an inpatient stay record. Appendix II includes specifications for AMI and acute stroke.

Four outcomes are projected for AMI, acute stroke, and AMI or acute stroke: counts of inpatient discharges, average total hospital cost, average length of stay, and in-hospital mortality rate. Average total hospital cost reflects actual expenses incurred in the production of hospital services; the average cost does not include physician billing. No adjustment has been made to the costs to equate them to a constant year. However, the Gross Domestic Product (GDP) price index is included to demonstrate deflation. In HCUP, the length of stay counts nights spent in the hospital. If a patient is admitted and discharged on the same day, the length of stay is zero. Mortality is in-hospital only; post-hospital mortality is not included.

A detailed explanation of the projection methodology is included in Appendix III. More information on HCUP is available on the HCUP User Support Website (<http://www.hcup-us.ahrq.gov>).

Summary

The following table summarizes the change from 2004 annual estimates to 2015 projected annual estimates for AMI, acute stroke, and AMI or acute stroke for each of the four outcomes. Detailed graphs showing historical data and projections by quarter follow for each measure and outcome. The data presented in the table is for all adults. Graphs following this summary also show data for three adult age groups and by sex. Up or down arrows indicate change of over 10 percent between annual weighted estimates from 2004 to 2015. Dashes indicate inconsistent or little change.

Measure	Projected Annual Total Discharges for All Adults 2015	Change from 2004 to 2015 Projection for All Adults			
		Total Discharges	Average Total Hospital Cost	Average Length of Stay	In-Hospital Mortality Rate
Acute Myocardial Infarction (AMI) for Adults	580,008	—	↑	↓	↓
Acute Stroke for Adults	554,443	↑	↑	↓	↓
AMI or Acute Stroke for Adults	1,137,602	—	↑	↓	↓

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Acute Myocardial Infarction (AMI) for Adults

An acute myocardial infarction (AMI) is commonly known as a heart attack. A heart attack occurs when blood flow to the heart is blocked. Using the HCUP SID from 2004 to 2013 and early 2014 data from 15 States, different outcomes for inpatient discharges with a principal diagnosis of AMI are projected for 2014 to 2015.

Projections include the following:

- Total inpatient discharges for all adults, adults by age group, and adults by sex. Discharge counts exclude inpatient stays that were transferred out to another acute care hospital. This ensures that these events are not double counted.
- Average total hospital cost for all adults, adults by age group, and adults by sex. Average total hospital cost reflects actual expenses incurred in the production of hospital services; physician costs are not included. For comparison, a line is included that depicts the change in the average inpatient hospital cost per admission in the first quarter of 2004 (Q1 2004) due solely to economy-wide inflation. The difference between the actual/projected cost line and the inflation-adjusted Q1 2004 cost line represents cost increases due to other noninflation factors, such as new technology, patient case mix, etc.
- Average length of stay for all adults, adults by age group, and adults by sex. In HCUP, the length of stay counts nights spent in the hospital. If a patient is admitted and discharged on the same day, the length of stay is zero.
- In-hospital mortality rate for all adults, adults by age group, and adults by sex.

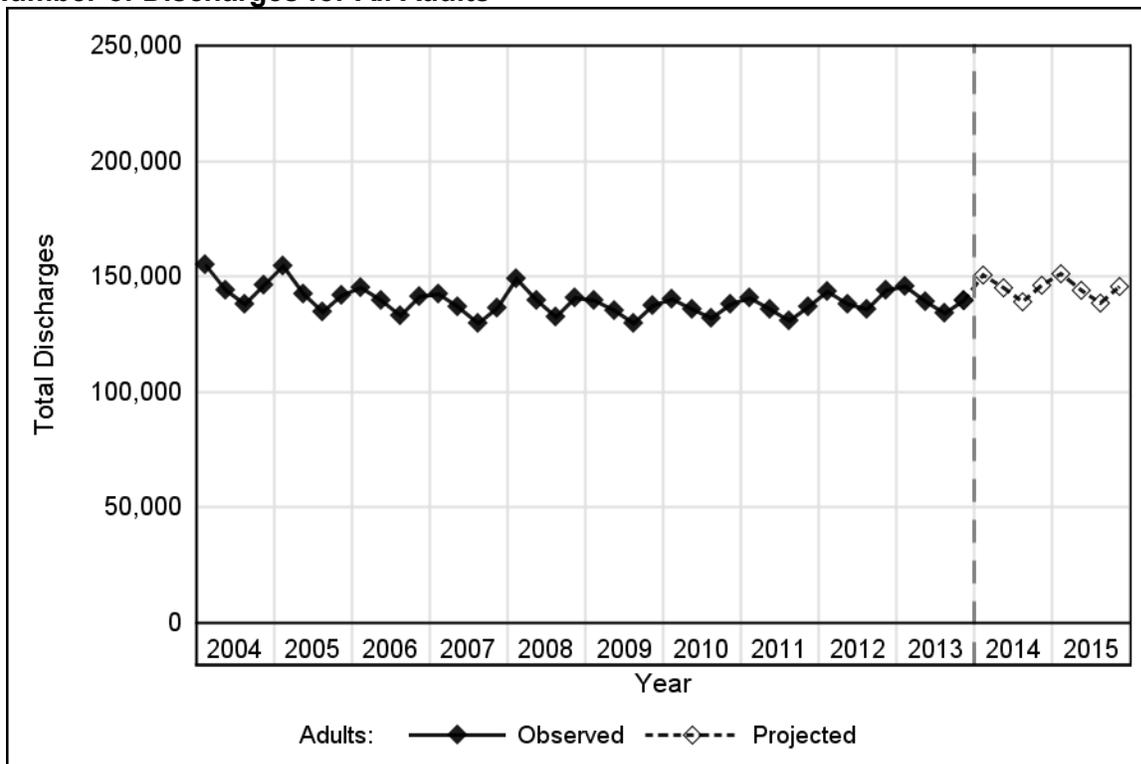
Acute Myocardial Infarction (AMI) for Adults

Number of Discharges

Key Findings:

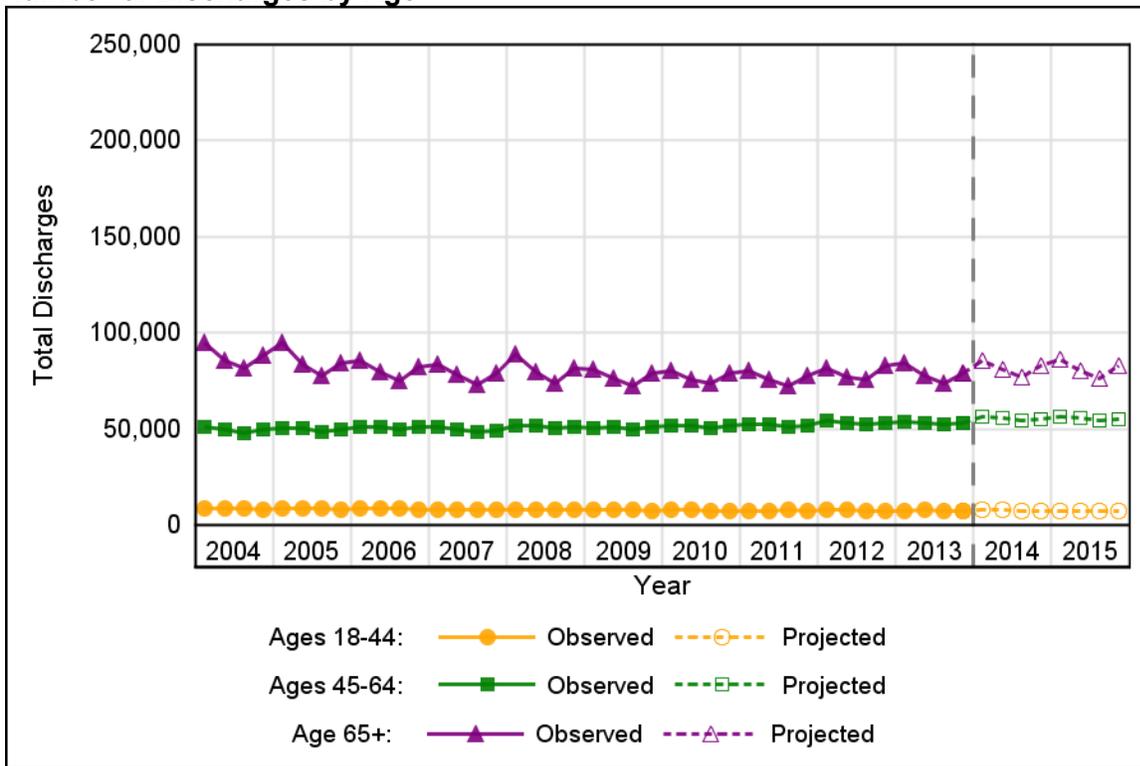
- The number of discharges for AMI was relatively stable over time, vacillating around 139,500 discharges per quarter. Discharges are projected to be 146,000 at the end of 2015.
- Adults aged 65 years and older had the highest discharges at about 87,500 discharges per quarter in 2004 and decreasing to 78,500 discharges per quarter in 2013. Adults aged 45–64 years had the next highest discharges, remaining relatively stable at about 51,000 discharges per quarter. Adults aged 18–44 years had the lowest discharges at about 8,500 discharges per quarter in 2004 and decreasing to 7,500 discharges per quarter in 2013.
- Males had about 28,000 more discharges per quarter than did females. Males had a relatively stable number of discharges at about 84,000 discharges per quarter. Females had about 60,000 discharges per quarter in 2004, decreasing to 53,500 discharges per quarter in 2013.

Number of Discharges for All Adults

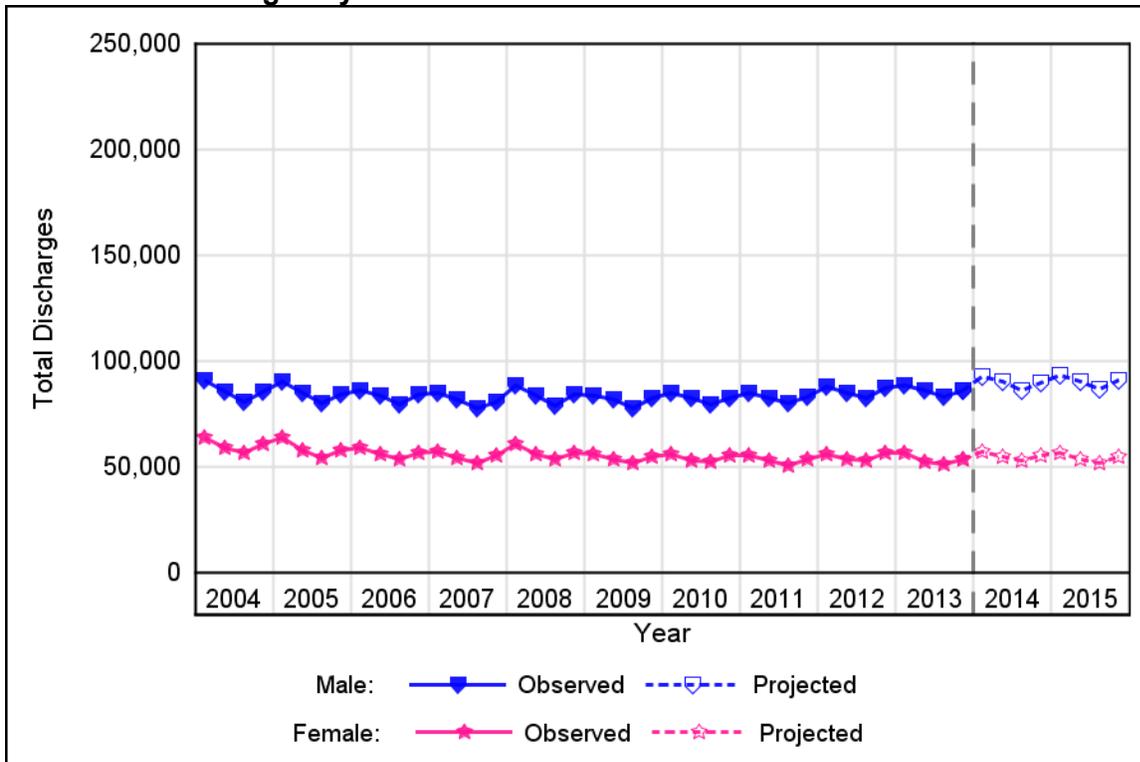


Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

Number of Discharges by Age



Number of Discharges by Sex



Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

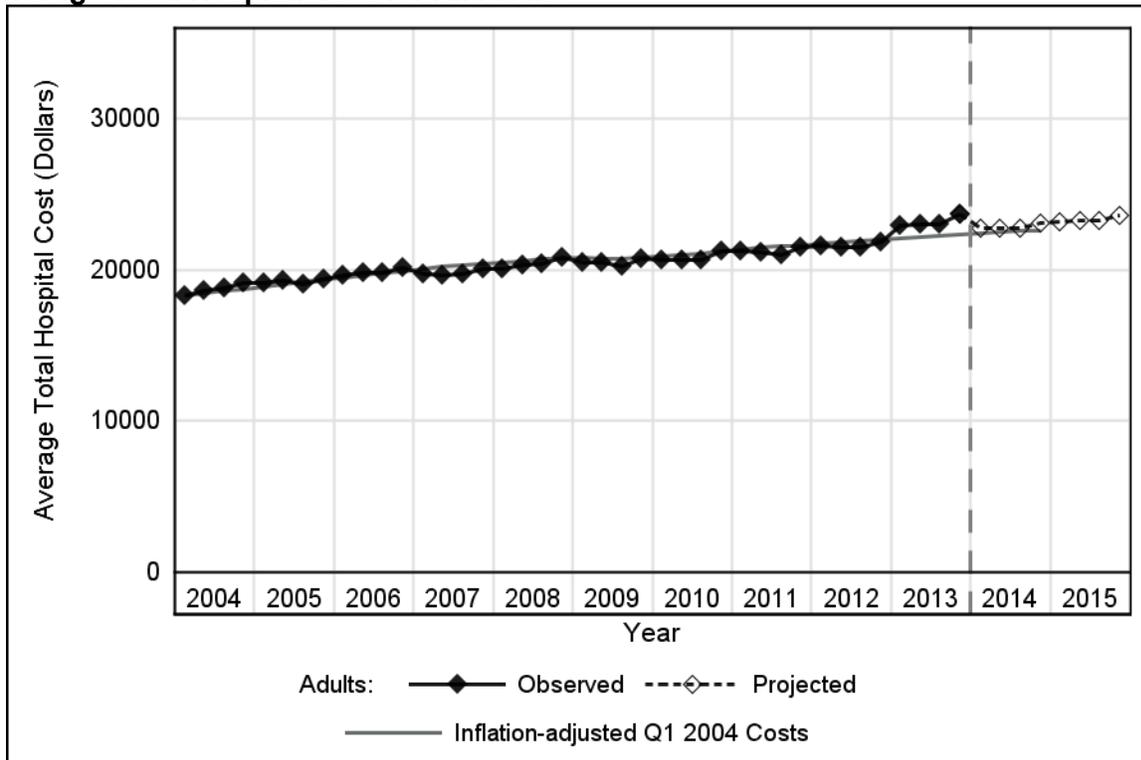
Acute Myocardial Infarction (AMI) for Adults

Average Total Hospital Cost

Key Findings:

- The average hospital cost for discharges with AMI increased from about \$18,500 in 2004 to \$23,000 in 2013. The average hospital cost is projected to be \$23,500 at the end of 2015.
- The average hospital cost was highest for adults aged 45–64 years, increasing from about \$20,000 in 2004 to \$24,500 in 2013. The youngest and oldest age groups had similar average hospital cost at about \$17,500 in 2004 and increasing to \$22,000 in 2013.
- The average hospital cost was about \$3,000 higher for males than for females. Males had an average hospital cost that increased from about \$19,500 in 2004 to \$24,500 in 2013. Females had an average hospital cost that increased from about \$17,000 in 2004 to \$21,000 in 2013.
- Using the Gross Domestic Product (GDP) price index, a cost of \$18,500 in 2004 would be equivalent to a cost of \$23,000 at the end of 2013. The average hospital cost through 2013 remained relatively consistent with the cost expected by inflation alone.

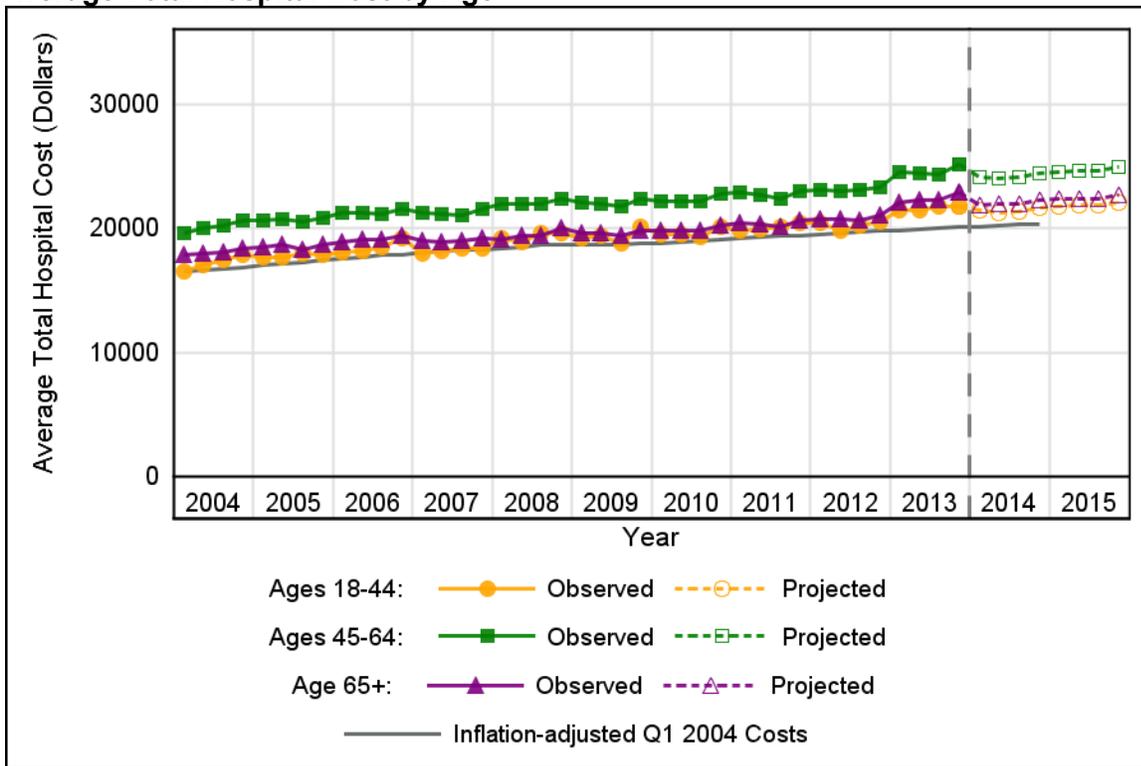
Average Total Hospital Cost for All Adults



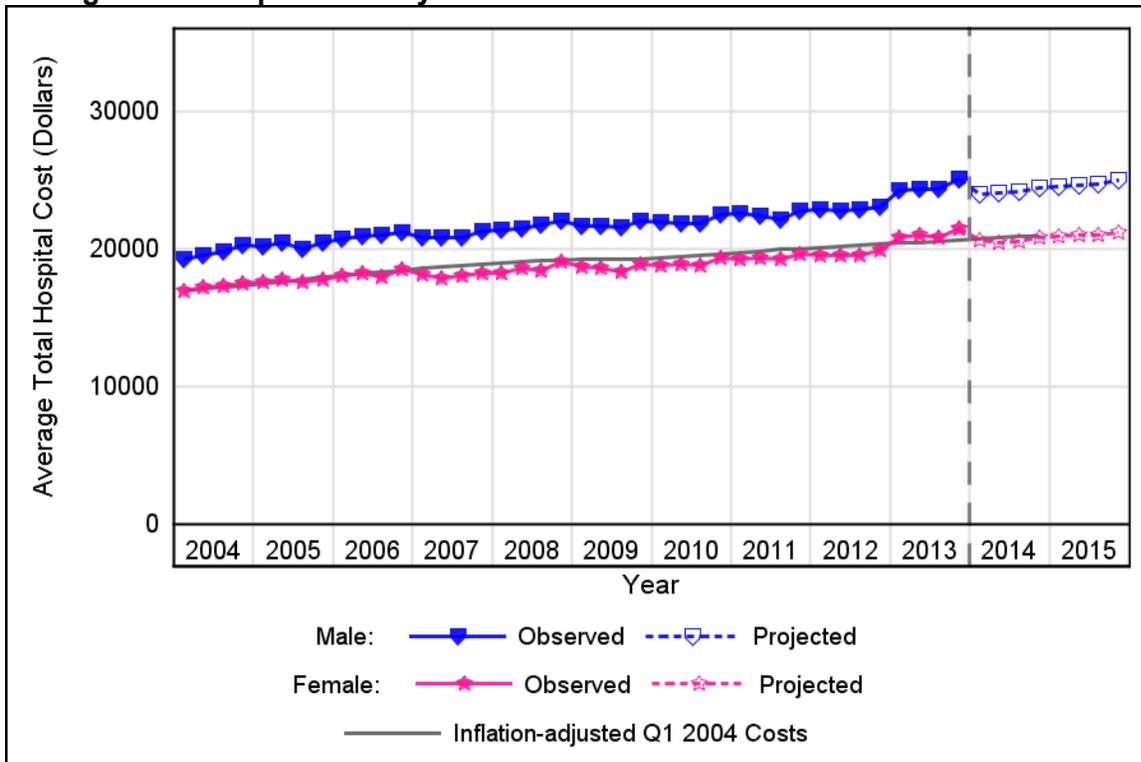
Inflation-adjusted Q1 2004 Costs: Cost per admission in the first quarter of 2004, adjusted for economy-wide inflation.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

Average Total Hospital Cost by Age



Average Total Hospital Cost by Sex



Inflation-adjusted Q1 2004 Costs: Cost per admission in the first quarter of 2004, adjusted for economy-wide inflation. Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

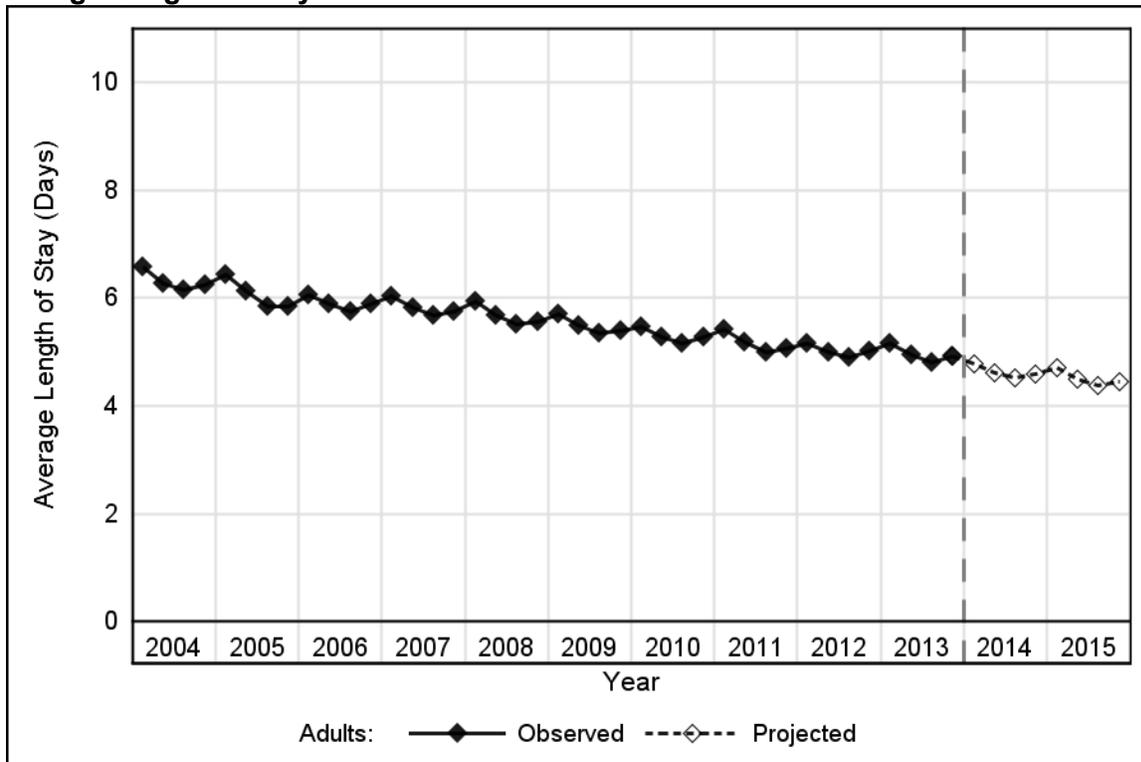
Acute Myocardial Infarction (AMI) for Adults

Average Length of Stay

Key Findings:

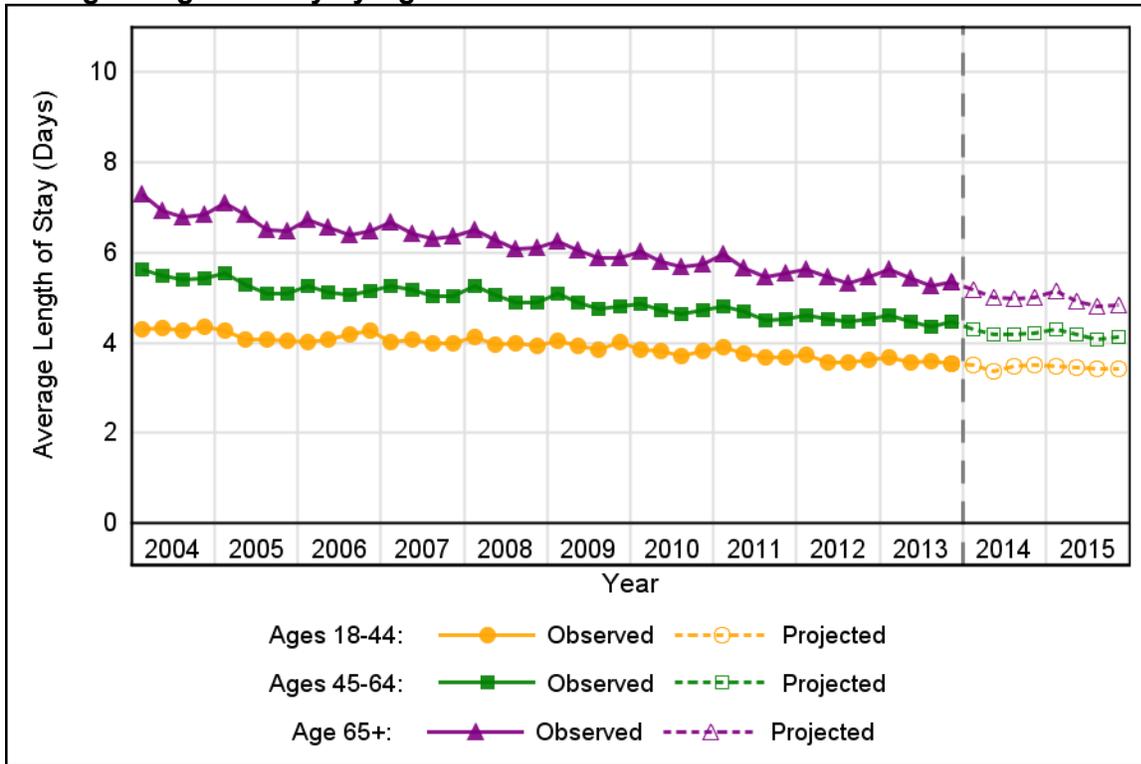
- The length of stay for discharges with AMI decreased over time from 6.3 days in 2004 to 5.0 days in 2013. The length of stay is projected to be 4.4 days at the end of 2015.
- Adults aged 65 years and older had the longest length of stay at 7.0 days in 2004 and decreasing to 5.4 days in 2013. Adults aged 45–64 years had the next longest length of stay at 5.5 days in 2004 and decreasing to 4.5 days in 2013. Adults aged 18–44 years had the shortest length of stay at 4.3 days in 2004 and decreasing to 3.6 days in 2013.
- Length of stay was similar for males and females, decreasing from 6.3 days in 2004 to 5.0 days in 2013.

Average Length of Stay for All Adults

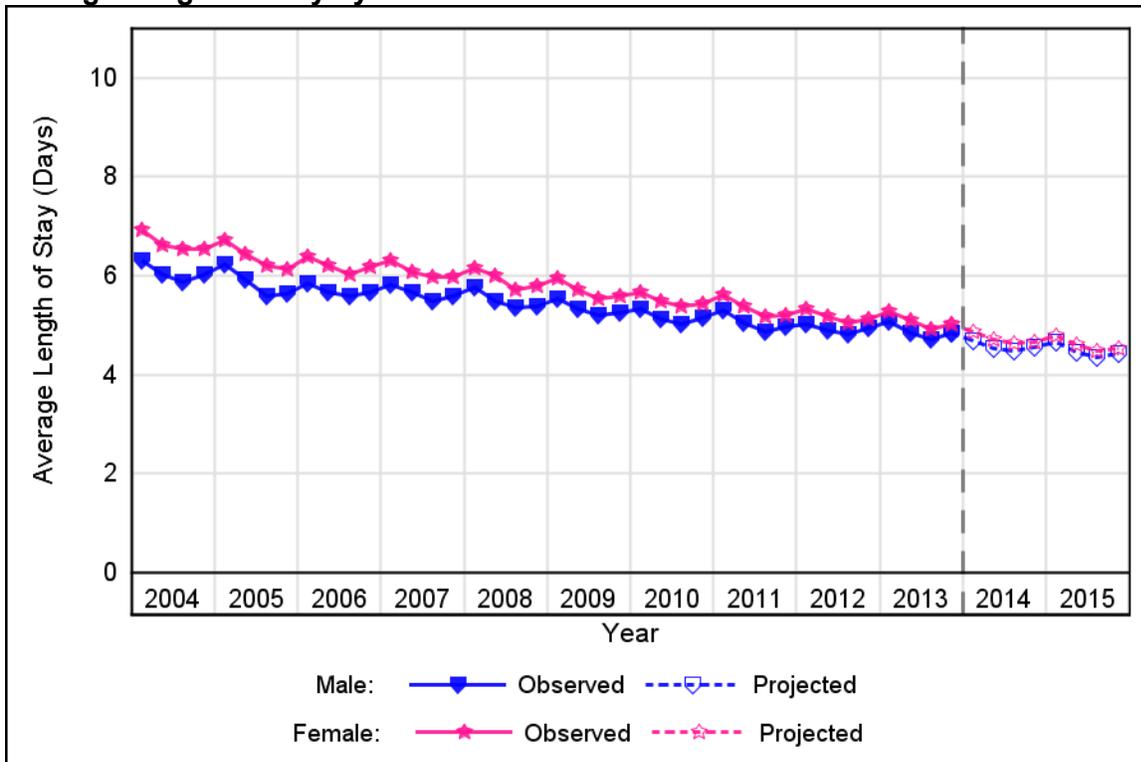


Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

Average Length of Stay by Age



Average Length of Stay by Sex



Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

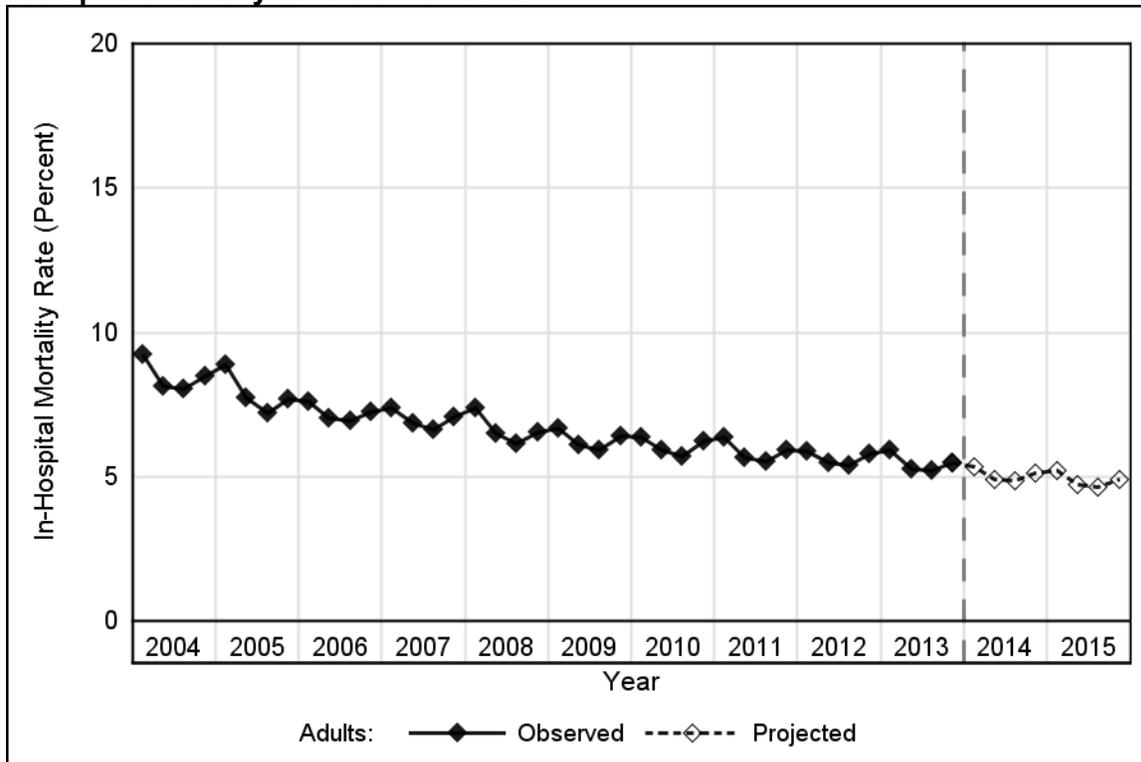
Acute Myocardial Infarction (AMI) for Adults

In-Hospital Mortality Rate

Key Findings:

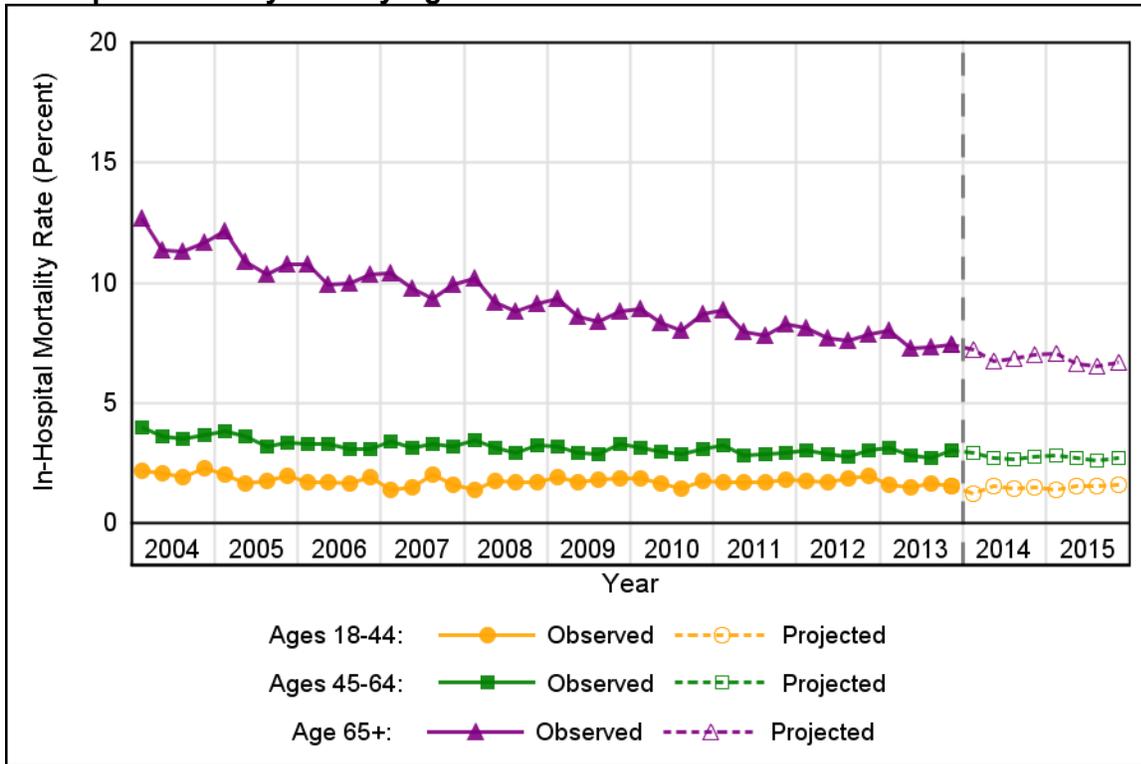
- The mortality rate for discharges with AMI decreased over time from 8.5 percent in 2004 to 5.5 percent in 2013. This decreasing trend is projected to continue in 2014 and 2015, with the mortality rate projected to be 4.9 percent at the end of 2015.
- Adults aged 65 years and older had the highest mortality rate at 11.8 percent in 2004 and decreasing to 7.5 percent in 2013. Adults aged 45–64 years had the next highest mortality rate at 3.7 percent in 2004 and decreasing to 2.9 percent in 2013. Adults aged 18–44 years had the lowest mortality rate at 2.1 percent in 2004 and decreasing to 1.6 percent in 2013.
- The mortality rate was 2.1 percentage points higher for females than for males. Females had a mortality rate that decreased from 10.3 percent in 2004 to 6.3 percent in 2013. Males had a mortality rate that decreased from 7.2 percent in 2004 to 5.0 percent in 2013.

In-Hospital Mortality Rate for All Adults

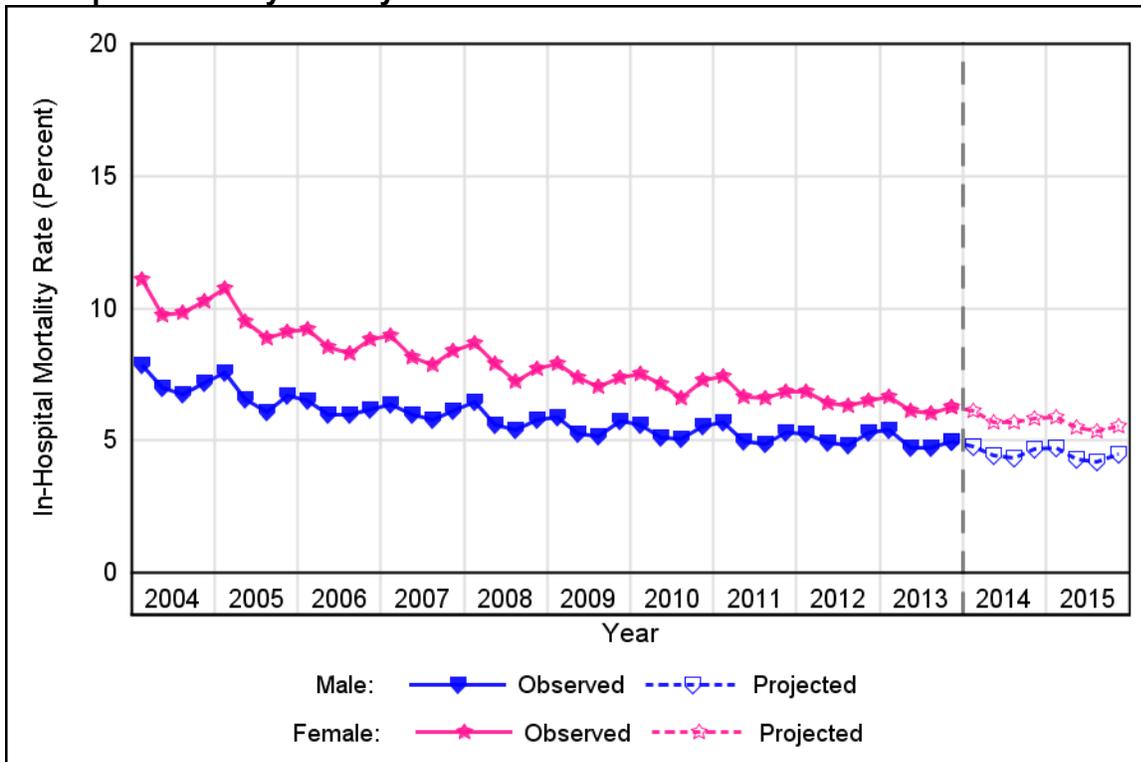


Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

In-Hospital Mortality Rate by Age



In-Hospital Mortality Rate by Sex



Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

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Acute Stroke for Adults

A stroke occurs when a blood vessel that carries oxygen and nutrients to the brain is either blocked by a clot or bursts. When that happens, part of the brain cannot get the blood (and oxygen) it needs, which results in either temporary or permanent injury to the brain. Using the HCUP SID from 2004 to 2013 and early 2014 data from 15 States, different outcomes for inpatient discharges with a principal diagnosis of acute stroke are projected for 2014 to 2015.

Projections include the following:

- Total inpatient discharges for all adults, adults by age group, and adults by sex. Discharge counts exclude inpatient stays that were transferred out to another acute care hospital. This ensures that these events are not double counted.
- Average total hospital cost for all adults, adults by age group, and adults by sex. Average total hospital cost reflects actual expenses incurred in the production of hospital services; physician costs are not included. For comparison, a line is included that depicts the change in the average inpatient hospital cost per admission in the first quarter of 2004 (Q1 2004) due solely to economy-wide inflation. The difference between the actual/projected cost line and the inflation-adjusted Q1 2004 cost line represents cost increases due to other noninflation factors, such as new technology, patient case mix, etc.
- Average length of stay for all adults, adults by age group, and adults by sex. In HCUP, the length of stay counts nights spent in the hospital. If a patient is admitted and discharged on the same day, the length of stay is zero.
- In-hospital mortality rate for all adults, adults by age group, and adults by sex.

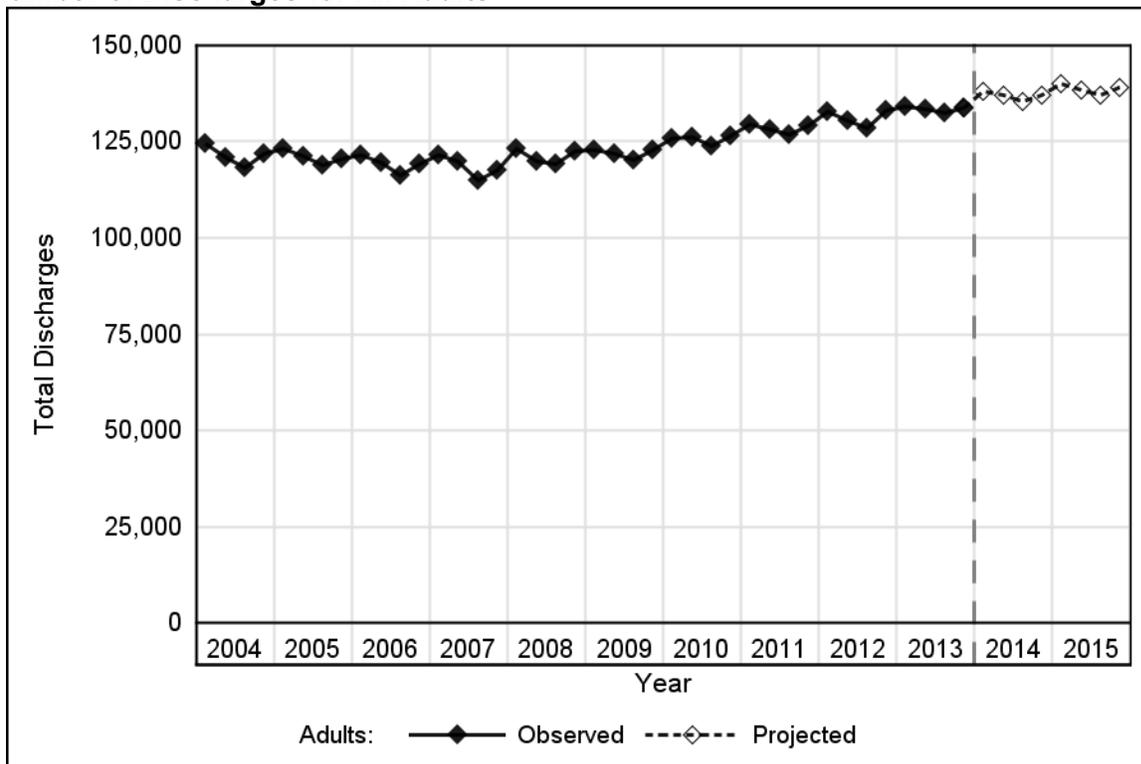
Acute Stroke for Adults

Number of Discharges

Key Findings:

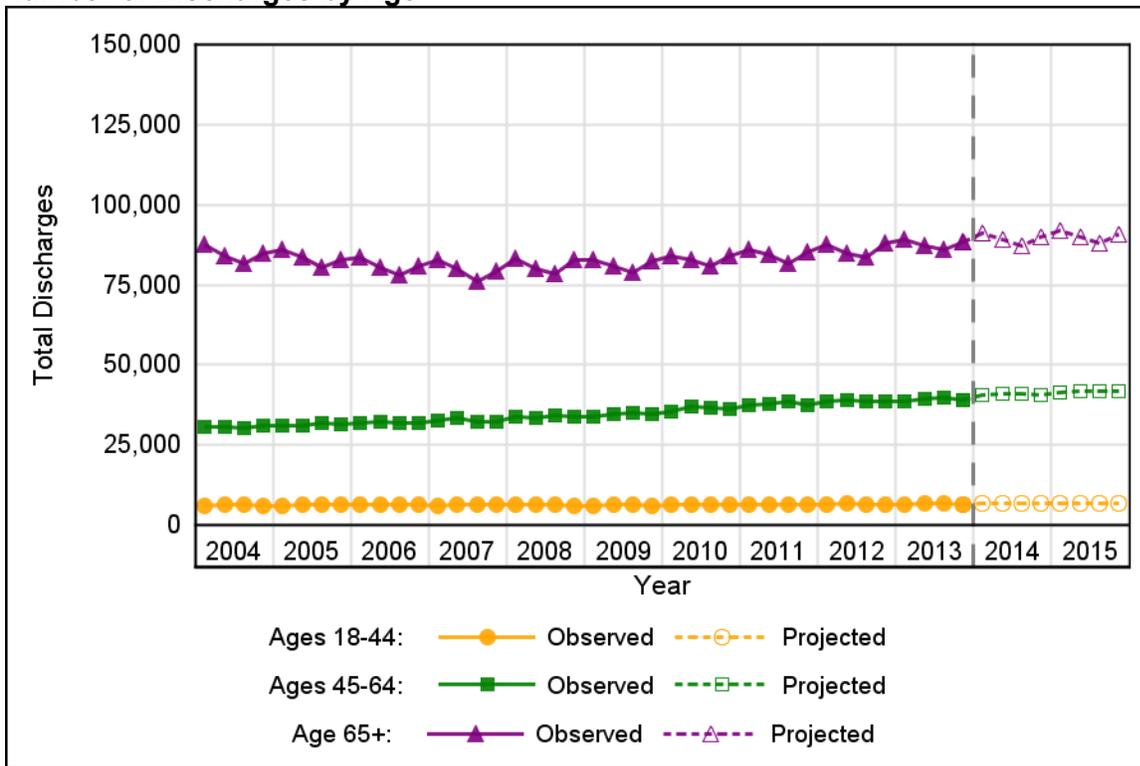
- The number of acute stroke discharges was relatively stable between 2004 and 2008 at about 120,000 discharges per quarter, but then increased to 133,500 discharges per quarter in 2013. Discharges are projected to be 139,000 at the end of 2015.
- Adults aged 65 years and older had the highest discharges, remaining relatively stable at about 83,000 discharges per quarter. Adults aged 45–64 years had the next highest discharges at about 30,500 discharges per quarter in 2004 and increasing to 39,000 discharges per quarter in 2013. Adults aged 18–44 years had the lowest discharges, remaining relatively stable at about 6,500 discharges per quarter.
- Females had about 12,500 more discharges per quarter than did males in 2004. This initial difference disappeared over time with both sexes having about 67,000 discharges per quarter in 2013.

Number of Discharges for All Adults

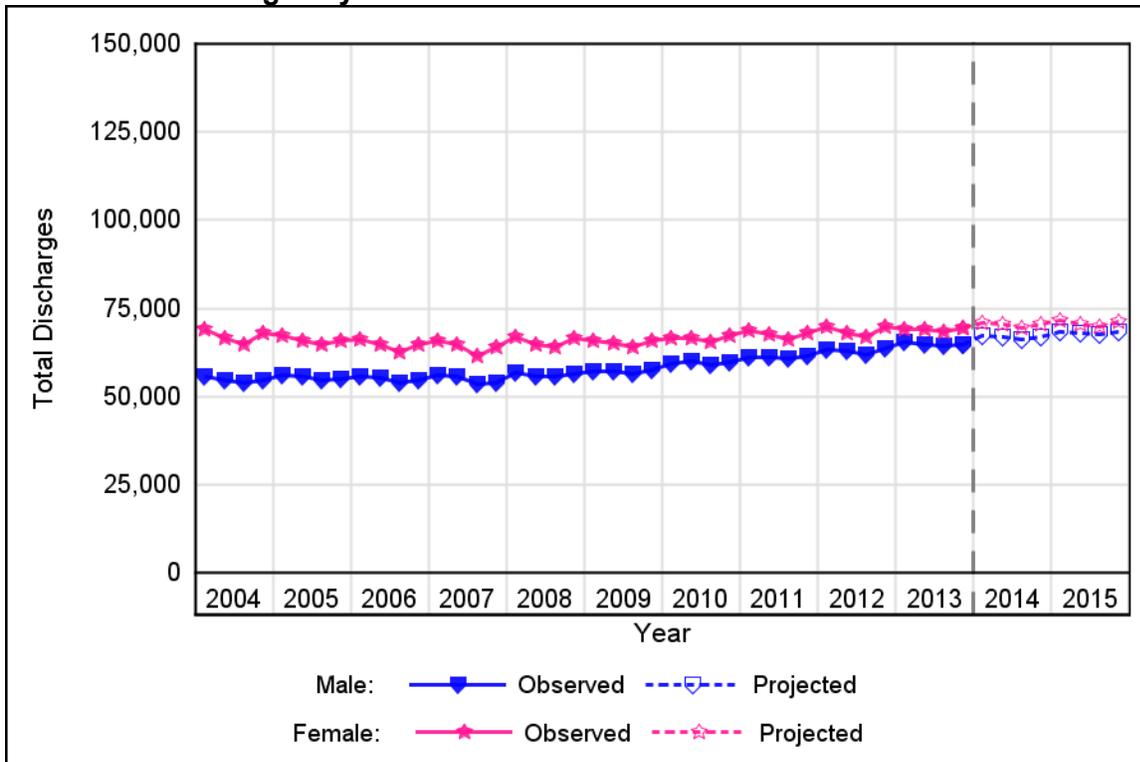


Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

Number of Discharges by Age



Number of Discharges by Sex



Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

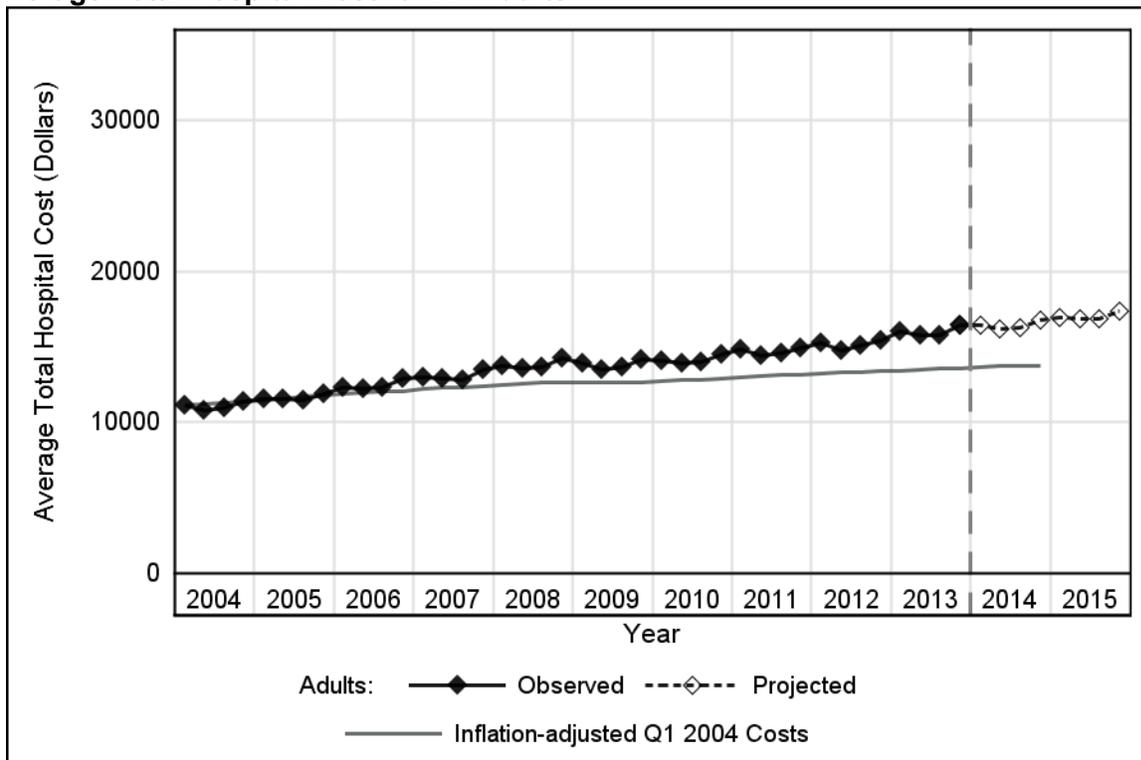
Acute Stroke for Adults

Average Total Hospital Cost

Key Findings:

- The average hospital cost for discharges with acute stroke increased over time from about \$11,000 in 2004 to \$16,000 in 2013. The average hospital cost is projected to be \$17,500 at the end of 2015.
- The average hospital cost was highest for adults aged 18–44 years, increasing from about \$18,500 in 2004 to \$26,500 in 2013. Adults aged 45–64 years had the next highest average hospital cost at about \$14,000 in 2004 and increasing to \$20,000 in 2013. Adults aged 65 years and older had the lowest average hospital cost at about \$9,500 in 2004 and increasing to \$13,500 in 2013.
- The average hospital cost was similar for males and females, increasing from about \$11,000 in 2004 to \$16,000 in 2013.
- Using the Gross Domestic Product (GDP) price index, a cost of \$11,000 in 2004 would be equivalent to a cost of \$13,500 in 2013. By the end of 2013, the average hospital cost exceeded the cost expected by inflation alone.

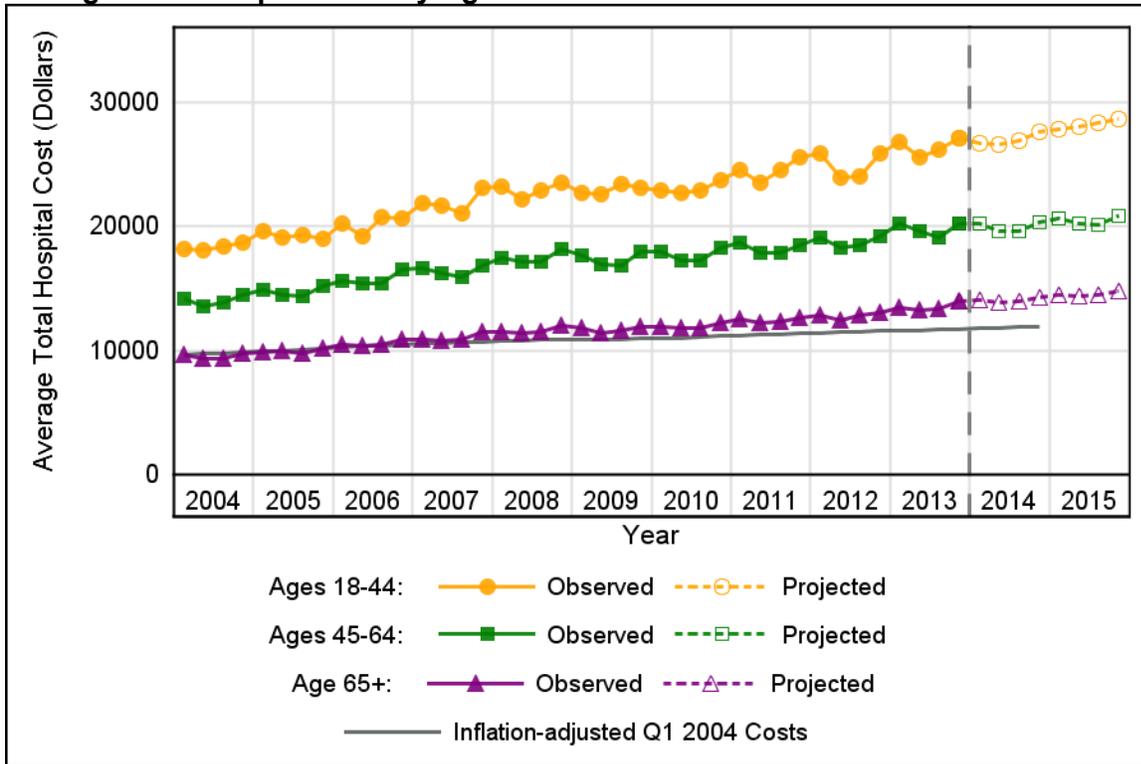
Average Total Hospital Cost for All Adults



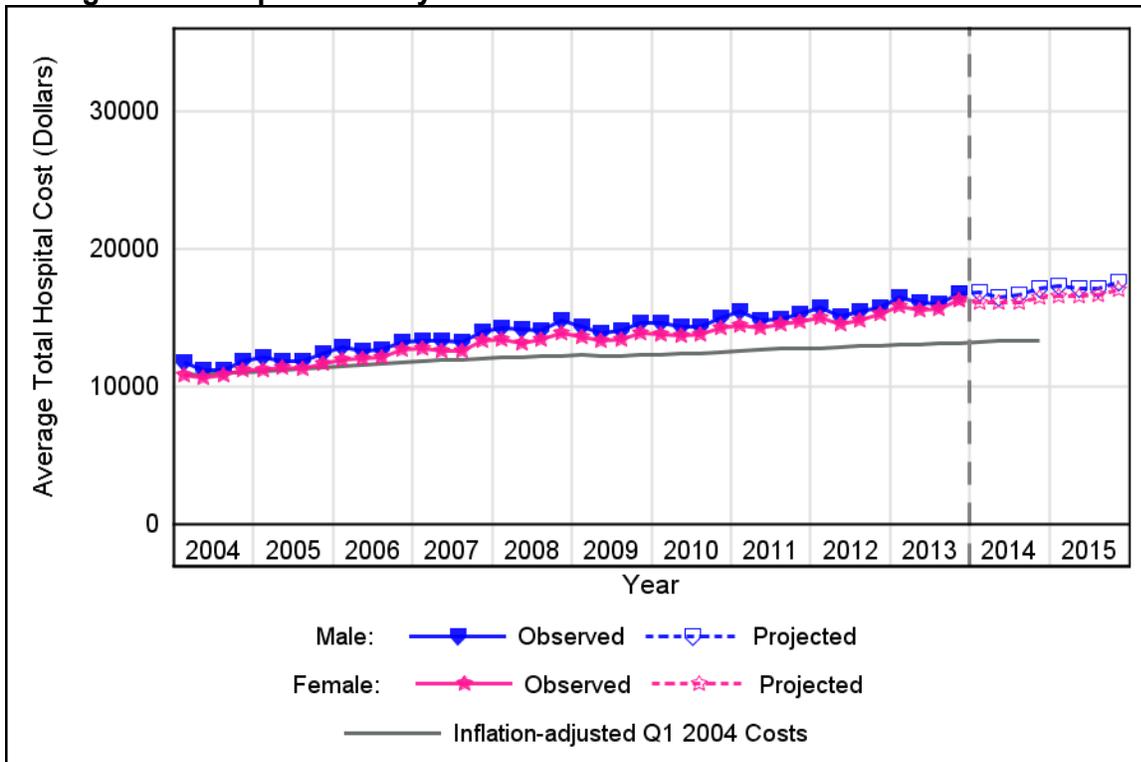
Inflation-adjusted Q1 2004 Costs: Cost per admission in the first quarter of 2004, adjusted for economy-wide inflation.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

Average Total Hospital Cost by Age



Average Total Hospital Cost by Sex



Inflation-adjusted Q1 2004 Costs: Cost per admission in the first quarter of 2004, adjusted for economy-wide inflation. Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

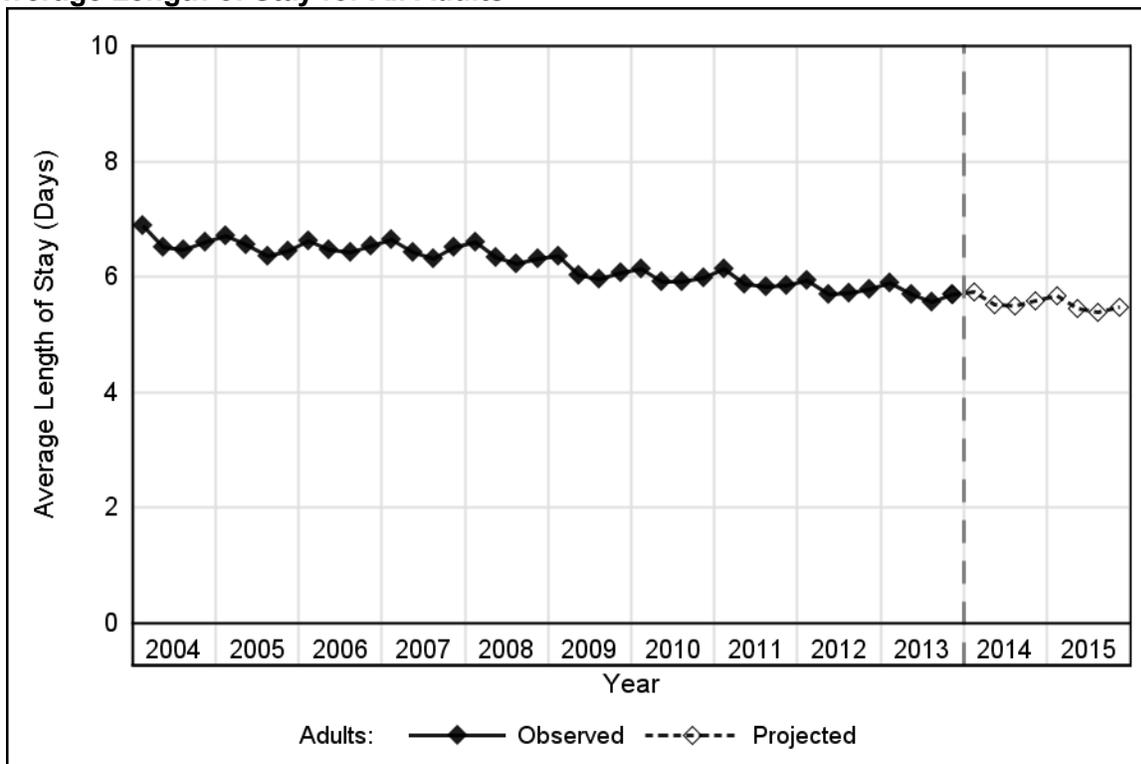
Acute Stroke for Adults

Average Length of Stay

Key Findings:

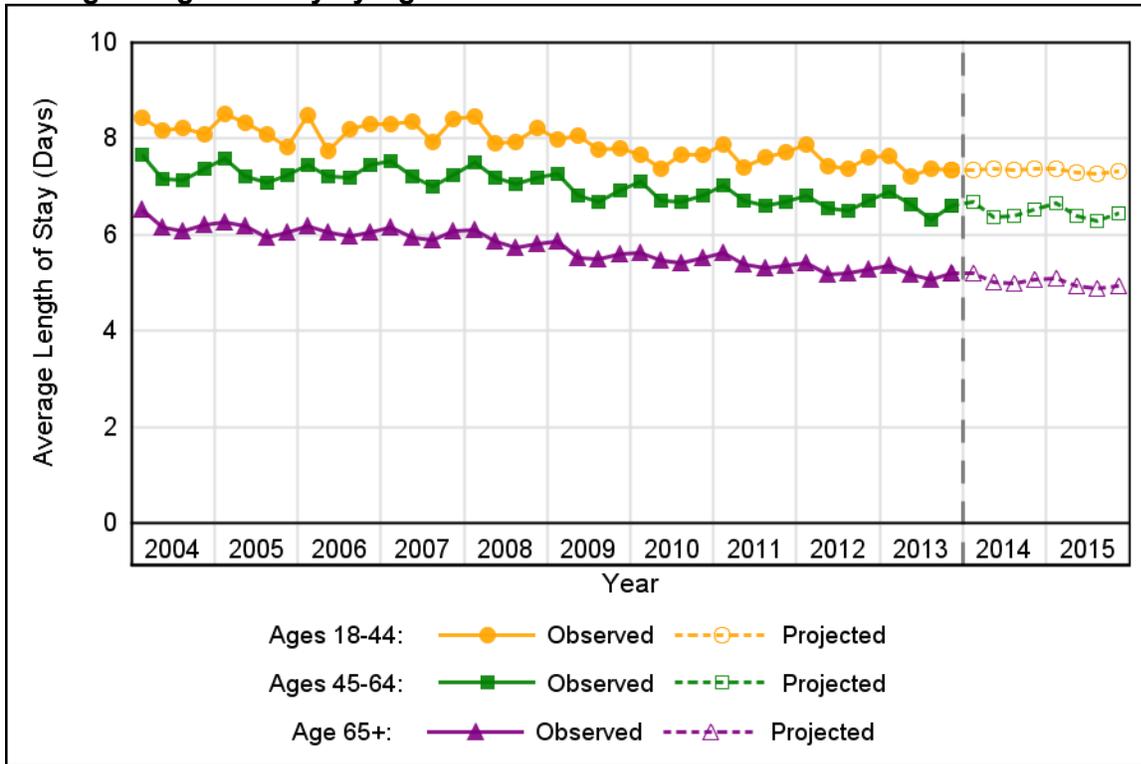
- The length of stay for discharges with acute stroke decreased over time from 6.6 days in 2004 to 5.7 days in 2013. The length of stay is projected to be 5.5 days at the end of 2015.
- Adults aged 18–44 years had the longest length of stay at 8.2 days in 2004 and decreasing to 7.4 days in 2013. Adults aged 45–64 years had the next longest length of stay at 7.4 days in 2004 and decreasing to 6.6 days in 2013. Adults aged 65 years and older had the shortest length of stay at 6.3 days in 2004 and decreasing to 5.2 days in 2013.
- Length of stay was similar for males and females, decreasing from around 6.6 days in 2004 to 5.7 days in 2013.

Average Length of Stay for All Adults

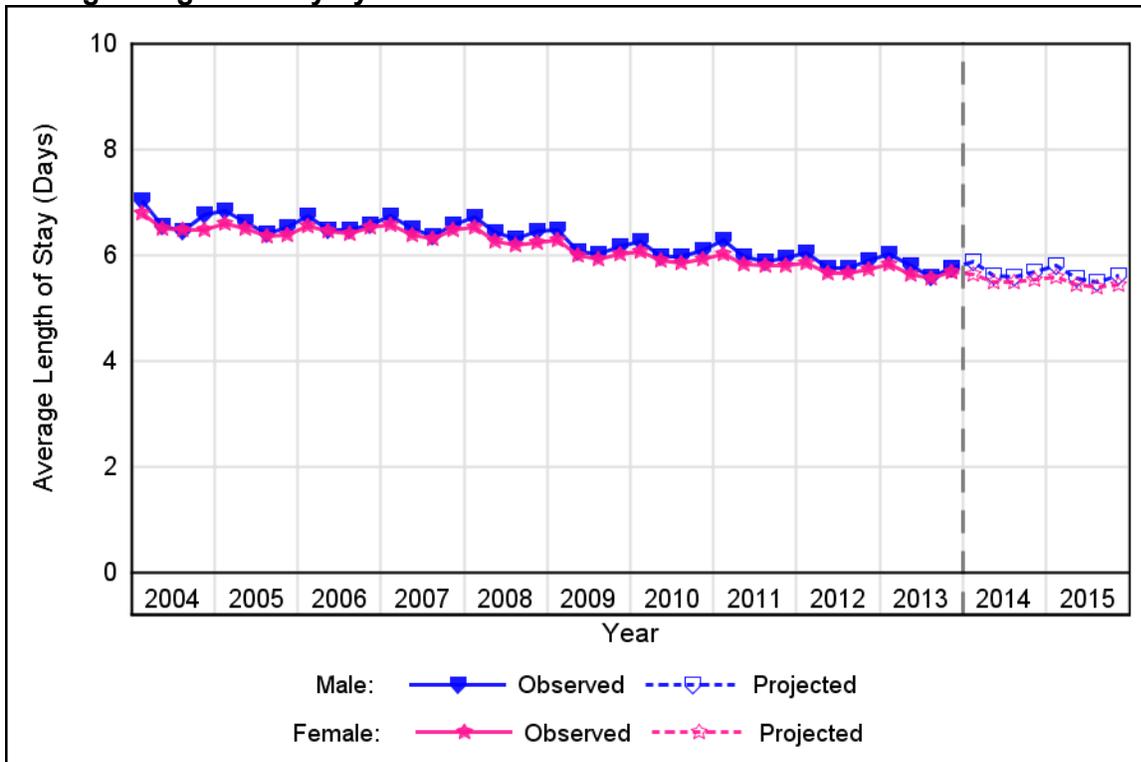


Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

Average Length of Stay by Age



Average Length of Stay by Sex



Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

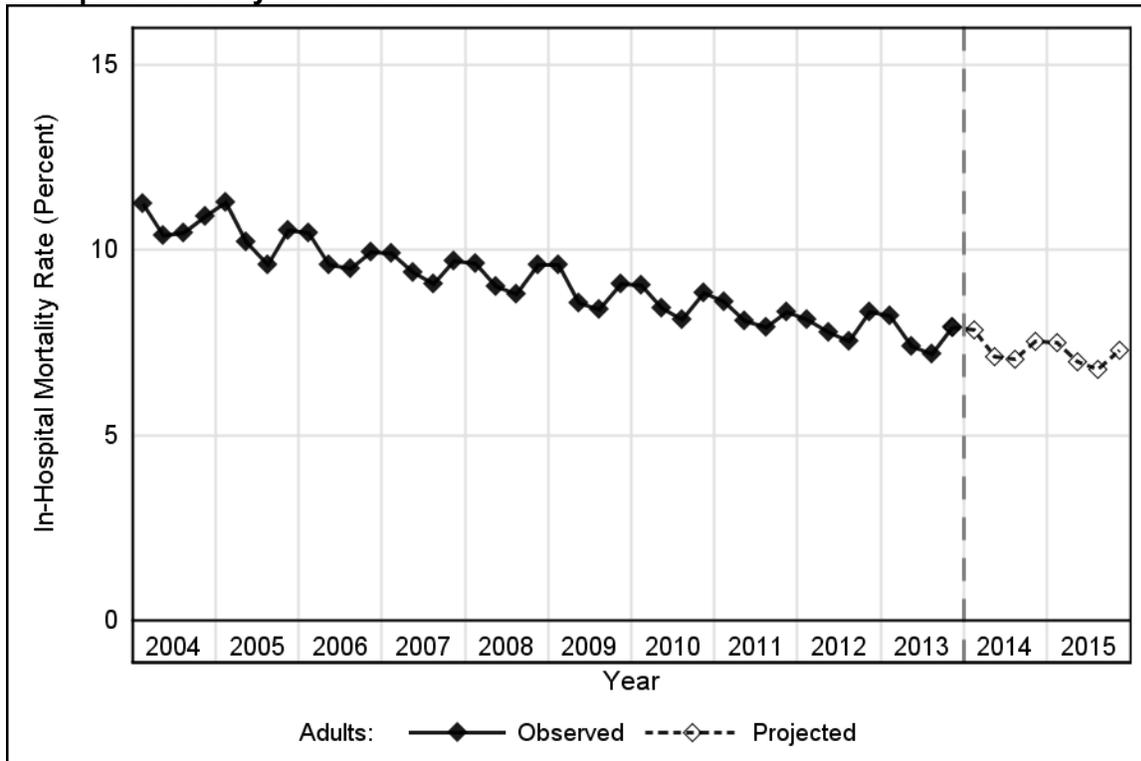
Acute Stroke for Adults

In-Hospital Mortality Rate

Key Findings:

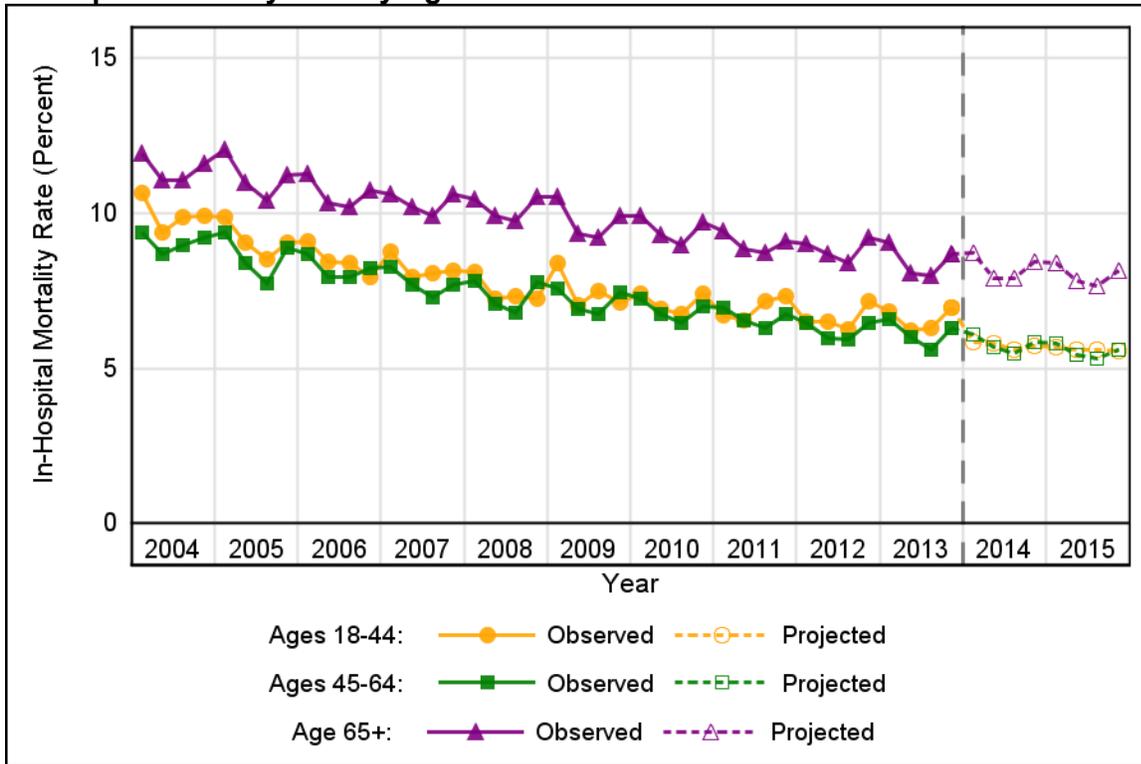
- The mortality rate for discharges with acute stroke decreased over time from 10.8 percent in 2004 to 7.7 percent in 2013. The mortality rate is projected to be 7.3 percent at the end of 2015.
- Adults aged 65 years and older had the highest mortality rate at 11.4 percent in 2004 and decreasing to 8.5 percent in 2013. The two youngest age groups had a similar mortality rate at around 9.5 percent in 2004 and decreasing to 6.4 percent in 2013.
- The mortality rate was similar for males and females, decreasing from around 10.7 percent in 2004 to 7.7 percent in 2013.

In-Hospital Mortality Rate for All Adults

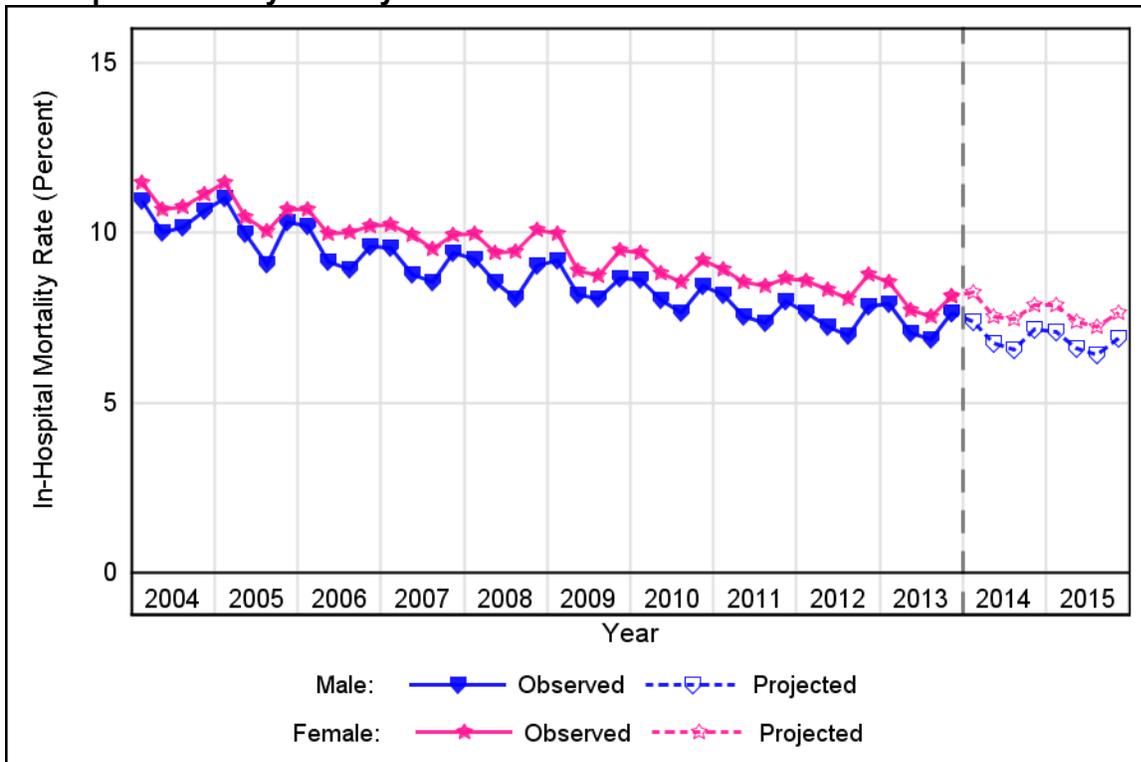


Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

In-Hospital Mortality Rate by Age



In-Hospital Mortality Rate by Sex



Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

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AMI or Acute Stroke for Adults

Using the HCUP SID from 2004 to 2013 and early 2014 data from 15 States, different outcomes for inpatient discharges with a principal diagnosis of AMI or acute stroke are projected for 2014 to 2015.

Projections include the following:

- Total inpatient discharges for all adults, adults by age group, and adults by sex. Discharge counts exclude inpatient stays that were transferred out to another acute care hospital. This ensures that these events are not double counted.
- Average total hospital cost for all adults, adults by age group, and adults by sex. Average total hospital cost reflects actual expenses incurred in the production of hospital services; physician costs are not included. For comparison, a line is included that depicts the change in the average inpatient hospital cost per admission in the first quarter of 2004 (Q1 2004) due solely to economy-wide inflation. The difference between the actual/projected cost line and the inflation-adjusted Q1 2004 cost line represents cost increases due to other noninflation factors, such as new technology, patient case mix, etc.
- Average length of stay for all adults, adults by age group, and adults by sex. In HCUP, the length of stay counts nights spent in the hospital. If a patient is admitted and discharged on the same day, the length of stay is zero.
- In-hospital mortality rate for all adults, adults by age group, and adults by sex.

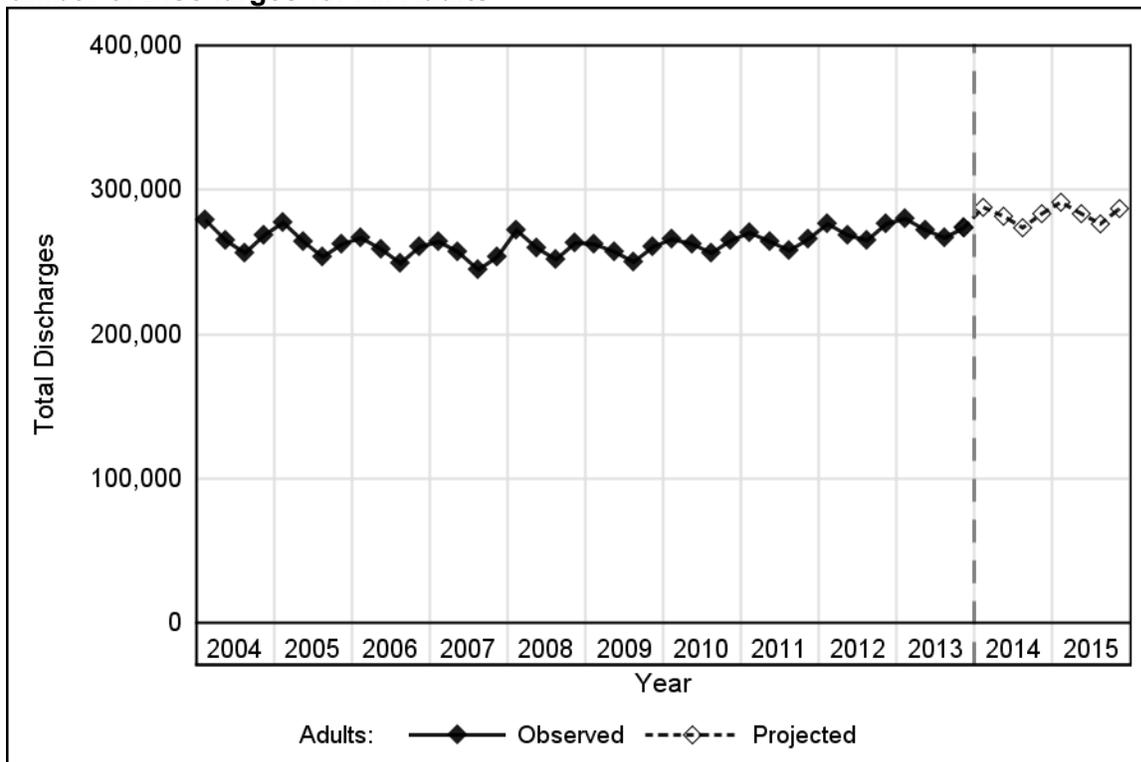
AMI or Acute Stroke for Adults

Number of Discharges

Key Findings:

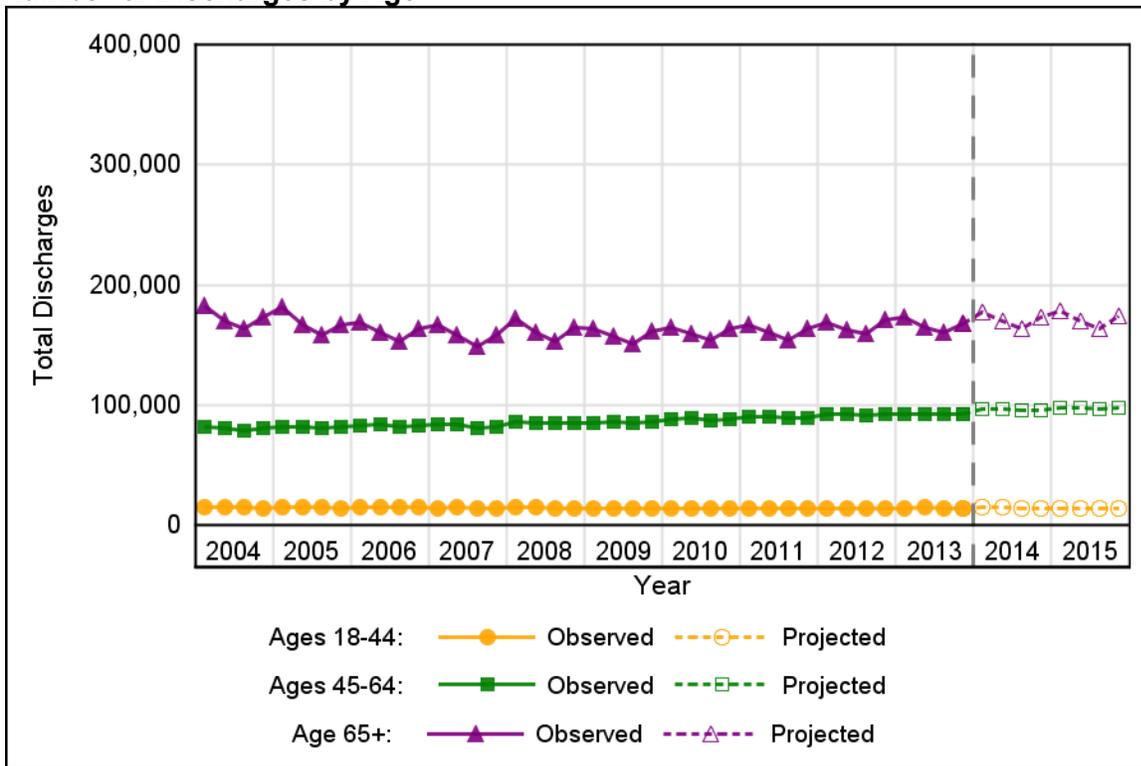
- The number of discharges for AMI or acute stroke was relatively stable over time, vacillating around 263,500 discharges per quarter. Discharges are projected to be 286,500 at the end of 2015.
- Adults aged 65 years and older had the highest discharges, remaining relatively stable at about 163,500 discharges per quarter between 2004 and 2013. Adults aged 45–64 years had the next highest discharges at about 80,500 discharges per quarter in 2004 and increasing to 92,500 discharges per quarter in 2013. Adults aged 18–44 years had the lowest discharges, remaining relatively stable at about 14,500 discharges per quarter between 2004 and 2013.
- Males had about 20,000 more discharges per quarter than did females. Males had a relatively stable number of discharges between 2004 and 2013 at about 142,000 discharges per quarter. Females also had a relatively stable number of discharges over time at about 122,000 discharges per quarter.

Number of Discharges for All Adults

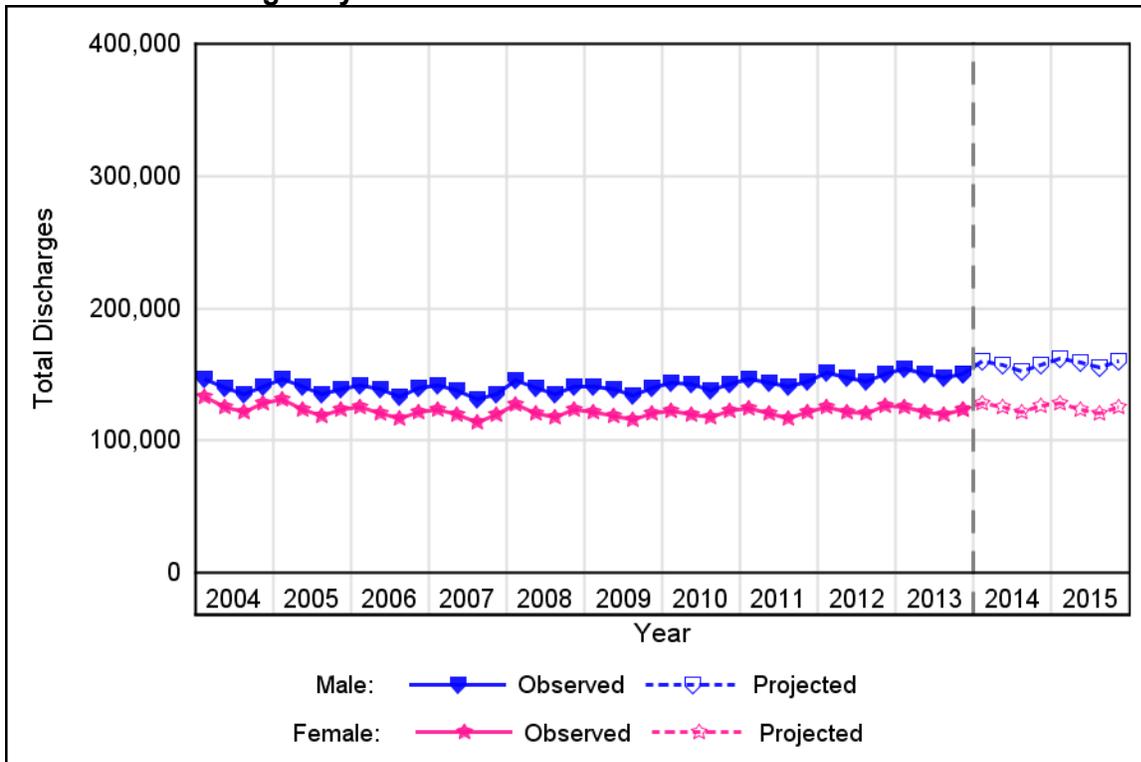


Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

Number of Discharges by Age



Number of Discharges by Sex



Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

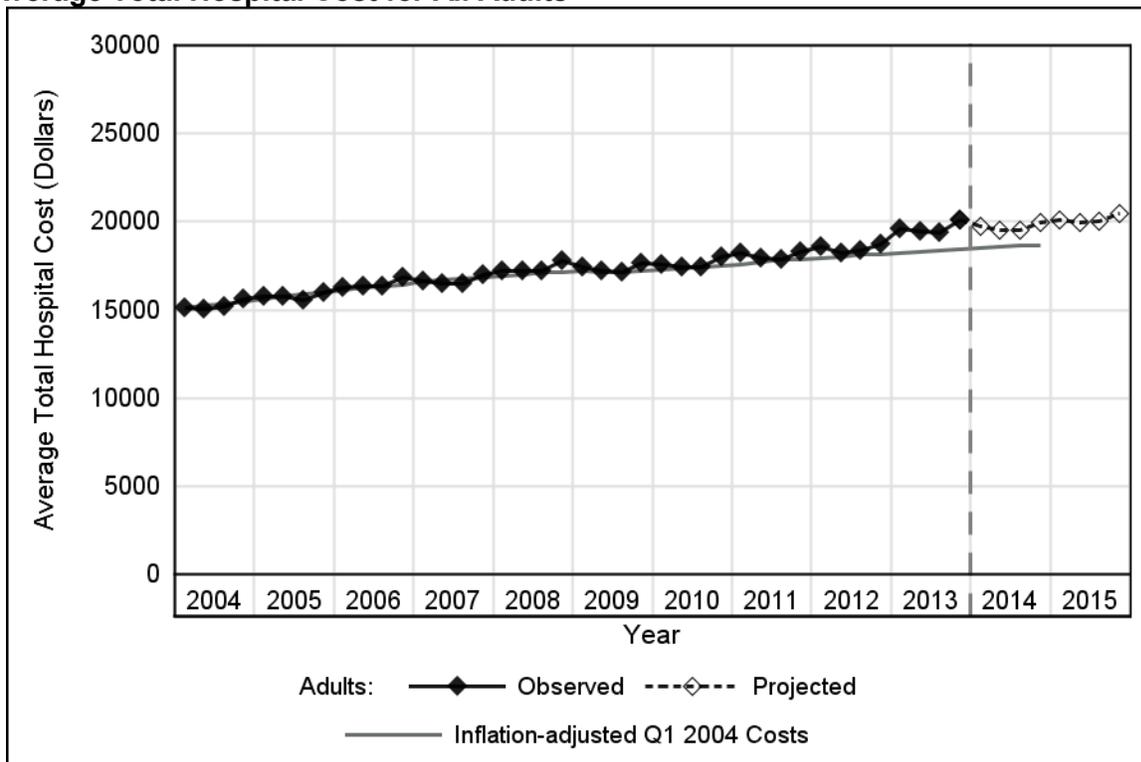
AMI or Acute Stroke for Adults

Average Total Hospital Cost

Key Findings:

- The average hospital cost for discharges with AMI or acute stroke increased from about \$15,000 in 2004 to \$19,500 in 2013. The average hospital cost is projected to be \$20,500 at the end of 2015.
- The two youngest age groups had similar average hospital costs, increasing from around \$18,000 in 2004 to \$23,500 in 2013. Adults aged 65 years and older had the lowest average hospital cost, increasing from about \$14,000 in 2004 to \$17,500 in 2013.
- The average hospital cost was about \$3,000 higher for males than for females. Males had an average hospital cost that increased from about \$16,500 in 2004 to \$21,000 in 2013. Females had an average hospital cost that increased from about \$14,000 in 2004 to \$18,000 in 2013.
- Using the Gross Domestic Product (GDP) price index, a cost of \$15,000 in 2004 would be equivalent to a cost of \$18,500 at the end of 2013. The average hospital cost through 2013 remained relatively consistent with the cost expected by inflation alone.

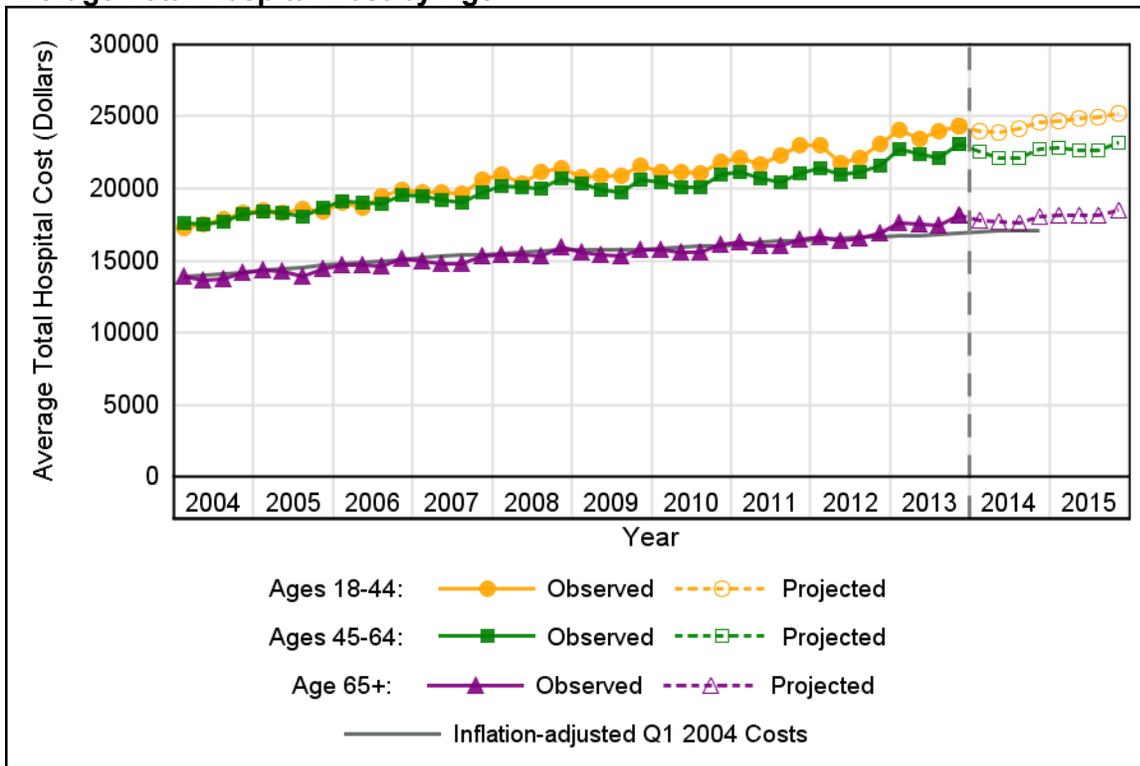
Average Total Hospital Cost for All Adults



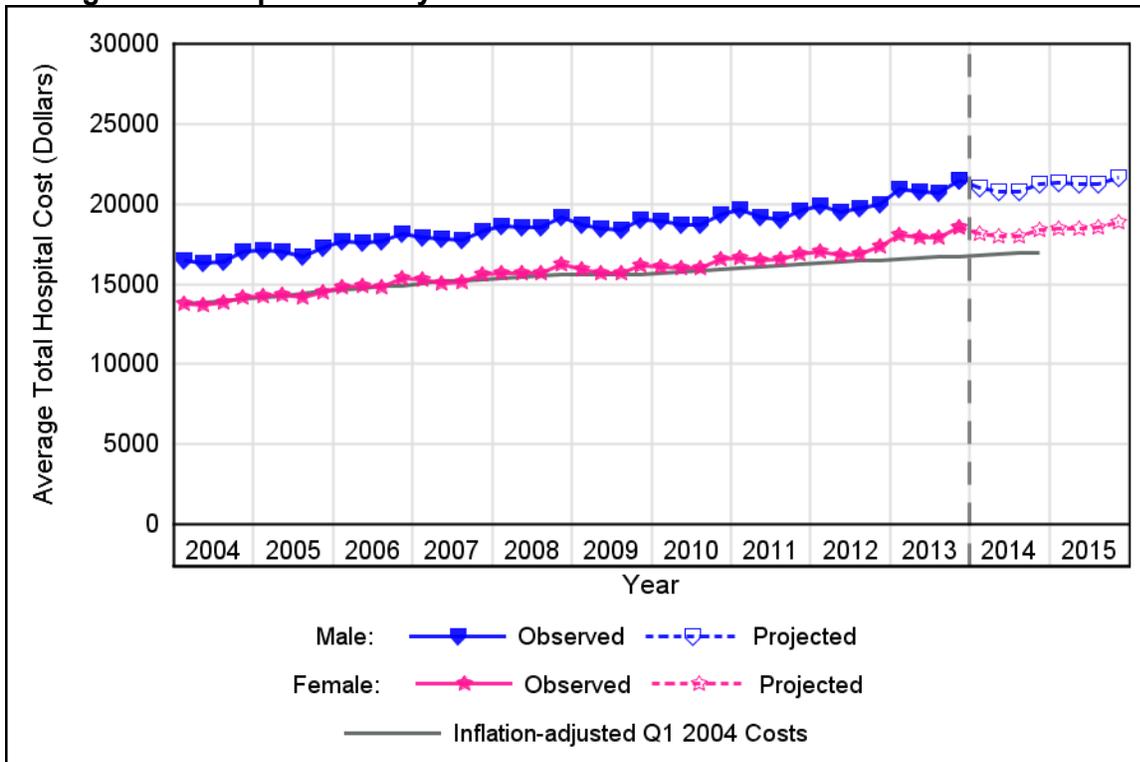
Inflation-adjusted Q1 2004 Costs: Cost per admission in the first quarter of 2004, adjusted for economy-wide inflation.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

Average Total Hospital Cost by Age



Average Total Hospital Cost by Sex



Inflation-adjusted Q1 2004 Costs: Cost per admission in the first quarter of 2004, adjusted for economy-wide inflation. Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

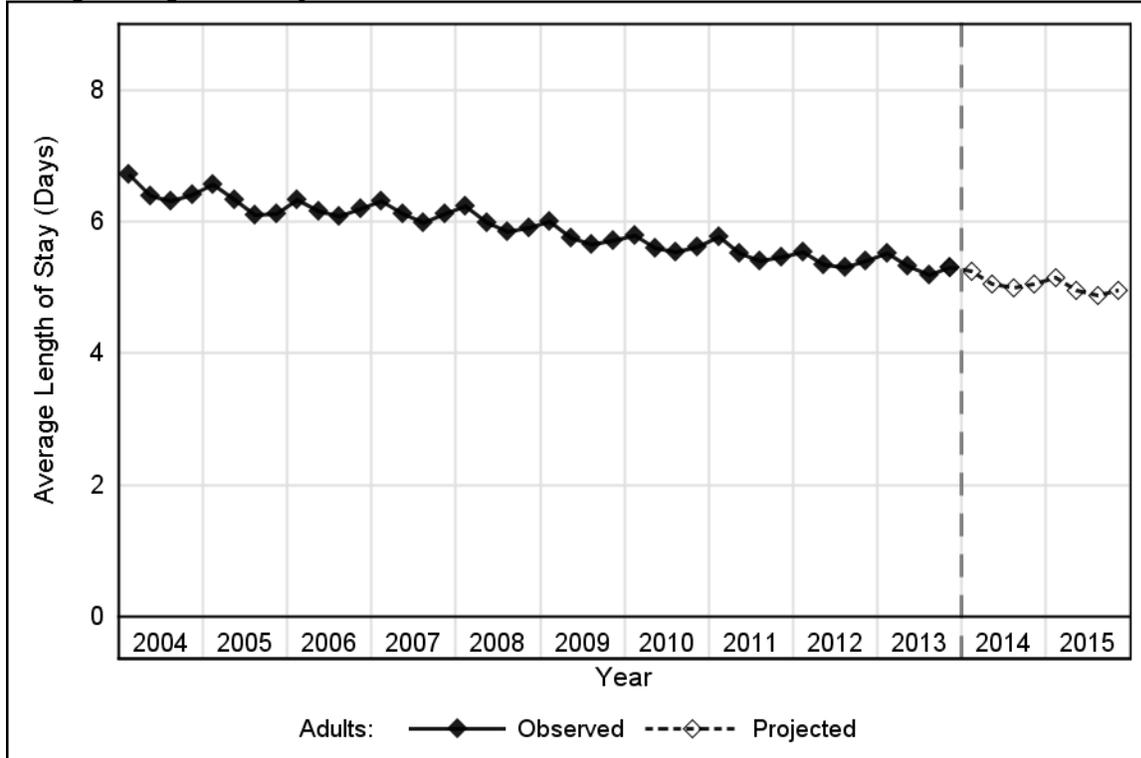
AMI or Acute Stroke for Adults

Average Length of Stay

Key Findings:

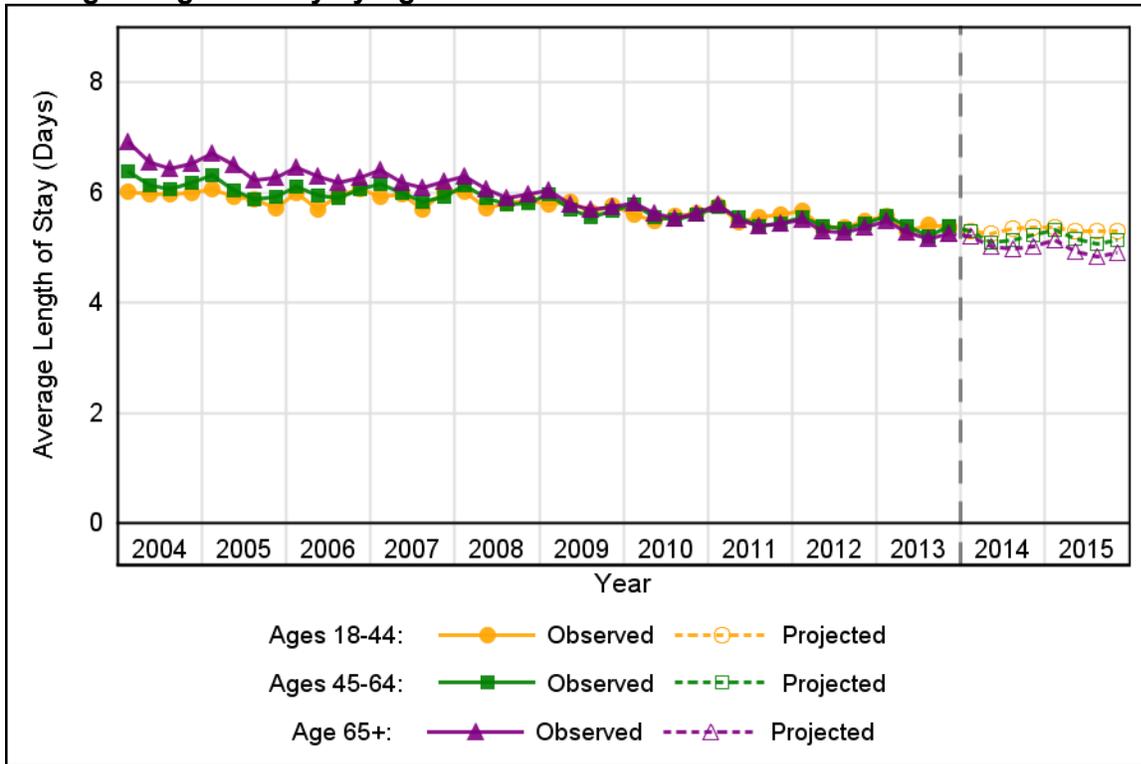
- The length of stay for discharges with AMI or acute stroke decreased over time from 6.5 days in 2004 to 5.3 days in 2013. The length of stay is projected to be 4.9 days at the end of 2015.
- Length of stay was similar for all ages, decreasing from around 6.5 days in 2004 to 5.3 days in 2013.
- Length of stay was similar for males and females, decreasing from around 6.5 days in 2004 to 5.3 days in 2013.

Average Length of Stay for All Adults

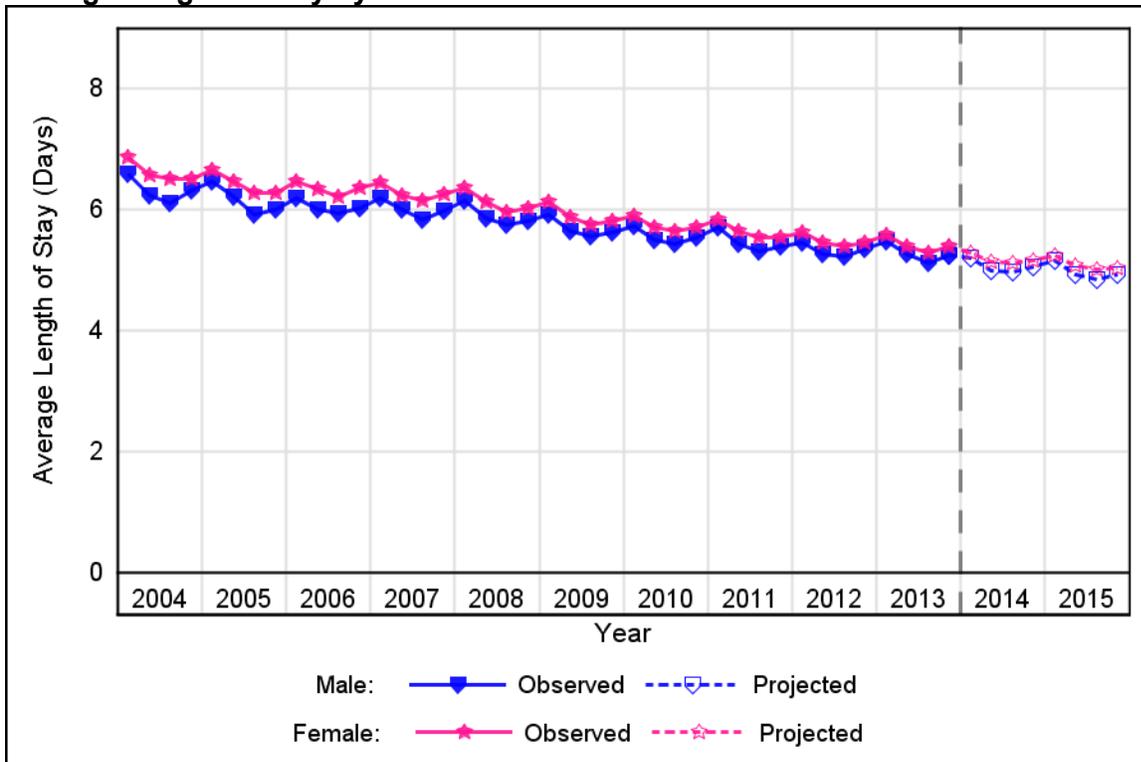


Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

Average Length of Stay by Age



Average Length of Stay by Sex



Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

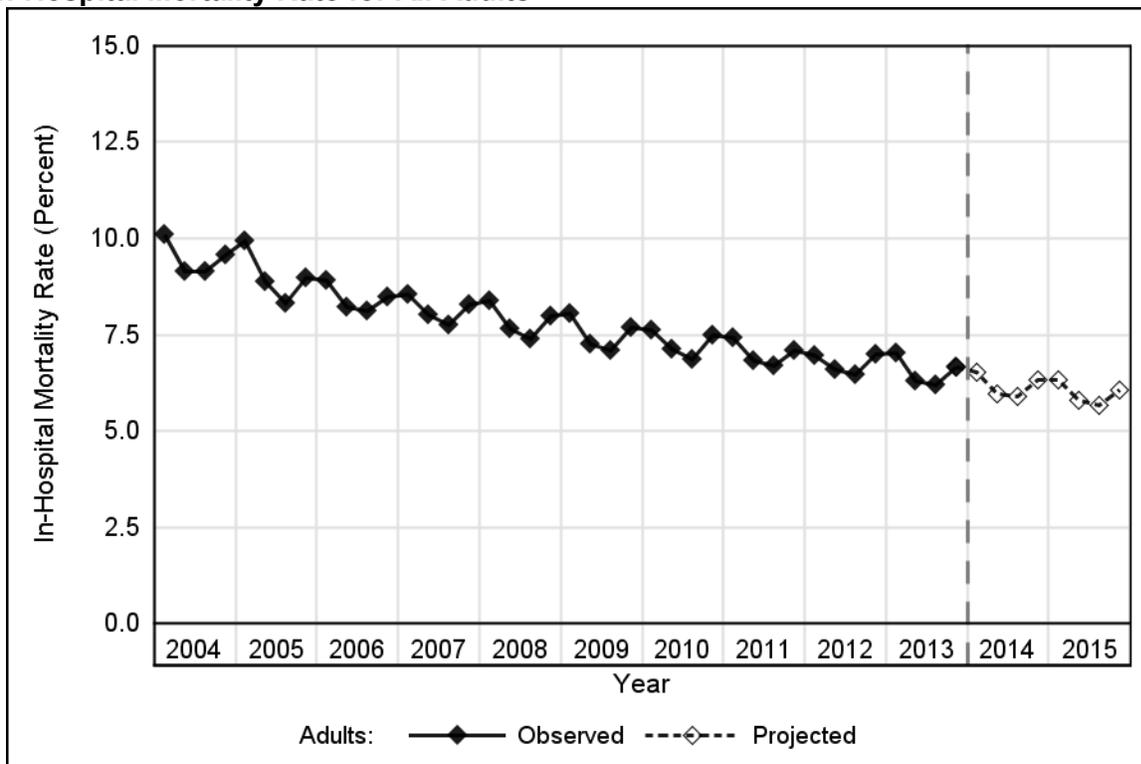
AMI or Acute Stroke for Adults

In-Hospital Mortality Rate

Key Findings:

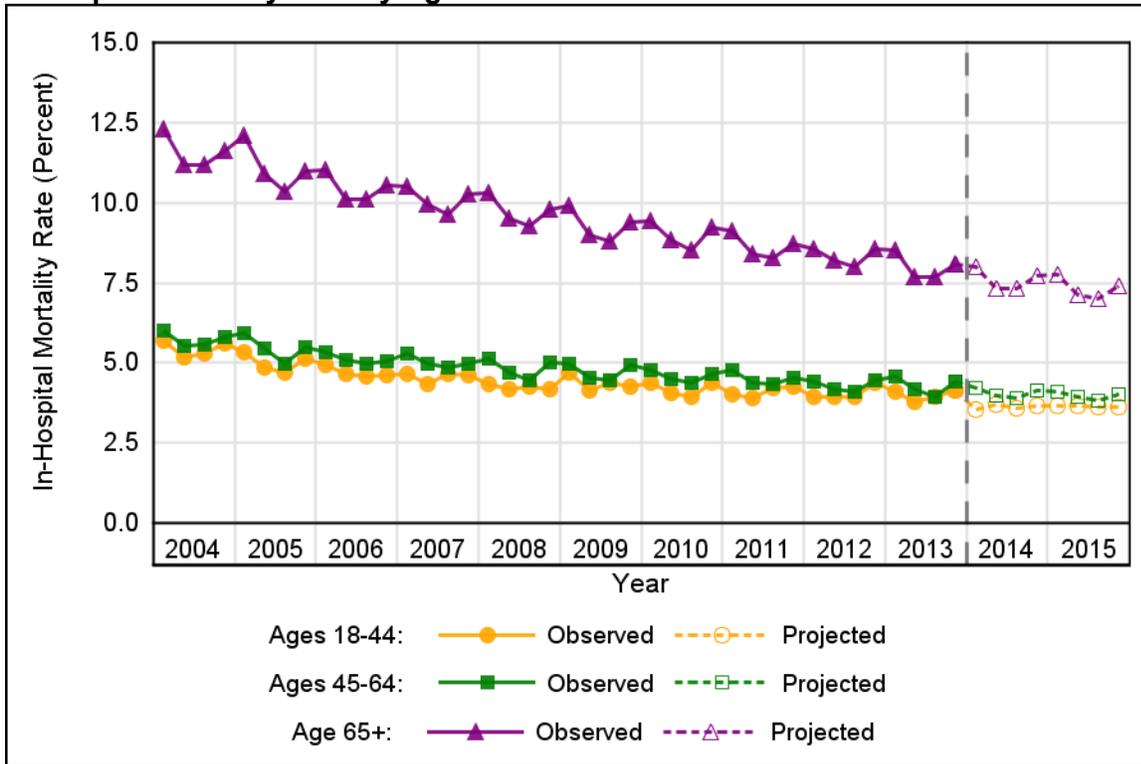
- The mortality rate for discharges with AMI or acute stroke decreased over time from 9.5 percent in 2004 to 6.6 percent in 2013. The mortality rate is projected to be 6.1 percent at the end of 2015.
- Adults aged 65 years and older had the highest mortality rate at 11.6 percent in 2004 and decreasing to 8.0 percent in 2013. The two youngest age groups had similar mortality rates, decreasing from around 5.6 percent in 2004 to 4.1 percent in 2013.
- The mortality rate was 1.8 percentage points higher for females than for males. Females had a mortality rate that decreased from 10.6 percent in 2004 to 7.2 percent in 2013. Males had a mortality rate that decreased from 8.5 percent in 2004 to 6.0 percent in 2013.

In-Hospital Mortality Rate for All Adults

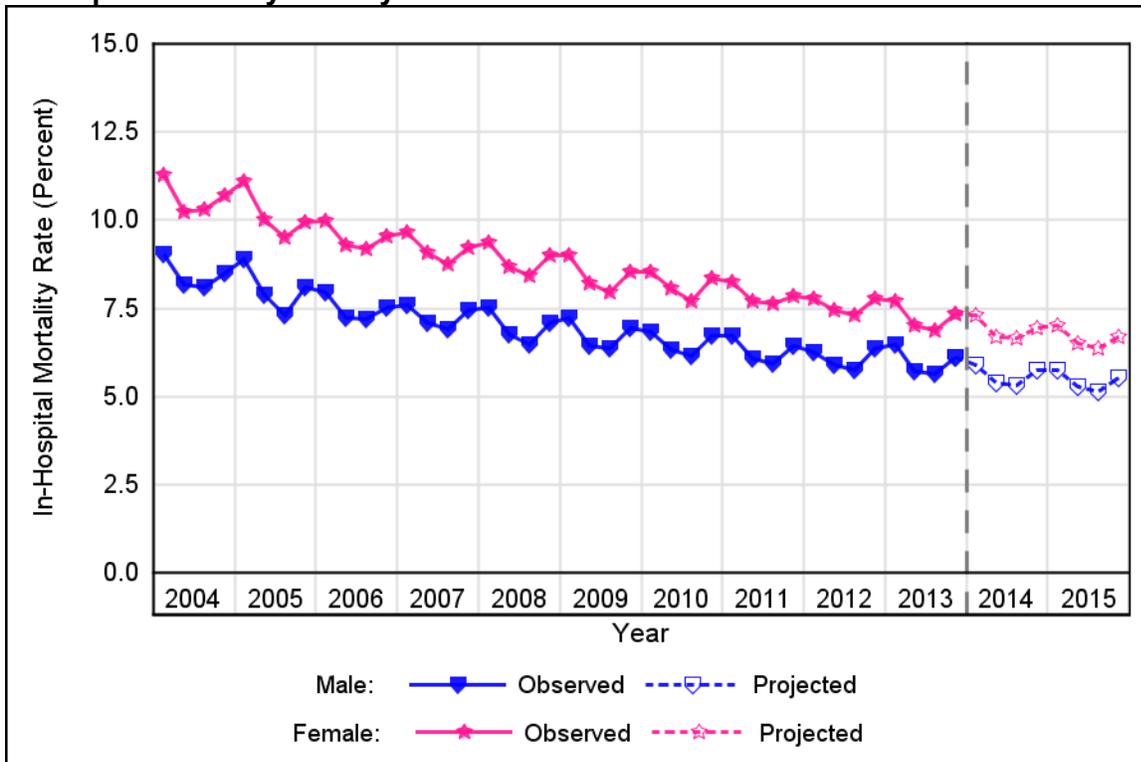


Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

In-Hospital Mortality Rate by Age



In-Hospital Mortality Rate by Sex



Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID)

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Appendix I: HCUP Data Partners

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

Appendix II: Definitions for Acute Myocardial Infarction (AMI) and Acute Stroke

This section includes the coding criteria used to identify adult discharges with acute myocardial infarction (AMI) and acute stroke. Coding criteria are based on either International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes or the HCUP Clinical Classifications Software (CCS). CCS categorizes ICD-9-CM diagnoses and procedures into a manageable number of clinically meaningful categories.¹⁰ This "clinical grouper" makes it easier to quickly understand patterns of diagnoses and procedures.

AMI and acute stroke are identified using the principal diagnosis, which is the condition established to be chiefly responsible for the patient's admission to the hospital.

Outcomes of interest include the following:

- Discharge counts:
Number of discharges that meet the AMI or acute stroke coding criteria, excluding discharges transferred out to another acute care hospital
- Average total hospital cost:
$$\frac{\text{Total cost for discharges that meet the AMI or acute stroke coding criteria, including transfers}}{\text{Discharge counts (definition above)}}$$
- Average length of stay:
$$\frac{\text{Total days for discharges that meet the AMI or acute stroke coding criteria, including transfers}}{\text{Discharge counts (definition above)}}$$
- Mortality rate:
$$\frac{\text{Number of discharges that meet the AMI or acute stroke coding criteria, with discharge disposition of died}}{\text{Discharge counts (definition above)}}$$

Outcome of interest also reported by adult age group (18–44, 45–64, and 65 years and above) and by sex.

¹⁰ HCUP Clinical Classifications Software (CCS) for ICD-9-CM. Healthcare Cost and Utilization Project (HCUP). March 2015. U.S. Agency for Healthcare Research and Quality, Rockville, MD. <http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp>. Accessed April 24, 2015.

Appendix II: Definitions for Acute Myocardial Infarction (AMI) and Acute Stroke

Acute Myocardial Infarction (AMI)	
Coding criteria:	Adult discharge (age 18 and older) with a principal diagnosis of CCS 100 <i>Acute myocardial infarction</i> (equivalent to ICD-9-CM principal diagnosis code of 410**)

Acute Stroke	
Coding criteria:	<p>Adult discharge (age 18 and older) with an ICD-9-CM principal diagnosis of one of the following:</p> <ul style="list-style-type: none"> • 430 Subarachnoid hemorrhage • 431 Intracerebral hemorrhage • 433.01 Occlusion and stenosis of basilar artery with cerebral infarction • 433.11 Occlusion and stenosis of carotid artery with cerebral infarction • 433.21 Occlusion and stenosis of vertebral artery with cerebral infarction • 433.31 Occlusion and stenosis of multiple and bilateral precerebral arteries with cerebral infarction • 433.81 Occlusion and stenosis of other specified precerebral artery with cerebral infarction • 433.91 Occlusion and stenosis of unspecified precerebral artery with cerebral infarction • 434.00 Cerebral thrombosis without mention of cerebral infarction • 434.01 Cerebral thrombosis with cerebral infarction • 434.10 Cerebral embolism without mention of cerebral infarction • 434.11 Cerebral embolism with cerebral infarction • 434.90 Cerebral artery occlusion, unspecified without mention of cerebral infarction • 434.91 Cerebral artery occlusion, unspecified with cerebral infarction • 436 Acute, but ill-defined, cerebrovascular disease

AMI or Acute Stroke	
Coding criteria:	Adult discharge (age 18 and older) with a principal diagnosis of AMI or acute stroke (as defined above)

Appendix III: Methods

This appendix describes the methods for projecting national outcomes of inpatient stays using the HCUP State Inpatient Databases (SID). The methodology leverages the breadth of States (up to 47) and longitudinal data (up to ten years) to improve the timeliness of estimates of inpatient statistics. The following factors make this initiative possible:

- the longitudinal nature of HCUP State databases
- the breadth of the databases across 47 States
- the capacity of our HCUP Partners to provide timely quarterly data
- the modeling expertise among HCUP staff, both Federal and contract
- the use of recently-released SAS Econometric Time Series® Software
- the automated assembly of analytic results into a streamlined, ready-to-deliver report.

HCUP includes the largest collection of longitudinal hospital care data in the United States, with all-payer, encounter-level information beginning in 1988. The number of HCUP Partners has expanded over the years to include an ever-larger percentage of hospital discharges nationwide. In fact, the HCUP State Inpatient Databases (SID) encompass about 97 percent of all U.S. community hospital discharges, made possible by the data collection efforts of State data organizations, hospital associations, private data organizations, and the Federal government. The list of statewide data organizations that contribute to HCUP databases is available in Appendix I. Although full-year administrative hospital data typically lag the current calendar year by nine to 15 months, some HCUP Partner organizations can now produce quarterly data files within four to six months following the close of a quarter. This “early” data is used to inform the projection models.

Discharges from the SID were limited to those from hospitals that were open during any part of each calendar year and were designated as community hospitals by the American Hospital Association (AHA) Annual Survey of Hospitals, excluding rehabilitation hospitals. The definition of a community hospital was that used by the AHA: "all nonfederal short-term general and other specialty hospitals, excluding hospital units of institutions."

Projected outcomes include the following:

- Counts of inpatient discharges
- Average total hospital cost
- Average length of stay
- In-hospital mortality rate

Appendix III: Methods

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).¹¹ Costs 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-charge ratio is used. Hospital charges reflect the amount the hospital billed for the entire hospital stay and does not include professional (physician) fees. Inflation adjustments were not applied to the observed total cost. Projected total costs will estimate inflated charges. In HCUP, the length of stay counts nights spent in the hospital. If a patient is admitted and discharged on the same day, the length of stay is zero. Each outcome is projected for the measures specified in Appendix II: Definitions.

Projections were generated using the SAS Time Series Forecasting System™ (Version 9.4).¹² Projections were calculated first by State and then weighted proportionally to the nine Census divisions and the nation. For each State, the software automatically selected from among 40 different time series models the model with the lowest mean absolute percentage error (MAPE) for that State.

National quarterly trends were calculated by weighting State-level quarterly trends within each division. Total counts of discharges (excluding births) in each State and year were from the AHA Hospital Survey. HCUP discharges were weighted to totals within stratum defined by the following hospital characteristics: teaching status, size based on the number of beds, urban-rural location, and control. These AHA-based weights were used throughout the period, 2004–2013. For 2014, we had early quarterly data for 15 States. The 2014 projections incorporated observed rates for these 15 States and incorporated rates estimated from time series models for the remaining States. For 2015, the projections were entirely based on rates estimated from time series models.

¹¹ HCUP Cost-to-Charge Ratio Files (CCR). Healthcare Cost and Utilization Project (HCUP). 2001–2012. U.S. Agency for Healthcare Research and Quality, Rockville, MD. Updated December 2014. <http://www.hcup-us.ahrq.gov/db/state/costtocharge.jsp>. Accessed April 24, 2015.

¹² *Large-Scale Automatic Forecasting Using Inputs and Calendar Events*. White Paper, SAS Institute Inc., 2009.