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Meningitis-Related Hospitalizations in the United States, 2006

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Introduction

Meningitis is a rare yet serious medical condition that occurs when the meninges, the tissue surrounding the spinal cord and brain, becomes inflamed.[1] Caused by an infection of the spinal fluid or brain, the inflamed tissue can block blood vessels in the brain, which may cause significant complications, including stroke, brain and organ damage, and death.[2,3]

Meningitis can be bacterial, viral, fungal, or parasitic in origin. The source of the infection can affect the progression, outcome, and spread of the disease. For example, some types of meningitis are highly contagious and develop rapidly, making those who are in close contact with others, such as young children or college students living in dorms, particularly susceptible.[4] Other forms are more likely to occur in patients with compromised immune systems or certain diseases.[5]

This Statistical Brief presents data from the Healthcare Cost and Utilization Project (HCUP) focusing on hospitalizations in 2006 involving four main categories of meningitis: bacterial, viral, fungal and other specified causes, and non-specified causes. General characteristics of these stays are compared to the average non-maternal hospitalization. Information on the most common subtypes of meningitis within the four categories is also presented. Finally, meningitis-associated hospitalizations are investigated by age and payer, community income levels, and in-hospital deaths. All differences between estimates noted in the text are statistically significant at the 0.05 level or better.

Highlights

- In 2006, there were more than 72,000 meningitis-related hospitalizations in the U.S. totaling $1.2 billion in hospital costs.
- More than half (54.6 percent) of all meningitis-related hospitalizations were attributed to a virus, while bacterial meningitis accounted for 21.8 percent of all meningitis-related hospital stays. Funguses and other microorganisms were noted in only 7.3 percent of all hospitalizations related to meningitis. The remaining meningitis-related stays (17.2 percent) had unspecified causes.
- The most common subtype of meningitis was unspecified viral, or aseptic, meningitis, which accounted for 45.9 percent of all cases.
- Among stays where a specific causative microorganism was distinguished, cryptococcal meningitis (a fungal type of the disease) was, at 5.7 percent of all meningitis-related stays, the most common subtype noted.
- Patients covered by Medicaid and the uninsured comprised a dispro-portionate share of hospitalizations related to fungal/other meningitis.
- Patients living in the poorest communities were disproportionately more likely to be hospitalized with meningitis than those living in the wealthiest communities. The difference was particularly dramatic among patients hospitalized with fungal/other meningitis—45.7 percent of these patients came from the poorest communities (from which one-quarter of all hospitalized patients originated).
- The highest death rates occurred among patients hospitalized with fungal meningitis and those with bacterial meningitis (9.1 percent and 8.0 percent, respectively). In-hospital death rates for all categories of meningitis were substantially higher for patients 45 years and older: 9.6 percent of 45-64 year olds with bacterial meningitis and 14.9 percent of those over 65 died, compared with 6.7 percent of 18-44 year olds.

[1] Meningitis. MedlinePlus. U.S. National Library of Medicine, National Institutes of Health, 2008. http://www.nlm.nih.gov/medlineplus/meningitis.html (Accessed July 9, 2008).
[2] Meningitis and Encephalitis Fact Sheet. National Institute of Neurological Disorders and Stroke, National Institutes of Health, April 2004. http://www.ninds.nih.gov/disorders/encephalitis_meningitis/detail_encephalitis_meningitis.htm (Accessed July 9, 2008).
[3] Meningitis (Meningococcal Disease). Centers for Disease Control, 2008 http://www.cdc.gov/meningitis/bacterial/faqs.htm (Accessed July 9, 2008).
[4] Hirsh, L (2007). Infections: Meningitis. From *KidsHealth*. http://www.kidshealth.org/parent/infections/lung/meningitis.html (Accessed July 9, 2008).
[5] Fungal Meningitis. The Meningitis Research Foundation, 2008. http://www.meningitis.org/disease-info/types-causes/fungal/ (Accessed July 9, 2008).

Findings

In 2006, there were more than 72,000 meningitis-related hospitalizations in the U.S. This represented a rate of 24.1 hospitalizations per 100,000 persons, and totaled $1.2 billion in hospital costs. Meningitis was listed as the principal reason for hospitalization (i.e., the principal diagnosis) for nearly 58 percent of these stays.

General characteristics of meningitis-related hospital stays
Table 1 describes the general characteristics of hospitalizations among all patients with meningitis—those for whom meningitis was the principal reason for hospitalization as well as those for whom it was a coexisting condition. In general, compared with all non-maternal hospitalizations, stays associated with meningitis were four days longer (9.1 days length of stay compared to 5.1 days) and over 70 percent more costly ($17,100 versus $9,900).

Compared to all patients, those hospitalized with meningitis were younger (34.2 years old versus 58.1 years old). Meningitis-related hospital stays also originated in the emergency room more often than the average hospitalization (67.4 percent versus 55.7 percent overall). Finally, the in-hospital death rate for patients hospitalized with meningitis was almost 40 percent higher than the in-hospital death rate for all conditions (3.7 percent versus 2.6 percent).

Types of meningitis noted during hospitalization
Table 2 highlights both general categories and specific subtypes of meningitis noted during hospitalization. In 2006, more than half (54.6 percent) of all meningitis-related hospitalizations were attributed to a virus, while bacterial meningitis accounted for 21.8 percent of all meningitis-related hospital stays (figure 1). Funguses and other microorganisms were noted in only 7.3 percent of all hospitalizations related to meningitis. All remaining meningitis-related hospitalizations did not specify a causative microorganism (17.2 percent).

Unspecified, or aseptic meningitis, was the most common subtype of meningitis accounting for 45.9 percent of all cases. Among those stays where a specific causative microorganism was distinguished, cryptococcal meningitis (a fungal type of the disease) was the most common form noted during hospitalization, accounting for 5.7 percent of all meningitis-related stays. This was followed by streptococcal meningitis (3.9 percent), staphylococcal meningitis (3.0 percent), gram negative meningitis (2.5 percent), and pneumococcal meningitis (2.3 percent)—all bacterial types.

Among the groups of meningitis-related hospitalizations, those caused by bacteria had the longest hospital stays (16.6 days), followed closely by those caused by funguses and other microorganisms (16.2 days). Patients hospitalized with viral meningitis had the shortest hospital stays (4.1 days). Meningitis with no specific causative agent listed averaged 12.8 days.

Among the subtypes of meningitis, the longest hospital stays occurred among patients with a diagnosis of candidal meningitis (a fungal form, 36.8 days), gram negative meningitis (a bacterial form, 28.3 days), and staphylococcal meningitis (a bacterial form, 25.8 days). Predictably, these meningitis types also accounted for the most costly hospitalizations.

Aggregate costs for meningitis were highest for bacterial meningitis ($520 million, or 43 percent of all costs associated with meningitis), though this group comprised only 21.8 percent of cases. Similarly, aggregate costs for non-specific meningitis (with no specification of origin) were disproportionately high, accounting for over 25.0 percent of total costs but only 17.2 percent of meningitis cases.

Males predominated among hospitalizations related to specific subtypes of meningitis, such as cryptococcal meningitis (fungal, 73.4 percent), staphylococcal meningitis (bacterial, 54.6 percent), and gram negative meningitis (bacterial, 52.9 percent). Conversely, females accounted for more hospitalizations related to candidal meningitis (fungal, 67.6 percent female) and hemophilus influenzae meningitis (bacterial, 58.2 percent female).

The highest death rates occurred among patients hospitalized with fungal meningitis and those with bacterial meningitis (9.1 percent and 8.0 percent, respectively). In fact, the in-hospital death rate for the bacterial pneumococcal meningitis was more than three times higher than for all meningitis-related hospital stays combined (12.4 percent versus 3.7 percent). Moreover, hospital death rates for staphylococcal meningitis (bacterial, 10.3 percent), cryptococcal meningitis (fungal, 9.8 percent),

streptococcal meningitis (bacterial, 8.0 percent), and gram negative meningitis (bacterial, 7.5 percent) were two to three times higher than the death rate for all hospital stays related to meningitis. Conversely, hospitalizations related to viral meningitis rarely resulted in an in-hospital death (0.6 percent).

Meningitis-related hospital stays, by age and payer
As shown in Figure 2, differences existed in the age distribution by category of meningitis. Viral meningitis was predominantly a disease seen in younger patients—over 75 percent of viral meningitis cases were 44 years or younger. Conversely, very few children and adolescents were hospitalized with fungal/other meningitis; over half of this group was 18 to 44 years old and patients 45 to 64 years old accounted for an additional third. The age distribution for bacterial and non-specific meningitis was relatively even, though bacterial meningitis was seen in fewer elderly patients.

Figure 3 shows the distribution of meningitis-related hospital stays by primary payer. Reflecting the higher percentage of children and young adults hospitalized with meningitis, private insurance was billed for more than half of all viral meningitis-related hospital care and about 40 percent of stays associated with bacterial and non-specific meningitis. Private insurance was the primary payer for only 25 percent of stays associated with fungal/other meningitis.

Medicaid was the primary payer for one-quarter of hospital stays related to bacterial, viral, and non-specific meningitis. Children accounted for less than 4 percent of fungal/other meningitis-related hospitalizations, yet Medicaid was the primary payer for more than a third of these stays. Similarly, uninsured patients were disproportionately billed for some meningitis categories, accounting for over 10 percent of hospitalizations related to viral meningitis and fungal/other meningitis. In comparison, uninsured patients comprised about 6 percent of hospitalizations for all non-maternal conditions (data not shown).

Approximating the percentage of meningitis-related stays occurring among the elderly, Medicare covered roughly one in four to one in five hospital stays associated with bacterial and non-specific meningitis. Medicare was also the primary payer for nearly one-fourth of fungal/other meningitis-related hospitalizations, but patients 65 years and older accounted for less than 9 percent of stays in this category.

Meningitis-related hospital stays, by community income levels
Figure 4 illustrates that the distribution of meningitis-related hospitalizations was inversely related to wealth—persons living in the poorest communities were disproportionately more likely than those living in the wealthiest communities to be hospitalized with meningitis-related diagnoses. While the magnitude of difference between the poorest and wealthiest communities was much less among stays associated with bacterial, viral, and non-specified meningitis, the difference was particularly dramatic among patients hospitalized with fungal/other meningitis. Nearly half (45.7 percent) of hospitalizations related to fungal/other meningitis occurred among patients living in the poorest communities, while only 11.7 percent occurred among patients living in the wealthiest communities.

In-hospital deaths associated with meningitis-related hospital stays, by age
Though rarely above one death per 100,000 population (data not shown), the percentage of patients with a diagnosis of meningitis who died during hospitalization rose with increasing age for all categories except fungal/other meningitis. For the fungal/other subgroup, death rates were high for children and adolescents, slightly lower for 18 to 44 year olds, and then, progressively higher for the older age groups. Because this form of meningitis more commonly occurs in persons with immune deficiencies, the variation in mortality rates for fungal/other meningitis—which had the highest overall in-hospital mortality of the four categories at 9.0 percent—may, in part, be due to an inability to fight the disease because of impaired immunity in the young and elderly.

Data Source

The estimates in this Statistical Brief are based upon data from the HCUP 2006 Nationwide Inpatient Sample (NIS).

Definitions

Diagnoses and ICD-9-CM
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.

Case Definition
The ICD-9-CM codes defining meningitis include diagnosis codes in the following ranges:
– 003.21: Salmonella meningitis
– 013.00–013.06: Tuberculosis meningitis
– 036.0: Meningococcal meningitis
– 047.0: Meningitis due to coxackie virus
– 047.1: Meningitis due to echo virus
– 047.8: Other specified viral meningitis
– 047.9: Unspecified viral meningitis
– 049.0: Lymphocytic Choriomeningitis
– 049.1: Non-arthropod borne meningitis due to adenovirus
– 053.0: Herpes zoster meningitis
– 054.72: Herpes simplex meningitis
– 072.1: Mumps meningitis
– 091.81: Acute syphilitic meningitis (secondary)
– 094.2: Syphilitic meningitis
– 098.82: Gonococcal meningitis
– 100.81: Leptospiral meningitis (aseptic)
– 112.83: Candidal meningitis
– 114.2: Coccidioidal meningitis
– 115.01: Histoplasma capsulatum meningitis
– 115.11: Histoplasma duboisii meningitis
– 115.91: Histoplasmosis meningitis unspecified
– 320.0: Hemophilus influenzae (Hemophilus meningitis)
– 320.1: Pneumococcal Meningitis
– 320.2: Streptococcal Meningitis
– 320.3: Staphylococcal Meningitis
– 320.7: Meningitis in other bacterial diseases classified elsewhere
– 320.81: Anaerobic Meningitis
– 320.82: Meningitis due to gram-negative bacteria not elsewhere classified (gram negative)
– 320.89: Bacillus pyocyaneus & meningitis due to other specified bacteria
– 320.9: Meningitis due to unspecified bacterium
– 321.0: Cryptococcal meningitis
– 321.1: Meningitis in other fungal diseases
– 321.2: Meningitis due to viruses not elsewhere classified
– 321.3: Meningitis due to trypanosomiasis
– 321.4: Meningitis in sarcoidosis
– 321.8: Meningitis due to other nonbacterial organisms classified elsewhere
– 322.0: Nonpyogenic meningitis
– 322.1: Eosinophilic meningitis
– 322.2: Chronic meningitis
– 322.9: Meningitis, unspecified

The ICD-9-CM codes defining bacterial meningitis include diagnosis codes in the following ranges:
– 003.21: Salmonella meningitis
– 013.00–013.06: Tuberculosis meningitis
– 036.0: Meningococcal meningitis
– 091.81: Acute syphilitic meningitis (secondary)
– 094.2: Syphilitic meningitis
– 098.82: Gonococcal meningitis
– 100.81: Leptospiral meningitis (aseptic)

– 320.0: Hemophilus influenzae (Hemophilus meningitis)
– 320.1: Pneumococcal Meningitis
– 320.2: Streptococcal Meningitis
– 320.3: Staphylococcal Meningitis
– 320.7: Meningitis in other bacterial diseases classified elsewhere
– 320.81: Anaerobic Meningitis
– 320.82: Meningitis due to gram-negative bacteria not elsewhere classified (gram negative)
– 320.89: Bacillus pyocyaneus & meningitis due to other specified bacteria
– 320.9: Meningitis due to unspecified bacterium

The ICD-9-CM codes defining viral meningitis include diagnosis codes in the following ranges:
– 047.0: Meningitis due to coxackie virus
– 047.1: Meningitis due to echo virus
– 047.8: Other specified viral meningitis
– 047.9: Unspecified viral meningitis
– 049.0: Lymphocytic Choriomeningitis
– 049.1: Non-arthropod borne meningitis due to adenovirus
– 053.0: Herpes zoster meningitis
– 054.72: Herpes simplex meningitis
– 072.1: Mumps meningitis
– 321.2: Meningitis due to viruses not elsewhere classified

The ICD-9-CM codes defining fungal/other meningitis include diagnosis codes in the following ranges:
– 112.83: Candidal meningitis
– 114.2: Coccidioidal meningitis
– 115.01: Histoplasma capsulatum meningitis
– 115.11: Histoplasma duboisii meningitis
– 115.91: Histoplasmosis meningitis unspecified
– 321.0: Cryptococcal meningitis
– 321.1: Meningitis in other fungal diseases
– 321.3: Meningitis due to trypanosomiasis
– 321.4: Meningitis in sarcoidosis
– 321.8: Meningitis due to other nonbacterial organisms classified elsewhere

The ICD-9-CM codes defining non-specific meningitis include diagnosis codes in the following ranges:
– 322.0: Nonpyogenic meningitis
– 322.1: Eosinophilic meningitis
– 322.2: Chronic meningitis
– 322.9: Meningitis, unspecified

The ICD-9-CM codes defining meningococcal meningitis include diagnosis codes in the following ranges:
– 036.0: Meningococcal meningitis

The ICD-9-CM codes defining Hemophilus influenzae meningitis include diagnosis codes in the following ranges:
– 320.0: Hemophilus influenzae (Hemophilus meningitis)

The ICD-9-CM codes defining pneumococcal meningitis include diagnosis codes in the following ranges:
– 320.1: Pneumococcal Meningitis

The ICD-9-CM codes defining streptococcal meningitis include diagnosis codes in the following ranges:
– 320.2: Streptococcal Meningitis

The ICD-9-CM codes defining staphylococcal meningitis include diagnosis codes in the following ranges:
– 320.3: Staphylococcal Meningitis

The ICD-9-CM codes defining gram negative meningitis include diagnosis codes in the following ranges:
– 320.82: Meningitis due to gram-negative bacteria not elsewhere classified (gram negative)

The ICD-9-CM codes defining non-specific bacterial meningitis include diagnosis codes in the following ranges:
– 320.9: Meningitis due to unspecified bacterium

The ICD-9-CM codes defining meningitis caused by coxsackie virus include diagnosis codes in the following ranges:
– 047.0: Meningitis due to coxackie virus

The ICD-9-CM codes defining meningitis caused by echovirus include diagnosis codes in the following ranges:
– 047.1: Meningitis due to echo virus

The ICD-9-CM codes defining non-specific viral meningitis include diagnosis codes in the following ranges:
– 047.9: Unspecified viral meningitis

The ICD-9-CM codes defining candidal meningitis include diagnosis codes in the following ranges:
– 112.83: Candidal meningitis

The ICD-9-CM codes defining cryptococcal meningitis include diagnosis codes in the following ranges:
– 321.0: Cryptococcal meningitis

The ICD-9-CM codes defining meningitis in other fungal diseases include diagnosis codes in the following ranges:
– 321.1: Meningitis in other fungal diseases

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).[6] 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

[6] 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.

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.

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.

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 2005*, 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

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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. Hospitalizations related to meningitis compared to hospitalizations for all conditions, 2006

	Meningitis-related hospital stays*	Hospital stays for all conditions†
Number of hospital stays	72,000	30,142,300
Mean length of stay, days	9.1	5.1
Mean hospital cost	$17,100	$9,900
Aggregate costs	$1.2 billion	$297.6 billion
Mean age	34.2	58.1
Percentage male	51.4%	46.4%
Percentage admitted through the emergency department	67.4%	55.7%
Percentage died in hospital	3.7%	2.6%

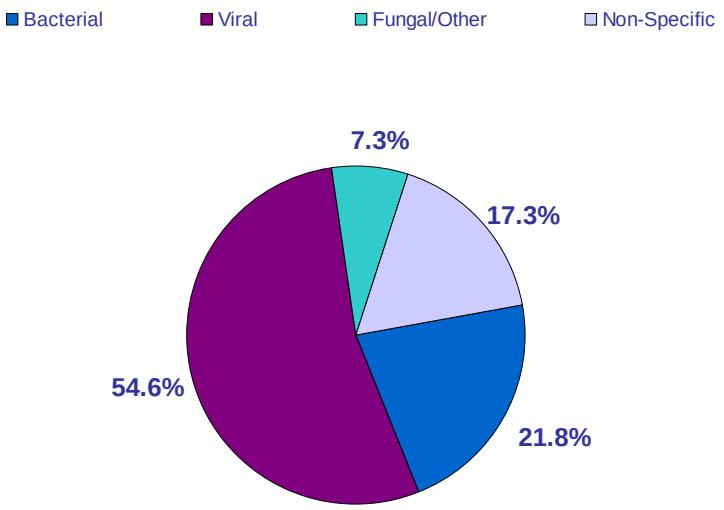
*Based on all-listed diagnoses.
†Stays for neonates and maternal conditions have been excluded.
Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2006.

Table 2. Select meningitis types noted during hospitalization, 2006*

All-listed Diagnosis	Total number of stays	Percentage of all stays related to meningitis	Mean length of stay (in days)	Mean cost per stay (in dollars)	Aggregate cost (in millions)	Mean age	Percentage of stays for males	Percentage of stays admitted from the ED	Percentage died in the hospital
ALL MENINGITIS	**72,000**	**100.0%**	**9.1**	**$17,100**	**$1.2 billion**	**34.2**	**51.4%**	**67.4%**	**3.7%**
Bacterial meningitis	**15,700**	**21.8%**	**16.6**	**$33,100**	**$520.4**	**37.8**	**52.9%**	**56.4%**	**8.0%**
Streptococcal Meningitis	2,800	3.9%	15.9	$29,300	$81.5	32.6	49.4%	53.5%	8.0%
Staphylococcal Meningitis	2,200	3.0%	25.8	$54,500	$119.2	41.9	54.6%	48.0%	10.3%
Gram negative Meningitis	1,800	2.5%	28.3	$61,200	$110.2	31.6	52.9%	39.0%	7.5%
Pneumococcal Meningitis	1,700	2.3%	11.9	$25,300	$41.9	43.7	51.6%	69.3%	12.4%
Meningococcal Meningitis	700	0.9%	8.5	$16,100	$10.8	24.4	47.7%	57.6%	4.3%
Hemophilus influenzae Meningitis	300	0.4%	10.6	$19,800	$6.2	36.0	41.8%	60.6%	—
Non-specific bacterial Meningitis	4,000	5.6%	11.3	$21,000	$84.1	40.2	51.7%	65.1%	6.4%
Viral meningitis	**39,300**	**54.6%**	**4.1**	**$6,800**	**$265.7**	**29.8**	**47.6%**	**76.8%**	**0.6%**
Meningitis caused by coxsackie Virus	60	0.1%	2.9	$5,000	$276,000**	25.1	60.3%	85.3%	—
Meningitis caused by Echovirus	20	0.0%	4.5	$7,500	$142,000**	35.8	52.3%	49.9%	—
Unspecified viral [aseptic] Meningitis	33,000	45.9%	3.7	$6,000	$197.6	29.3	47.7%	77.7%	0.4%
Fungal/Other meningitis	**5,300**	**7.3%**	**16.2**	**$29,000**	**$153.2**	**42.7**	**69.8%**	**63.7%**	**9.1%**
Candidal Meningitis	200	0.3%	36.8	$72,600	$38.0	28.7	32.4%	42.8%	—
Cryptococcal Meningitis	4,100	5.7%	14.7	$26,100	$301.6	43.9	73.4%	65.4%	9.8%
Meningitis in other fungal diseases	600	0.8%	23.8	$44,100	$24.4	38.6	55.8%	52.8%	11.4%
Non-specific meningitis	**12,400**	**17.2%**	**12.8**	**$25,000**	**$308.1**	**40.0**	**54.1%**	**53.1%**	**6.0%**

* Based on all diagnoses.
** Aggregate charges were less than $1 million.
— Too few cases for statistical reliability.
Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample (NIS), 2006.

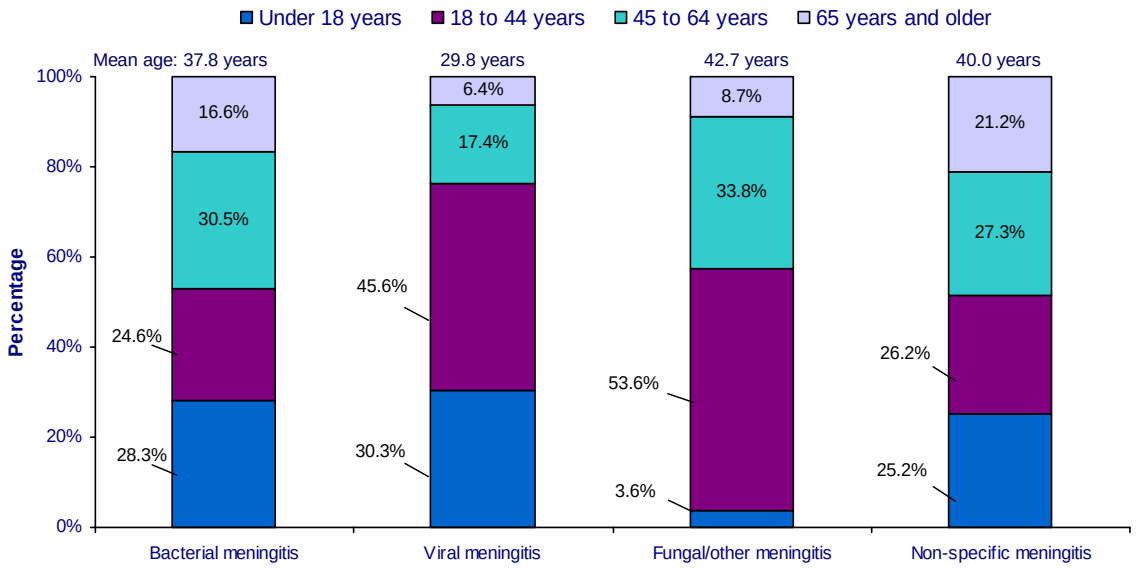
Figure 1. More than half of all meningitis-related hospitalizations was for the viral form of the disease, 2006*



* Based on all-listed diagnoses.

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

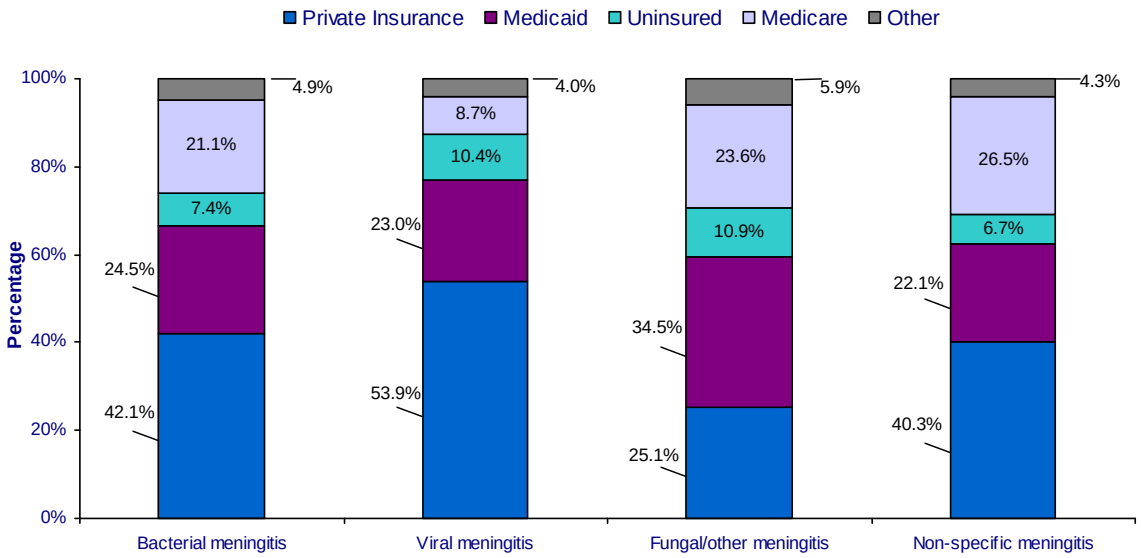
Figure 2. The age distribution of meningitis-related hospitalizations varied by category, 2006*



* Based on all-listed diagnoses.

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

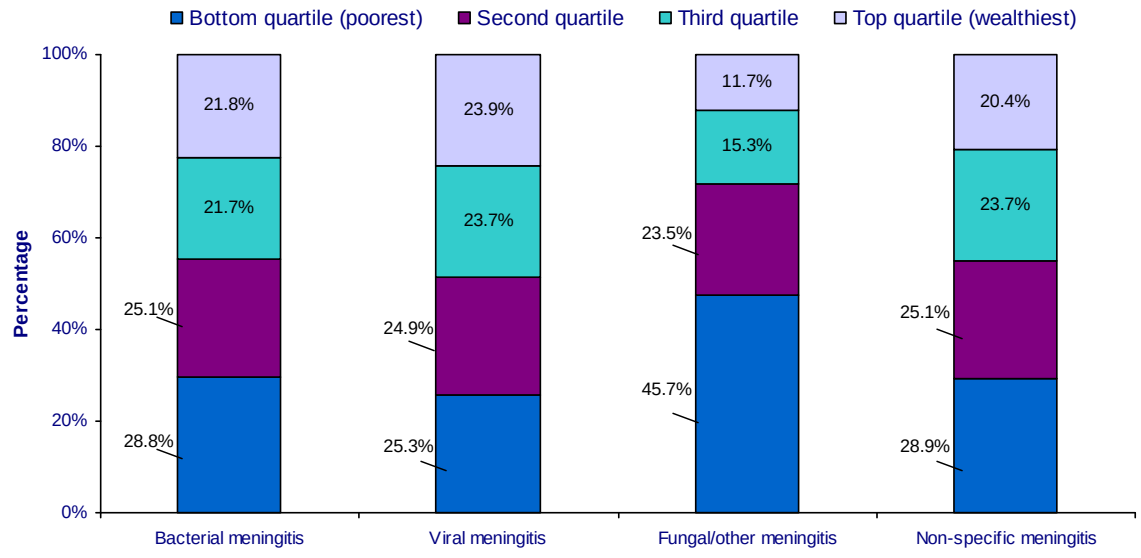
Figure 3. Medicaid, Medicare, and the uninsured were disproportionately billed for hospitalizations associated with fungal/other meningitis, 2006*



* Based on all-listed diagnoses.

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

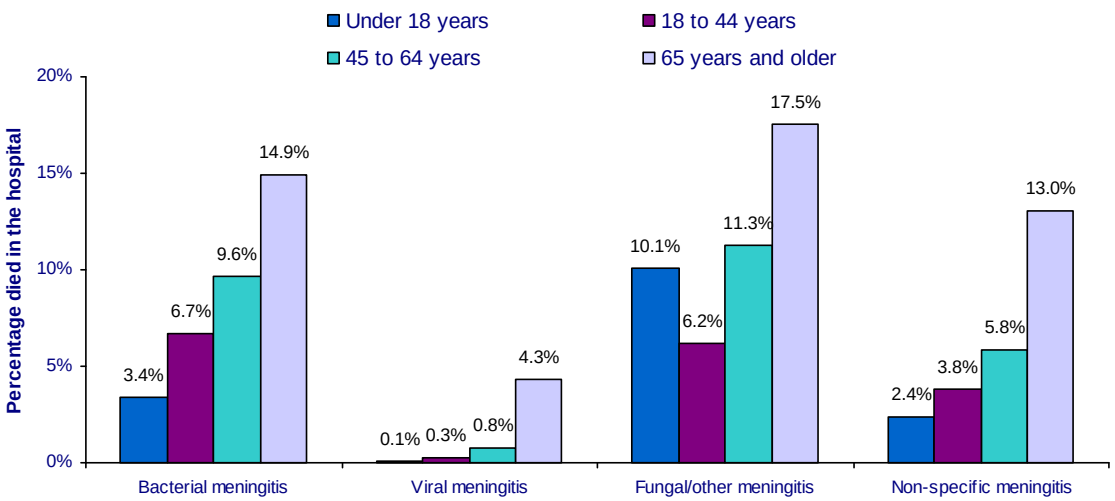
Figure 4. The distribution of meningitis-related hospitalizations was inversely related to wealth, particularly among those hospitalized with fungal/other meningitis, 2006*



* Based on all-listed diagnoses.

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

Figure 5. In-hospital mortality for meningitis increased substantially among patients 45 years and older, 2006*



* Based on all-listed diagnoses.

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