

STATISTICAL BRIEF #60

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Tuberculosis Stays in U.S. Hospitals, 2006

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Introduction

It is estimated that one-third of the world's population is infected with *Mycobacterium tuberculosis*, the airborne bacteria that causes tuberculosis.¹ While prevalence is much lower in the United States than in other countries, tuberculosis is still a significant health concern: in 2006, its prevalence in the U.S. was estimated at 3.2 persons per 100,000 population.² Though tuberculosis treatment is mainly performed on an outpatient basis, examining hospitalizations for tuberculosis can provide insight into this public health problem.

This Statistical Brief presents data from the Healthcare Cost and Utilization Project (HCUP) on characteristics of hospital admissions in the U.S. related to the treatment of tuberculosis in 2006. Variation in the characteristics of stays principally for tuberculosis and hospitalizations with a secondary diagnosis of tuberculosis are compared to other hospitalizations, excluding maternal and neonatal hospitalizations. Additionally, trends in tuberculosis hospitalizations are examined from 1995 to 2006, and information on payer, income level, and principal diagnoses for stays with a secondary diagnosis of tuberculosis are also presented. All differences between estimates noted in the text are statistically significant at the 0.05 level or better.

Findings

In 2006, there were nearly 58,500 hospitalizations in the U.S. that included a diagnosis of tuberculosis (TB). This represented a rate of nearly 20 stays per 100,000 population, which totaled \$752 million in hospital costs. However, TB was listed as the principal reason for hospitalization (i.e., the principal diagnosis) for only 8,800 stays (15 percent of all TB-related stays)—a rate of 3 stays per 100,000 population. Overall, the number of hospitalizations

¹ Overview of Tuberculosis (TB). National Institute of Allergy and Infectious Diseases, National Institutes of Health, 2008. <http://www3.niaid.nih.gov> (Accessed August 25, 2008).

² TB Country File: USA. United States of America. World Health Organization, 2008. <http://www.who.int/en> (Accessed September 10, 2008).

Highlights

- In 2006 there were 58,500 hospital stays related to tuberculosis (TB), a rate of 20 stays per 100,000 population. TB-related stays accounted for \$752 million in hospital costs.
- There has been a significant decline in the number of hospital stays principally for TB— from 15,000 in 1995 to 8,800 in 2006 for stays principally for TB, and 55,500 to 49,700 for stays with a secondary diagnosis.
- Hospital stays principally for TB had an average cost of \$20,100 and an average length of stay of 15 days—more than twice the cost and three times the length of the average non-maternal, non-neonatal stay.
- Uninsured patients accounted for 22.0 percent of TB stays, though they made up only 5.8 percent of all non-maternal, non-neonatal hospitalizations. Medicaid covered 24.4 percent of all TB stays, though it accounted for only 12.3 percent of all non-maternal, non-neonatal stays.
- The lowest rates of TB hospitalizations occurred in the Midwest (1.4 stays per 100,000 population for stays principally for TB, and 13.0 stays per 100,000 population for a secondary diagnosis) and the highest rates were in the Northeast (3.6 stays per 100,000 population principally and 21.0 stays per 100,000 for a secondary diagnosis).
- The hospitalization rate of stays principally for TB was more than twice as high in poorer communities than in wealthier communities—4.9 stays per 100,000 population compared to 2.2 stays per 100,000 population.

involving TB decreased between 1995 and 2006: the number of hospitalizations principally for TB decreased by 41 percent from 15,000 to 8,800; as a secondary condition, stays decreased slightly by about 10 percent, from 55,500 to 49,700 (figure 1).

General characteristics of tuberculosis-related stays

As outlined in table 1, stays principally for TB were significantly longer than those with a secondary TB diagnosis. For stays principally for TB, the average length of stay was 15.0 days—more than twice the average stay for a patient with a secondary TB diagnosis (6.6 days). In fact, the length of stay for hospitalizations principally for TB was nearly three times longer than the average non-maternal, non-neonatal hospitalization (5.1 days).

The average cost for a hospital stay principally for TB was \$20,100, more than twice as expensive as the average for all non-maternal, non-neonatal hospitalizations. At least partly related to the long length of stay, the average cost per day (\$1,300) was lower—nearly \$500 less than secondary TB stays (\$1,800 per day) and \$600 less than the average non-maternal, neonatal stay (\$1,900 per day).

Stays related to TB were more likely to be admitted from the emergency department than the average non-maternal, non-neonatal hospitalization. About two-thirds of principal TB stays (67.6 percent) and secondary TB stays (63.9 percent) were admitted from the emergency department, as compared to just over half of all non-maternal, non-neonatal stays (55.7 percent). In-hospital mortality was also higher for TB-related hospitalizations (3.6 percent versus 2.6 percent of all non-maternal, non-neonatal stays).

Demographic characteristics of patients hospitalized principally for TB and those with a secondary diagnosis varied by age and gender. The mean age of patients hospitalized principally for TB was 47.9 years—more than 10 years younger than the mean age for the average hospitalization (58.1 years). The average age of patients with a secondary diagnosis, however, was 62.8 years, or four years older than the average hospitalization. Men were more likely than women to be hospitalized with TB. As a principal diagnosis, 64.6 percent of patients were male; as a secondary diagnosis, just over half (52.3 percent) of patients with TB were male. Conversely, men comprised 46.4 percent of stays for hospitalizations for all conditions.

Tuberculosis-related hospitalizations, by payer

As shown in Figure 2, the uninsured and Medicaid accounted for a disproportionate share of TB hospitalizations. Uninsured patients accounted for 22.0 percent of hospitalizations principally for TB, even though only 5.8 percent of all non-maternal, non-neonatal hospitalizations were uninsured. In addition, a disproportionate number of TB cases were billed to Medicaid. In fact, Medicaid was the most common payer, accounting for 24.4 percent of stays principally for TB, even though Medicaid covered only 12.3 percent of all non-maternal, non-neonatal stays. Typically the most common payer for hospitalizations for all conditions (accounting for 48.7 percent of all stays), Medicare was billed for only 22.0 percent of hospitalizations principally for TB. Just 21.8 percent of principal TB stays had private insurance as the main payer, lower than the 29.5 percent of all non-maternal, non-neonatal stays covered by private insurance.

As a secondary diagnosis, over half (52.2 percent) of stays were billed to Medicare. Medicaid was the payer slightly more often for stays with a secondary diagnosis of TB than the average hospitalization (19.1 percent versus 12.3 percent). Private insurance was billed for only 15.7 percent of stays with a secondary diagnosis of TB—about half as much as for the average non-maternal, non-neonatal hospitalization (29.5 percent). The uninsured accounted for 8.3 percent of stays with TB as a secondary diagnosis.

Tuberculosis-related hospitalizations, by region

The rate of hospitalizations for TB varied significantly by region. The rate of hospitalizations with a principal diagnosis of TB was highest in the Northeast, with 3.6 stays per 100,000 population (figure 4). The West and South had a similar rate of hospitalization, with 3.3 and 3.4 stays per 100,000 population, respectively. The Midwest, however, had 1.4 stays per 100,000 population—less than half the rate of any other region.

A similar pattern was seen in the rate of hospitalizations for stays with a secondary diagnosis of TB. At 21.0 stays per 100,000 population, the Northeast had the highest rate of hospitalization. The Midwest had about one-third fewer hospitalizations with a secondary diagnosis of TB (13.0 stays per 100,000 population). The rate of hospitalizations with a secondary diagnosis of TB was 16.0 stays per 100,000 population in the South and 17.7 stays per 100,000 population in the West.

Tuberculosis-related hospitalizations, by median income

Shown in figure 3, TB hospitalization rates were higher among populations living in poorer areas than rates among populations living in wealthier communities. At 4.9 stays per 100,000 population versus 2.2 stays per 100,000 population, respectively, the rate of stays with a principal diagnosis of TB among patients living in poorer regions (areas with a median household income of less than \$36,000 annually) was more than twice that of patients living in wealthier communities (those with a median household income of \$36,000 and over annually). As a secondary diagnosis, rates were nearly 55 percent higher among patients living in poorer communities than patients living in wealthier areas (21.8 stays per 100,000 population versus 14.1 stays per 100,000 population).

Most common principal diagnoses for hospital stays with tuberculosis noted as a secondary condition

TB was a secondary reason for hospitalization in nearly 85 percent of TB-related stays. Table 2 lists the ten most common principal diagnoses among stays with a secondary diagnosis of TB, which account for over half of all secondary TB stays. Five of the ten most prevalent principal diagnoses pertained to the respiratory system: pneumonia, chronic obstructive pulmonary disease (COPD), respiratory failure, other lower respiratory disease, and asthma. Pneumonia was the most common principal diagnosis, appearing in 10.4 percent of TB-related stays. COPD was the principal reason for admission in 7.0 percent of stays; respiratory failure in adults was the principal diagnosis in 2.6 percent of stays. Other lower respiratory disease and asthma were the principal diagnoses for about two percent of stays with a secondary TB diagnosis. Among TB-related stays, the percentage of these respiratory conditions noted as the principal reason for hospitalization was more than twice the percentage in all non-maternal, non-neonatal hospitalizations.

In addition to respiratory disorders, HIV infections occurred in 5.3 percent of stays where TB was mentioned as a secondary diagnosis—21 times higher than among all non-maternal, non-neonatal stays. In contrast, the percentage of TB-related stays with congestive heart failure (2.9 percent), coronary atherosclerosis (2.1 percent), and nonspecific chest pain (2.0 percent) as the principal diagnosis was 20 to 50 percent lower than the percentage among all hospital stays. The percentage of TB-related stays with septicemia as the principal reason for hospitalization was the same as that among all non-maternal, non-neonatal stays (2.0 percent).

Data Source

The estimates in this Statistical Brief are based upon data from the HCUP 2006 Nationwide Inpatient Sample (NIS). Historical data were drawn from the 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, and 2005 NIS. The statistics were generated from HCUPnet, a free, online query system that provides users with immediate access to largest set of publicly available, all-payer national, regional, and State-level hospital care databases from HCUP. Supplemental source included data on regional population estimates from Table 8: Annual Estimates of the Population for the United States, Regions, and Divisions: April 1, 2000 to July 1, 2007 (NST-EST2007-01), Population Division, U.S. Census Bureau, Release date: December 27, 2007 (<http://www.census.gov/popest/states/tables/NST-EST2007-01.xls>).

Definitions

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

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

ICD-9-CM is the International Classification of Diseases, Ninth Revision, Clinical Modification, which assigns numeric codes to diagnoses. There are about 13,600 ICD-9-CM diagnosis codes.

CCS categorizes ICD-9-CM diagnoses into a manageable number of clinically meaningful categories. This "clinical grouper" makes it easier to quickly understand patterns of diagnoses and procedures.

Case Definition

For this report, tuberculosis was defined as the following CCS diagnosis: 1 Tuberculosis

Types of hospitals included in HCUP

HCUP is based on data from community hospitals, defined as short-term, non-Federal, general and other hospitals, excluding hospital units of other institutions (e.g., prisons). HCUP data include OB-GYN, ENT, orthopedic, cancer, pediatric, public, and academic medical hospitals. They exclude long-term care, rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals, but these types of discharges are included if they are from community hospitals.

Unit of analysis

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

Costs and charges

Total hospital charges were converted to costs using HCUP Cost-to-Charge Ratios based on hospital accounting reports from the Centers for Medicare and Medicaid Services (CMS).³ Costs will tend to reflect the actual costs of production, while charges represent what the hospital billed for the case. For each hospital, a hospital-wide cost-to-charge ratio is used because detailed charges are not available across all HCUP States. Hospital charges reflect the amount the hospital charged for the entire hospital stay and does not include professional (physician) fees. For the purposes of this Statistical Brief, costs are reported to the nearest hundreds.

Median community-level income

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

Payer

Payer is the expected primary payer for the hospital stay. To make coding uniform across all HCUP data sources, payer combines detailed categories into more general groups:

- Medicare includes fee-for-service and managed care Medicare patients.
- Medicaid includes fee-for-service and managed care Medicaid patients. Patients covered by the State Children's Health Insurance Program (SCHIP) may be included here. Because most state data do not identify SCHIP patients specifically, it is not possible to present this information separately.
- Private insurance includes Blue Cross, commercial carriers, and private HMOs and PPOs.
- Other includes Worker's Compensation, TRICARE/CHAMPUS, CHAMPVA, Title V, and other government programs.
- Uninsured includes an insurance status of "self-pay" and "no charge."

When more than one payer is listed for a hospital discharge, the first-listed payer is used.

³ HCUP Cost-to-Charge Ratio Files (CCR). Healthcare Cost and Utilization Project (HCUP), 2001–2005. U.S. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/db/state/costtocharge.jsp

Region

Region is one of the four regions defined by the U.S. Census Bureau:

- Northeast: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania
- Midwest: Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas
- South: Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas
- West: Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Alaska, and Hawaii

Admission source

Admission source indicates where the patient was located prior to admission to the hospital. Emergency admission indicates the patient was admitted to the hospital through the emergency department.

Admission from another hospital indicates the patient was admitted to this hospital from another short-term, acute-care hospital. This usually signifies that the patient required the transfer in order to obtain more specialized services that the originating hospital could not provide. Admission from long-term care facility indicates the patient was admitted from a long-term facility such as a nursing home.

Discharge status

Discharge status indicates the disposition of the patient at discharge from the hospital, and includes the following six categories: routine (to home), transfer to another short-term hospital, other transfers (including skilled nursing facility, intermediate care, and another type of facility such as a nursing home), home health care, against medical advice (AMA), or died in the hospital.

About HCUP

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

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

Arizona Department of Health Services
Arkansas Department of Health
California Office of Statewide Health Planning and Development
Colorado Hospital Association
Connecticut Integrated Health Information (Chime, Inc.)
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
Maine Health Data Organization
Maryland Health Services Cost Review Commission
Massachusetts Division of Health Care Finance and Policy
Michigan Health & Hospital Association

Minnesota Hospital Association
Missouri Hospital Industry Data Institute
Nebraska Hospital Association
Nevada Department of Health and Human Services
New Hampshire Department of Health & Human Services
New Jersey Department of Health and Senior Services
New York State Department of Health
North Carolina Department of Health and Human Services
Ohio Hospital Association
Oklahoma State Department of Health
Oregon Association of Hospitals and Health Systems
Rhode Island Department of Health
South Carolina State Budget & Control Board
South Dakota Association of Healthcare Organizations
Tennessee Hospital Association
Texas Department of State Health Services
Utah Department of Health
Vermont Association of Hospitals and Health Systems
Virginia Health Information
Washington State Department of Health
West Virginia Health Care Authority
Wisconsin Department of Health and Family Services

About the NIS

The HCUP Nationwide Inpatient Sample (NIS) is a nationwide database of hospital inpatient stays. The NIS is nationally representative of all community hospitals (i.e., short-term, non-Federal, non-rehabilitation hospitals). The NIS is a sample of hospitals and includes all patients from each hospital, regardless of payer. It is drawn from a sampling frame that contains hospitals comprising about 90 percent of all discharges in the United States. The vast size of the NIS allows the study of topics at both the national and regional levels for specific subgroups of patients. In addition, NIS data are standardized across years to facilitate ease of use.

About HCUPnet

HCUPnet is an online query system that offers instant access to the largest set of all-payer health care databases that are publicly available. HCUPnet has an easy step-by-step query system, allowing for tables and graphs to be generated on national and regional statistics, as well as trends for community hospitals in the U.S. HCUPnet generates statistics using data from HCUP's Nationwide Inpatient Sample (NIS), the Kids' Inpatient Database (KID), the State Inpatient Databases (SID) and the State Emergency Department Databases (SEDD).

For More Information

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

For additional HCUP statistics, visit HCUPnet, our interactive query system, at www.hcup.ahrq.gov.

For information on other hospitalizations in the U.S., download *HCUP Facts and Figures: Statistics on Hospital-based Care in the United States in 2006*, located at <http://www.hcup-us.ahrq.gov/reports.jsp>.

For a detailed description of HCUP, more information on the design of the NIS, and methods to calculate estimates, please refer to the following publications:

Steiner, C., Elixhauser, A., Schnaier, J. The Healthcare Cost and Utilization Project: An Overview. *Effective Clinical Practice* 5(3):143–51, 2002.

Introduction to the HCUP Nationwide Inpatient Sample, 2006. Online. May 14, 2008. U.S. Agency for Healthcare Research and Quality.

http://www.hcup-us.ahrq.gov/db/nation/nis/2006NIS_INTRODUCTION.pdf

Houchens, R., Elixhauser, A. *Final Report on Calculating Nationwide Inpatient Sample (NIS) Variances, 2001.* HCUP Methods Series Report #2003-2. Online. June 2005 (revised June 6, 2005). U.S. Agency for Healthcare Research and Quality.

<http://www.hcup-us.ahrq.gov/reports/CalculatingNISVariances200106092005.pdf>

Houchens RL, Elixhauser A. *Using the HCUP Nationwide Inpatient Sample to Estimate Trends. (Updated for 1988-2004).* HCUP Methods Series Report #2006-05 Online. August 18, 2006. U.S. Agency for Healthcare Research and Quality.

http://www.hcup-us.ahrq.gov/reports/2006_05_NISTrendsReport_1988-2004.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:

Irene Fraser, Ph.D., Director
Center for Delivery, Organization, and Markets
Agency for Healthcare Research and Quality
540 Gaither Road
Rockville, MD 20850

Table 1. Characteristics of hospitalizations related to tuberculosis compared to hospitalizations for all conditions, 2006.

	U.S. Hospitalizations		
	Stays principally for tuberculosis	Stays with a secondary diagnosis of tuberculosis	Hospital stays for all conditions*
Number of hospital stays	8,800	49,700	30,142,300
Percentage of all tuberculosis stays	15.0%	85.0%	0.02%
Mean length of stay, days	15.0	6.6	5.1
Mean cost per stay, dollars	\$20,100	\$11,600	\$9,900
Mean cost per day, dollars	\$1,300	\$1,800	\$1,900
Aggregate costs, dollars	\$178 million	\$574 million	\$297.6 billion
Percentage admitted from the emergency department	67.6%	63.9%	55.7%
Percentage died in the hospital	3.6%	3.6%	2.6%
Mean age	47.9	62.8	58.1
Percentage male	64.6%	52.3%	46.4%

*Stays for neonates and maternal conditions have been excluded.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2006.

Table 2. Most common principal diagnoses for hospital stays with tuberculosis noted as a secondary condition, 2006.

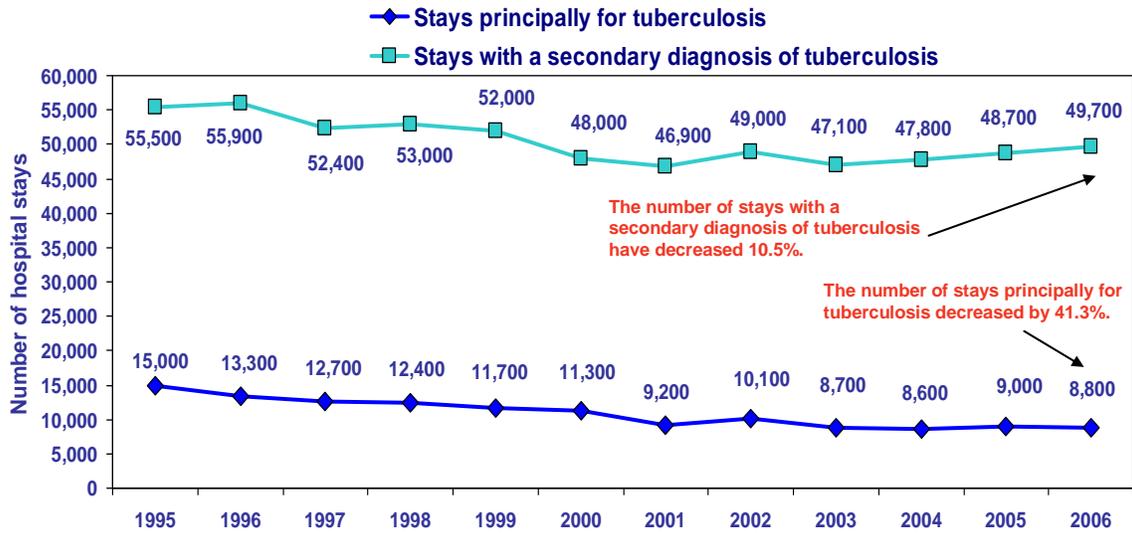
Rank	Principal Diagnosis	Number of stays with tuberculosis as a secondary diagnosis	Percentage of stays with this principal diagnosis	
			Stays with tuberculosis as a secondary diagnosis	Stays for all conditions*
1	Pneumonia	5,200	10.4%	4.0%
2	Chronic obstructive pulmonary disease	3,500	7.0%	2.0%
3	HIV infection	2,700	5.3%	0.3%
4	Congestive heart failure	1,500	2.9%	3.6%
5	Respiratory failure, insufficiency, arrest (adult)	1,300	2.6%	1.3%
6	Other lower respiratory disease	1,100	2.2%	0.5%
7	Coronary atherosclerosis	1,000	2.1%	4.0%
8	Septicemia	1,000	2.0%	2.0%
9	Nonspecific chest pain	1,000	2.0%	2.8%
10	Asthma	1,000	1.9%	1.4%

*Stays for neonates and maternal conditions have been excluded.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2006.



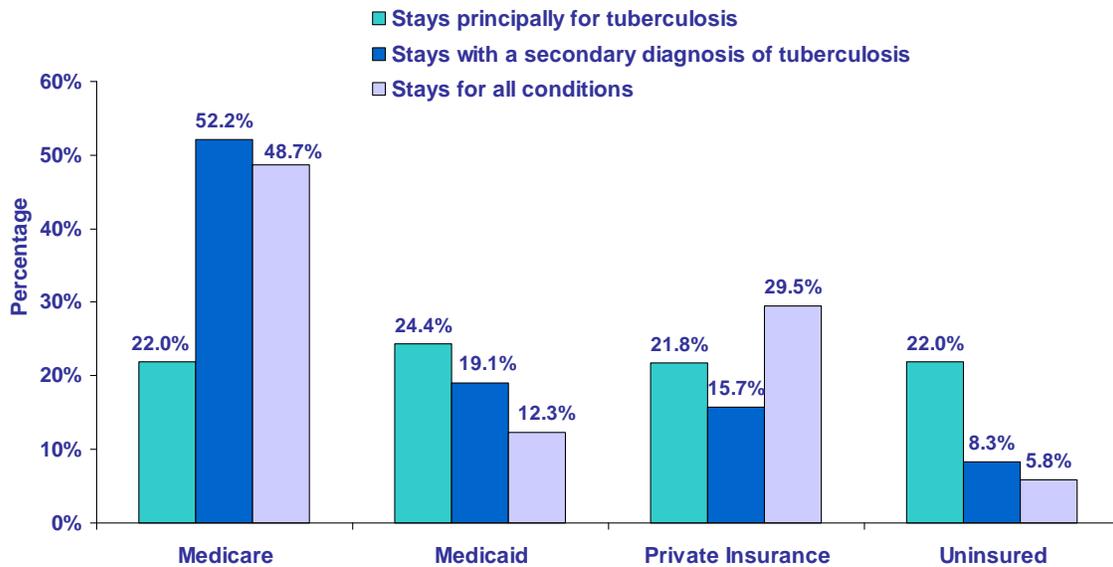
Figure 1. Since 1995, hospitalizations have decreased more than 41 percent for stays principally for tuberculosis, and more than 10 percent for secondary tuberculosis diagnoses, 2006



Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, HCUPnet, Nationwide Inpatient Sample, 2006.



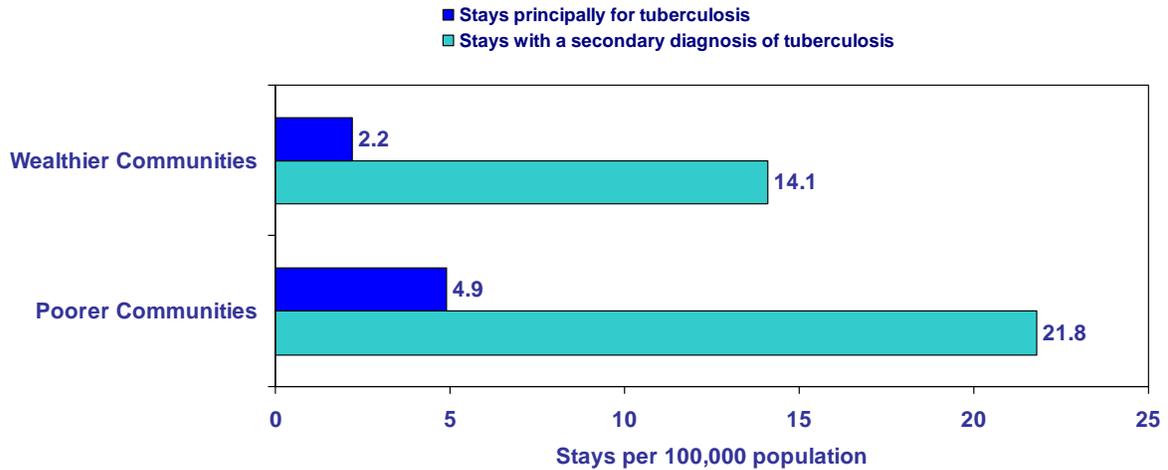
Figure 2. The uninsured and patients covered by Medicaid were disproportionately hospitalized for tuberculosis, 2006



Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, HCUPnet, Nationwide Inpatient Sample, 2006.



Figure 3. The hospitalization rate principally for tuberculosis was twice as high for patients living in poorer communities than for those living in wealthier communities, 2006*

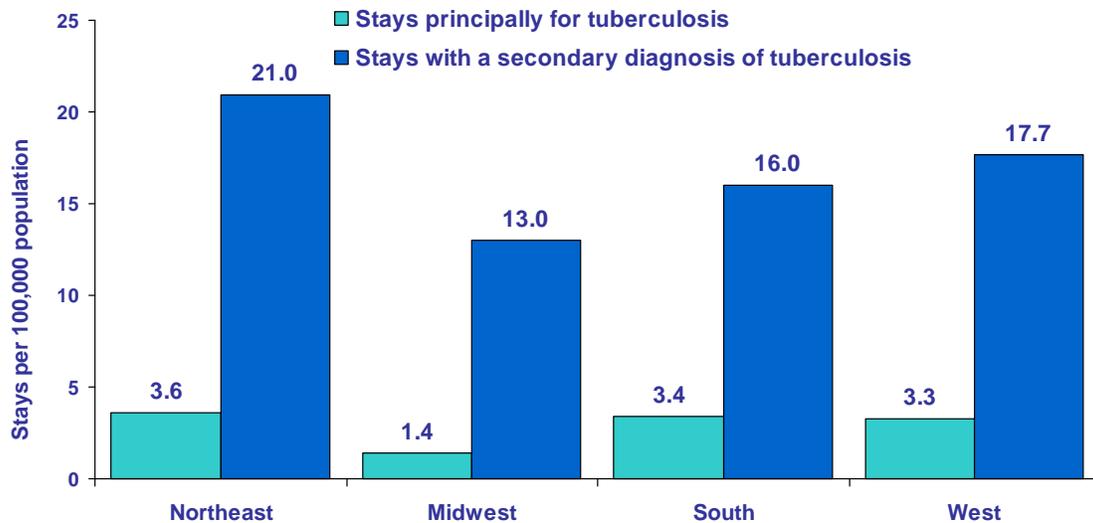


*The denominator for the rates were derived from 2006 Claritas Population Data. "Poorer communities" included ZIP Codes with median income level less than \$36,000; "wealthier communities" included ZIP Codes with median income level greater than or equal to \$36,000.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, HCUPnet , Nationwide Inpatient Sample, 2006.



Figure 4. Tuberculosis-related hospitalization rates were highest in the Northeast and lowest in the Midwest, 2006



Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, HCUPnet , Nationwide Inpatient Sample, 2006.