THE UNIVERSITY OF MEMPHIS®

The Methodist LeBonheur Center for Healthcare Economics

312 Fogelman College of Business & Economics
Memphis, Tennessee 38152-3120
Office: 901.678.3565
Fax: 901.678.2865

Potentially Avoidable Hospitalizations in Tennessee, 2002

Final Report

May 2006

Cyril F. Chang, PhD
Professor of Economics and Director of the
Methodist LeBonheur Center for Healthcare Economics
The University of Memphis, Memphis, Tennessee 38152
E-Mail: cchang@memphis.edu
URL: http://www.healthecon.memphis.edu

Acknowledgments

The author thanks BlueCross BlueShield of Tennessee for financial support and acknowledges capable research and computer programming assistance provided by Rebecca Pope of the Department of Economics at The University of Memphis. The views expressed are those of the author and do not necessarily represent those of the funding agencies.

MISSION

The mission of the Methodist LeBonheur Center for Healthcare Economics at the University of Memphis is to address complex healthcare issues of efficiency, effectiveness, and equity with a focus on emerging healthcare issues that affect Memphis, Shelby County, and the State of Tennessee. Through a variety of research, internships, instruction, and public service programs, the Center works closely with entities both internal and external to the University to accomplish its mission. The key policy areas emphasized by the Center include:

1. Evaluation of government health care programs, such as TennCare, and development of strategies for improving the efficiency of these programs
2. Study of the impact and applicability of regional and state health economics trends
3. Assistance to stakeholders such as hospitals, nursing homes, and health plans in developing market analyses and business plans
4. Dissemination of best practice models to assist employers in the development and implementation of cost effective strategies for improving employee health and cutting healthcare costs

STAFF

Cyril F. Chang, Ph.D
Professor of Economics and Director

Rebecca A. Pope
Research Assistant

Stephanie C. Steinberg, MHA, MBA
Research Assistant

CONTENTS

This study analyzes Tennessee hospitalization records for potentially avoidable hospitalizations defined as inpatient admissions that can be avoided by timely and effective access to primary care. The results illustrate that potentially avoidable hospitalizations, especially those related to diabetes, bacterial pneumonia, congestive heart failure, asthma and low birth weight birth, are a serious problem in Tennessee. The problem seems to be worsening as evidenced by the 19% increase in the total number of potentially avoidable cases between 1996 and 2002, a period during which the total population of the state increased by only 6.8%.

The economic costs associated with these hospitalizations are staggering. Total charges for treating patients with potentially avoidable hospitalizations were more than $1.7 billion for 2002 alone. Though it is true that hospitals typically charge more than their actual costs, undoubtedly millions of dollars of treatment costs can be saved if even a fraction of the excessive and avoidable hospitalizations are eliminated by providing effective and less expensive primary care in the community setting.

The analysis also reveals that the rate of potentially avoidable hospitalizations varies by gender, race, age, and insurance status. In general, females have preventable hospitalization rates somewhat higher than males. Blacks are more likely than whites to have potentially avoidable hospitalizations, especially for diabetes, hypertension, congestive heart failure, and low birth weight birth. The young and old in Tennessee have higher rates of potentially avoidable hospitalizations than those in the middle age range. Medicare, with a heavy concentration of older enrollees, exhibited the highest rates of avoidable hospitalizations while TennCare and Uninsured have similar rates that are much lower than those for Medicare. Individuals insured by commercial plans including those offered by BlueCross and BlueShield of Tennessee have, on average, the lowest rates of potentially avoidable hospitalizations.

Additional findings of the study include:

- The retired and unemployed patients tend to have high rates of hospitalizations for congestive heart failure, pneumonia, and chronic obstructive pulmonary disease.

- The rates of avoidable hospitalizations are the highest in the Middle Grand Region of the State and lowest in the East. The West Grand Region's rate is about equal to the state average.

- Over time, between 1996 and 2002, potentially avoidable hospitalizations increased by a total of 19%, with 14% of the percentage growth occurring in the 1996-1999 period and 4% between 1999 and 2002. In contrast, total Tennessee population increased 4% between 1996 and 1999 and 3% between 1999 and 2002.

Much more needs to be done in Tennessee to reduce inpatient hospitalizations, especially those that are due to medical conditions that can be prevented by improved access to effective primary care. This effort should be focused on both physicians and consumers regarding health, prevention, and cost-effective approaches to treating preventable hospitalizations for asthma, diabetes, congestive heart failure, hypertension, and low birth weight birth. The data presented in this analysis makes a small but concrete contribution to this critical and worthwhile effort.

Research suggests that hospitalizations for certain conditions called Ambulatory Care Sensitive Conditions (ACSCs) are potentially avoidable.[1,2,3] These hospitalizations can be avoided when clinicians deliver timely and effective outpatient treatment to individuals who actively participate in their own care, follow a healthy life style, and engage in responsible personal behavior.[4] Nationally, nearly five million inpatient admissions to U.S. hospitals in 2000 involved treatment for one or more of these ACSCs, resulting in a total cost of more than $26.5 billion.[5] Thus, high rates of hospitalizations for these conditions present opportunities for improving health system effectiveness and efficiency in an environment of rising demand for scarce resources.

Tennessee faces a wide range of health care challenges. Rising health care costs and the resulting efforts by businesses to control spending have reduced both the proportion of employers who offer health insurance and the likelihood of employees eligible for health insurance to accept coverage.[6] The much touted TennCare Program that was originally designed to expand insurance coverage to previously uninsured and uninsurable individuals has run into severe financial difficulties.[7] With the State finally taking decisive and painful steps to cut back both the number of people covered and the benefits available, policies are critically needed that can effectively reduce the growth of health care spending without adversely affecting health outcomes.

This preliminary report analyzes Tennessee hospitalization records for potentially avoidable hospitalizations. The purpose of this descriptive study is to determine:

(1) The prevalence rates of potentially avoidable hospitalizations in Tennessee;

(2) The characteristics of the people who were associated with these hospitalizations; and

(3) Variations in the rates of potentially avoidable hospitalization according to several breakdowns such as insurance coverage and geographic origin of patients.

Based on these preliminary findings, the Methodist LeBonheur Center for Healthcare Economics plans to undertake a more comprehensive study of potentially avoidable hospitalizations. This advanced study will apply appropriate multivariable techniques such as logistic regression to patient discharge data from hospitals to explore research questions that cannot be addressed by the descriptive analysis conducted in this report. One such future question is whether and, if so, to what extent race and ethnicity affect the likelihood of potentially avoidable hospitalization. Another question awaiting further exploration is the potential cost savings associated with the elimination of avoidable hospitalization if effective primary care were available and utilized.

What Is a Potentially Avoidable Hospitalization?

This report uses the definition of potentially avoidable hospitalization proposed by the federal Agency for Healthcare Policy and Quality (AHRQ) to measure the effectiveness and timeliness of services provided in outpatient, clinic and community settings.[4] Published in 2004, the AHRQ definition identifies a set of specific Ambulatory Care Sensitive Conditions (ACSCs) in three major diagnostic categories including:

(1) Chronic conditions such as diabetes (including uncontrolled diabetes, short-term diabetes complications, long-term diabetes complications, and lower-extremity amputations among patients with diabetes), circulatory diseases (congestive heart failure, hypertension, and angina without procedure), and respiratory diseases (adult asthma, pediatric asthma, and chronic obstructive pulmonary disease);

(2) Acute conditions including dehydration, bacterial pneumonia, urinary tract infection, perforated appendix, and pediatric gastroenteritis; and

(3) Birth outcomes including low birth weight birth.

These ACSCs and the associated *International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM)* codes are presented in Appendix Table 1. Also included in Appendix Table 1 are additional inclusion and exclusion criteria recommended by AHRQ in determining the number of avoidable inpatient hospitalizations and the appropriate denominators for calculating the prevalence rate for each of the individual ACSCs. Note that this report combines the four categories of diabetes recognized by the AHRQ document into a single category called Diabetes thus reducing the total number of ACSCs from the original 16 to 13.

Data Source

Tennessee law (Tennessee Code Annotated (TCA), Section 68-1-108) requires that every licensed hospital report all claims data found on the BU-92 Hospital Claims Form to the Tennessee Department of Health. The Division of Health Statistics in the Office of Policy Planning and Assessment of the Tennessee Department of Health has established a Hospital Discharge Data System (HDDS) to collect, compile, and disseminate patient-level discharge information since 1997.[8]

The data used in this report contain excerpts from the 2002 HDDS dataset. For better comparability, the data used are only from acute-care general hospitals, including general medical and surgical hospitals, women's or OB/GYN hospitals, and pediatric hospitals. Excluded are long-term care hospitals, psychiatric hospitals, rehabilitation hospitals, and other specialty hospitals. The data cover the period from January 1, 2002 through December 31, 2002 and are summarized in Table 1.

Table 1. Avoidable Hospitalizations by Gender, 2002

Gender	All Hospitalizations	Avoidable Hospitalizations	Percent
Female	504,982	77,289	15.3%
Male	338,881	55,682	16.4%
Unknown	19	2	10.5%
Total	**843,882**	**132,973**	**15.8%**

In 2002, a total of 132,973 potentially avoidable hospitalizations occurred in Tennessee, representing 15.8% of all inpatient hospitalizations at acute-care hospitals. Female patients were responsible for 504,982 (or 59.8%) of total hospitalizations for all conditions while males were responsible for the remaining 338,881 hospitalizations (40.2% of total). For avoidable hospitalizations, females were responsible for 77,289 hospitalizations (58.1% of total) while males were responsible for 55,682 hospitalizations (41.9%).

Overview. Table 2 presents the number of potentially avoidable hospitalizations for each diagnosis. Also presented are hospitalization rates per 100,000 population for Tennessee and U.S. for 11 of the 13 diagnoses. The rates for perforated appendix and low birth weight birth were calculated for each 100 at-risk population.

Table 2. Potentially Avoidable Hospitalizations in 2002 - TN and the U.S.

Primary Diagnosis	Tennessee		U.S.
	Total No. of Hospitalizations	Hospitalization Rate[1]	Hospitalization Rate[1]
Diabetes	11,486	270.6	224.5
Congestive Heart Failure	25,969	610.7	457.7
Hypertension	2,753	64.7	44.4
Angina, without procedure	2,291	53.9	55.1
Adult Asthma	4,987	117.3	110.9
Pediatric Asthma	3,123	224.3	188.8
Chronic Obstructive Pulmonary Disease	18,353	325.1	248.6
Dehydration	11,012	195.1	139.9
Bacterial Pneumonia	31,722	562.0	349.7
Urinary Tract Infection	11,832	209.6	137.9
Perforated Appendix [a]	1,576	36.5	30.5
Pediatric Gastroenteritis	1,846	132.6	87.7
Low Birth Weight Birth [b]	6,023	8.0	5.9

[1] Rates are per 100,000 population. For Diabetes, CHF, hypertension, angina, and adult asthma the population is all persons 18 years and older. For pediatric conditions, the population is all persons 0 through 17 years. The rates for COPD, dehydration, bacterial pneumonia, and urinary tract infection the population is all state residents.

[a] The rate for perforated appendix is calculated per 100 admissions for appendicitis.

[b] The rate for low birth weight birth (less than 2500 grams) is calculated per 100 births.

In 2002, the leading diagnosis was bacterial pneumonia, accounting for 31,722 (24% of total) potentially avoidable hospitalizations, followed by congestive heart failure (25,969 or 19.5% of total), and chronic obstructive pulmonary disease (18,353 or 13.8% of total). Across all diagnoses, Tennesseans experienced a higher rate of potentially avoidable hospitalizations than did the U.S., with Tennessee exceeding the U.S. by a large margin in congestive heart failure, hypertension, bacterial pneumonia, pediatric gastroenteritis, and low birth weight birth.

Length of Stay. Length of stay (LOS) is the number of days spent as an inpatient in the hospital. Table 3 presents average LOS for each diagnosis of potentially avoidable hospitalization in 2002. For comparison, the average LOS for Tennessee and U.S. for all conditions are also presented.

Length of stay for all potentially avoidable hospitalizations in 2002 was 5.3 days, a rate slightly higher than the LOS for all condition for U.S. (4.9 days) and Tennessee (4.8 days). There was substantial variation in LOS among the diagnoses, ranging from 2.0 days for pediatric gastroenteritis and 2.2 days for pediatric asthma and to as high as 16.3 days for low birth weight infants. Perforated appendix, diabetes, and congestive heart failure were among the diagnoses that had an above-average LOS.

Table 3. Comparison of Length of Stay - 2002

Primary Diagnosis	Avg. Length of Stay
U.S. - All Conditions*	4.9
TN - All Conditions	4.8
TN - Potentially Avoidable Hospitalizations	5.3
Diabetes	5.7
Congestive Heart Failure	5.5
Hypertension	3.1
Angina, without procedure	2.3
Adult Asthma	3.9
Pediatric Asthma	2.2
Chronic Obstructive Pulmonary Disease	4.8
Dehydration	3.9
Bacterial Pneumonia	5.2
Uninary Tract Infection	4.5
Perforated Appendix	6.4
Pediatric Gastroenteritis	2.0
Low Birth Weight Birth	16.3

* Source: Health, U.S., 2004, Table 93

Hospital Charges. Table 4 presents total hospital charges, average charge per episode of hospitalization, and average charge per day of stay. Hospital charges reflect the amount billed by the admitting hospital to the patient or the patient's insurance company for services delivered. It usually exceeds the amount of reimbursement actually received or the cost of providing the delivered care. In 2002, total hospital charges for potentially avoidable hospitalizations were $1,701,616,843 for Tennessee. The average charges per discharge and per day of inpatient hospitalization were $12,797 and $2,399, respectively.

Bacteria pneumonia alone was associated with a total of $390,504,735 (or 23% of total) of total hospital charges because of the large number of cases associated with this diagnosis. Low birth weight birth, the leading cause of infant mortality, was responsible for a staggering total of $235,475,871 (13.8% of total) of total inpatient charges. The average charges per discharge and per day of care for low birth weight births were also high, at $24,099 and $3,764, respectively.

Table 4. Hospital Charges for Potentially Avoidable Hospitalizations in 2002 - All Races

Primary Diagnosis	Total Hospital Charges	Avg. Charges per Stay	Avg. Charge per Day
Diabetes	$169,711,763	$14,776	$2,615
Congestive Heart Failure	$360,736,215	$13,891	$2,528
Hypertension	$23,659,698	$8,594	$2,780
Angina, without procedure	$18,296,434	$7,986	$3,529
Adult Asthma	$44,162,742	$8,856	$2,253
Pedicatric Asthma	$16,625,437	$5,324	$2,371
Chronic Obstructive Pulmonary Disease	$206,599,121	$11,257	$2,348
Dehydration	$85,861,644	$7,797	$1,983
Bacterial Pneumonia	$390,504,735	$12,310	$2,362
Uninary Tract Infection	$106,222,760	$8,978	$2,014
Perforated Appendix	$37,979,952	$24,099	$3,764
Pediatric Gastroenteritis	$5,780,470	$3,131	$1,553
Low Birth Weight Birth	$235,475,871	$39,096	$2,400
Total	**$1,701,616,843**	**$12,797**	**$2,399**

III. Potentially Avoidable Hospitalizations by Patient Characteristic

Gender. Table 5 presents the numbers of potentially avoidable hospitalizations and hospitalization rates by gender. Across all diagnoses for avoidable hospitalizations, females were more likely to be hospitalized than males, with males showing a rate of 2,747 hospitalizations per 100,000 population and females a rate of 3,473 hospitalizations per 100,000 population. Across the different diagnoses, females were more likely than males to enter the hospital for congestive heart failure, hypertension, adult asthma, chronic obstructive pulmonary disease, dehydration, pneumonia, and urinary track infection. In contrast, males were more likely to be hospitalized for pediatric asthma and perforated appendix. Males and females have roughly the same likelihood of entering the hospital for diabetes. Males and female infants were also equally likely to be born with low birth weight in 2002 in Tennessee.

Table 5. Potentially Avoidable Hospitalizations in 2002 by Gender

	Male		Female	
Primary Diagnosis	Total No. of Hospitalizations	Hospitalization Rate	Total No. of Hospitalizations	Hospitalization Rate
Diabetes	5,521	272.4	5,965	268.1
Congestive Heart Failure	10,848	535.1	15,121	679.5
Hypertension	900	44.4	1,853	83.3
Angina, without procedure	1,022	50.4	1,269	57.0
Adult Asthma	1,202	59.3	3,785	170.1
Pediatric Asthma	1,912	269.4	1,211	177.4
Chronic Obstructive Pulmonary Disease	7,894	288.4	10,459	359.7
Dehydration	4,195	153.3	6,817	234.4
Bacterial Pneumonia	14,267	521.3	17,455	600.3
Urinary Tract Infection	3,001	109.7	8,831	303.7
Perforated Appendix	942	36.0	634	33.1
Pediatric Gastroenteritis	913	128.6	933	136.7
Low Birth Weight Birth	3,065	7.9	2,956	8.1
Total	**55,682**	**2,746.9**	**77,289**	**3,473.4**

Race. Table 6 presents the numbers and rates of potentially avoidable hospitalizations by race. In 2002, a total of 23,421 potentially avoidable hospitalizations were identified as for a black patient, representing a rate of 2,583 hospitalizations per 100,000 population. The hospitalization rates were 2,302 per 100,000 white population and 1,265 per 100,000 population identified as other races which included small racial groups such as Asians, Native Americans, and Pacific Islanders. Hispanics as a group exhibited the lowest rate of potentially avoidable hospitalizations at 463.5 per 100,000 population.

Across the different diagnoses, black Tennesseans exhibited higher rates of potentially avoidable hospitalizations for diabetes, hypertension, adult and pediatric asthma, and low birth weight birth. In contrast, white Tennesseans had higher rates of potentially avoidable hospitalizations for chronic obstructive pulmonary disease, bacteria pneumonia, and pediatric gastroenteritis. It is not clear whether the low rates of potentially avoidable hospitalizations for Hispanics reflected adequate access to good primary care or a lack of insurance coverage which has long been recognized by health services researchers as a barrier to adequate access to needed health care.

Table 10. Potentially Avoidable Hospitalizations in 2002 by Race

Primary Diagnosis	White		Black		Hispanic		Other	
	Total No. of Hospitalizations	Hospitalization Rate	Total No. of Hospitalizations	Hospitalization Rate	Total No. of Hospitalizations	Hospitalization Rate	Total No. of Hospitalizations	Hospitalization Rate
Diabetes	7,649	222.5	3,300	535.0	54	58.8	169	159.9
Congestive Heart Failure	19,225	559.2	5,567	902.5	34	37.0	284	268.7
Hypertension	1,734	50.4	873	141.5	7	7.6	48	45.4
Angina, without procedure	1,835	53.4	338	54.8	5	5.4	48	45.4
Adult Asthma	3,491	101.5	1,248	202.3	15	16.3	108	102.2
Pediatric Asthma	1,726	170.6	1,165	401.9	54	132.3	91	183.0
Chronic Obstructive Pulmonary Disease	16,050	360.7	1,470	162.1	13	9.8	283	182.1
Dehydration	8,594	193.1	1,823	201.1	69	52.0	161	103.6
Bacterial Pneumonia	26,405	593.4	3,767	415.4	113	85.2	400	257.4
Urinary Tract Infection	9,429	211.9	1,822	200.9	70	52.8	195	125.5
Perforated Appendix	1,228	33.8	195	40.3	37	37.4	24	9.4
Pediatric Gastroenteritis	1,488	147.0	216	74.5	47	115.1	32	64.4
Low Birth Weight Birth	3,578	6.4	1,637	9.8	97	3.7	123	5.1
Total	**102,432**	**2,301.9**	**23,421**	**2,583.0**	**615**	**463.5**	**1,966**	**1,265.1**

Note: Total avoidable hospitalizations do not add up to the totals shown in previous tables because of missing values in the Race/Ethnicity variable.

Age. Table 7 presents the numbers and rates of potentially avoidable hospitalizations for the adult population (ages 18 and older) and pediatric population (less than 18 years of age), and for additional age subgroups within the two major age groups.

Table 7. Potentially Avoidable Hospitalizations in 2002 by Age Group

Adult Population						
	18 to 44 Years		45 to 64 Years		65 Years and Older	
Primary Diagnosis	Hospitalizations	Rate	Hospitalizations	Rate	Hospitalizations	Rate
Diabetes	3,419	157.5	4,129	294.6	3,938	579.4
Congestive Heart Failure	1,217	56.1	6,383	455.4	18,369	2,702.6
Hypertension	496	22.8	1,049	74.8	1,208	177.7
Angina, without procedure	262	12.1	994	70.9	1,035	152.3
Adult Asthma	1,815	83.6	1,831	130.6	1,341	197.3
Chronic Obstructive Pulmonary Disease	865	39.8	6,792	484.6	10,661	1,568.5
Dehydration	1,153	53.1	1,971	140.6	5,729	842.9
Bacterial Pneumonia	3,357	154.6	7,335	523.3	17,571	2,585.2
Urinary Tract Infection	2,071	95.4	1,881	134.2	6,722	989.0
Perforated Appendix	558	26.9	418	45.0	201	56.6
Total	**15,213**	**700.8**	**32,783**	**2,338.8**	**66,775**	**9,824.5**
Pediatric Population						
	Under 1 Year		1 to 4 Years		5 to 17 Years	
Primary Diagnosis	Hospitalizations	Rate	Hospitalizations	Rate	Hospitalizations	Rate
Pediatric Asthma	315	418.3	1,422	470.8	1,386	136.5
Chronic Obstructive Pulmonary Disease	3	4.0	10	3.3	22	2.2
Dehydration	528	701.2	1,052	348.3	579	57.0
Bacterial Pneumonia	672	892.4	1,481	490.3	1,306	128.7
Urinary Tract Infection	401	532.5	289	95.7	468	46.1
Perforated Appendix			33	61.1	366	32.6
Pediatric Gastroenteritis	514	682.6	796	263.5	536	52.8
Total	**2,433**	**3,230.9**	**5,083**	**1,682.9**	**4,663**	**459.4**

The data in Table 7 suggest a familiar U-shaped relationship between age and the rate of potentially avoidable hospitalizations in Tennessee, with young and older individuals more likely to enter a hospital for a potentially avoidable condition than those in the age groups in the middle. For patients ages 4 or younger, asthma was the most common diagnosis for potentially avoidable hospitalizations in 2002. The rate for asthma declined as age rises, but eventually picked up again among the 45-64 years group and yet again among the 65 years and older group. The young and old were also susceptible to hospitalizations for bacterial pneumonia. For young adults and adults ages 18 to 64, bacterial pneumonia was the most common cause of avoidable hospitalizations. For older adults ages 65 and higher, congestive heart failure, bacterial pneumonia, and chronic obstructive pulmonary disease were the most common diagnoses for potentially hospitalizations.

Primary Insurance Payer. Table 8 reports 2002 potentially avoidable hospitalizations by primary payer group, and the data suggest substantial inter-group differences. Medicare led in the proportion of potentially avoidable hospitalizations, with 22.3% of its inpatient discharges being potentially preventable in 2002. In comparison, 13.3% of hospitalizations paid by TennCare (Tennessee's managed-care Medicaid program) were potentially avoidable while the percentage for Commercial and BlueCross BlueShield patients was 9.8%. The Self Insured/Uninsured category includes patients who reported at the time of admission that they had no insurance coverage. They can therefore be considered mostly as uninsured. About 12.8% of Self Insured/Uninsured patients' hospitalizations were potentially avoidable in 2002. Finally, the "Other" category, which includes Champus (military) and Workers Compensation,

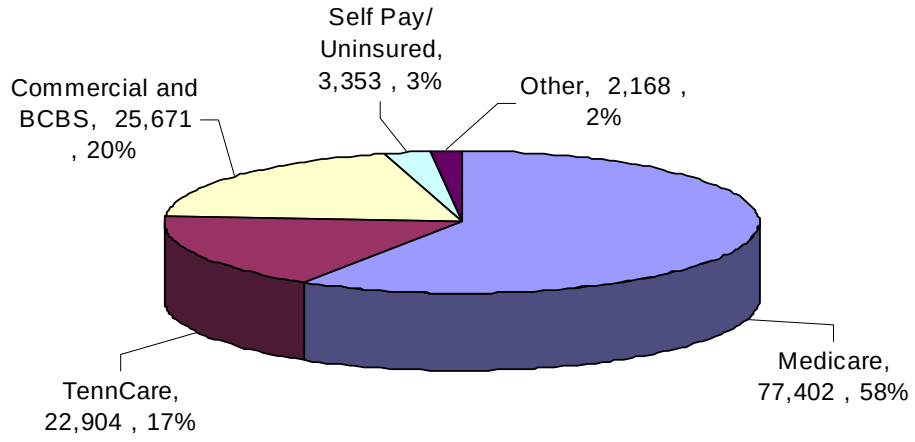
reported a rate of potentially avoidable hospitalizations of 10.2%, lower than the state average of about16%.

Table 8. Hospital Discharges in 2002 by Primary Payer

Primary Payer	Discharges for All Conditions	Potentially Avoidable Discharges	Percent
Medicare	346,601	77,402	22.3%
TennCare	172,353	22,904	13.3%
Commercial and BCBS	262,829	25,671	9.8%
Self Pay/Uninsured	26,169	3,353	12.8%
Other	21,337	2,168	10.2%
Unknown	14,593	1,475	10.1%
Total	843,882	132,973	15.8%

Charts 1 describes the percentage distribution of total potentially avoidable hospitalizations among the major primary insurance payers. Medicare represents 58 percent of the total potentially avoidable hospitalizations in 2002, followed by Commercial and BlueCross and Blue Shield insurance plans' 20% of total. The Self Pay/Uninsured and the Other categories together represent about 5% of total potentially avoidable hospitalizations. The percentage distribution of total charges among the major primary insurance payers, presented in Chart 2, are consistent with the distribution of the number of hospitalizations shown in Chart 1.

Chart 1. Total Number of Potentially Avoidable Hospitalizations in 2002 by Insurance Payer



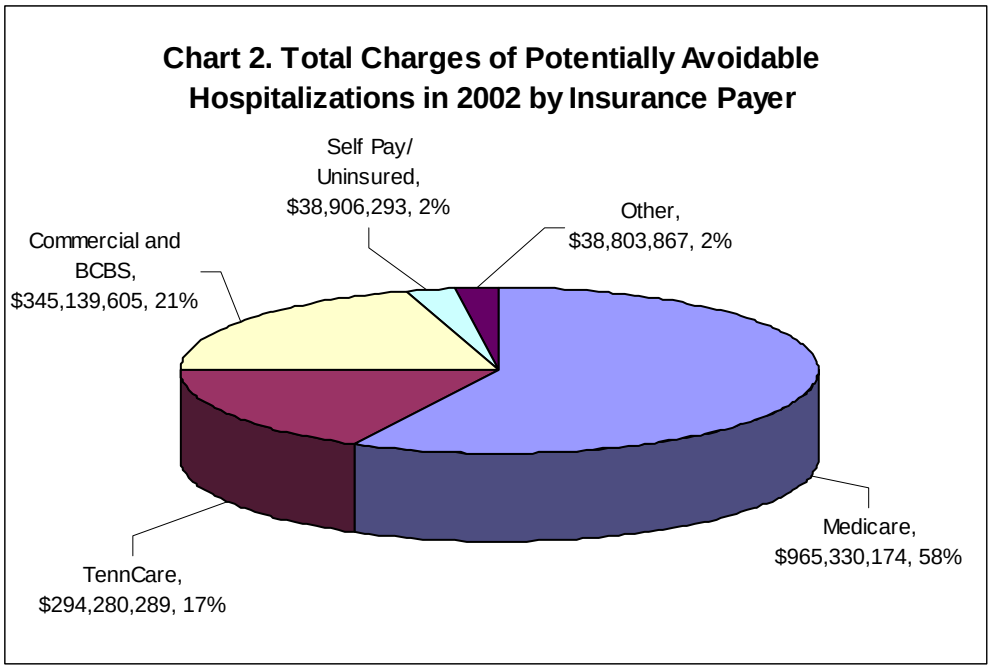


Table 9 summarizes the total number of potentially avoidable hospitalizations, average LOS, total hospital charges, average charges per stay, and average charge per day of stay by primary insurance payer. Again, Medicare had the largest number of cases and more than half of the total hospital charges for potentially avoidable hospitalizations in 2002. In contrast, Self-Pay/Uninsured patients had the highest hospital charges per day of stay.

Table 9. Potentially Avoidable Hospitalizations in 2002 by Charges, Length of Stay and Payer

Primary Payer	Total No. of Hospitalizations	Avg. Length of Stay	Total Hospital Charges	Avg. Charges per Stay	Avg. Charge per Day
Medicare	77,402	5.4	$965,330,174	$12,472	$2,308
TennCare	22,904	5.3	$294,280,289	$12,848	$2,437
Commercial and BCBS	25,671	5.2	$345,139,605	$13,445	$2,588
Self Pay/ Uninsured	3,353	4.4	$38,906,293	$11,603	$2,658
Other	2,168	6.8	$38,803,867	$17,898	$2,647
Total	132,973	5.3	$1,701,616,843	$12,797	$2,399

Note: The individual rows may not add up to column total because of missing values.

Employment Status. Table 10 shows potentially avoidable hospitalization discharge figures according to patient employment status: employed full time, part-time, self employed, active duty personnel, retired, and unemployment. It is important to note that the total number of hospitalizations reported in Table 10 adds up to only about 80% of all the patients who were hospitalized for a potentially avoidable diagnosis in 2002 because of missing value in the 2002 discharge data. Among the hospitalizations with patient employment data, unemployed and retired patients accounted for 39% and 38%, respectively, of the total hospitalizations that were potentially avoidable. The percentages for full-time employed, part-time employed and self-employed individuals were 21 percent, 0.8 percent, and 1.1 percent, respectively. It seems that potentially avoidable hospitalizations were most prevalent among individuals who were retired

or unemployed. The retired and unemployed patients also tended to have high rates of hospitalizations for congestive heart failure, pneumonia, and chronic obstructive pulmonary disease.

Table 10. Potentially Avoidable Hospitalizations in 2002 by Employment Status

	Full Time	Part Time	Self-Employed	Active Duty	Retired	Unemployed
Diabetes	2,261	89	104	2	2,496	4,398
Congestive Heart Failure	2,453	129	202	5	11,134	7,939
Hypertension	667	29	39	1	689	808
Angina, without procedure	471	15	41	1	705	617
Adult Asthma	1,338	66	41		846	1,751
Pediatric Asthma	885	1	15	3	3	1,325
Chronic Obstructive Pulmonary Disease	1,835	114	147	2	6,681	6,017
Dehydration	1,982	55	79	4	3,151	3,389
Bacterial Pneumonia	5,364	170	295	12	10,498	8,839
Urinary Tract Infection	1,939	60	93	5	3,840	3,463
Perforated Appendix	687	20	48	2	137	329
Pediatric Gastroenteritis	644	5	10	4	10	547
Low Birth Weight Birth	1,822	58	13	23	7	1,864
Total	**22,348**	**811**	**1,127**	**64**	**40,197**	**41,286**

Note: Total avoidable hospitalizations do not add up to the totals of previous tables because of missing values;
The employment status of Low Birth Weight Birth reflects that of the mother or the individual who had insurance.

Region. Table 11 displays 2002 avoidable hospitalizations by region. Tennessee has frequently used the traditional 3 grand regions or divisions (shown in Chart 3) for health planning and reporting purposes to reflect the significant regional differences in geography, socioeconomic characteristics, and health care needs. In 2002, the East and Middle regions of the state each had 37% of the total state population while the West had the remaining 26%. The distribution of total avoidable hospitalizations followed a pattern different than that of population distribution, with the East, Middle, and West regions having, respectively, 29%, 45%, and 26% of the statewide total potentially avoidable hospitalizations. Thus when expressed as a rate per 100,000 population, Middle Tennessee had the highest rate of avoidable hospitalization of 2,885 while the East the lowest at 1,828. The rate of avoidable hospitalization in the West was close to the state average at 2,369 per 100,000 population.

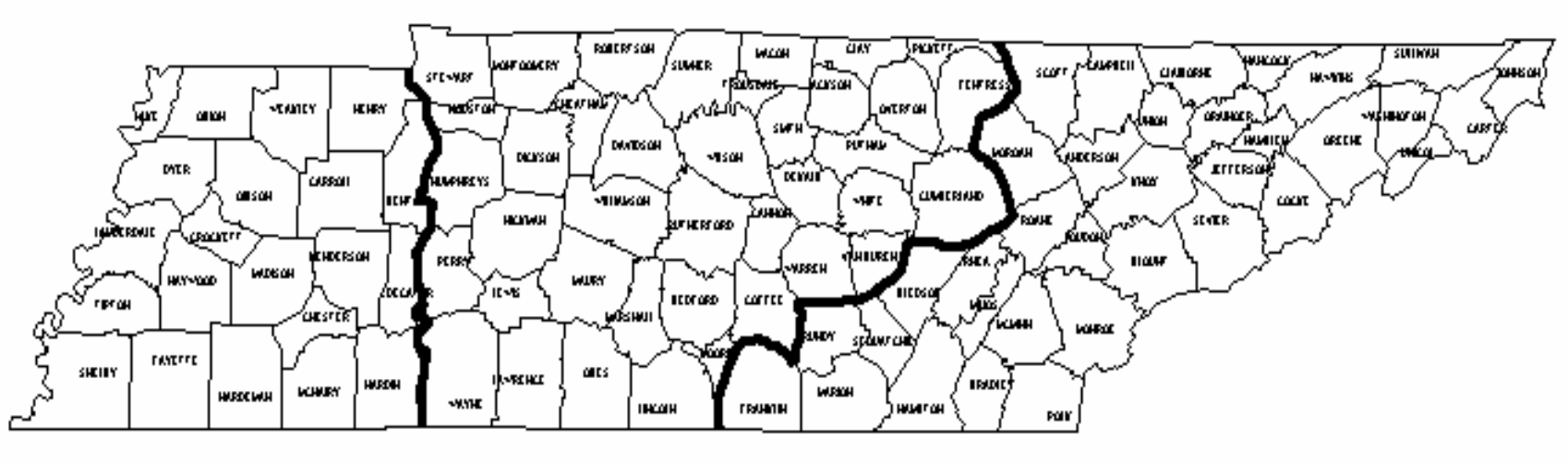
Table 11. Potentially Avoidable Hospitalizations in 2002 by Region

Region	Total No. of Hospitalizations	Rate
East Tennessee	38,413	1,828
Middle Tennessee	59,476	2,885
West Tennessee	35,084	2,369
Total	**132,973**	2,356

Note: Rates are expressed per 100,000 general population.

Chart 3. The Three Grand Regions of Tennessee

West Middle East



In terms of length of stay, Table 12 shows that the Middle had the shortest average LOS at 4.8 days, while the East and West had 5.0 days and 6.2 days, respectively. Table 12 also presents data on total hospital charges for the three grand regions. Middle Tennessee had the largest amount of total hospital charges because of the large number of hospitalizations in that region. But the impact of high rate of hospitalization was somewhat mitigated by the shorter LOS, resulting in the lowest average charge per hospital stay and per day for avoidable conditions. The West region had the longest LOS as, as a result, exhibited the highest average charges per stay and the second highest average charges per day.

Table 12. Potentially Avoidable Hospitalizations in 2002 by Charges, Length of Stay and Region

Region	Avg. Length of Stay	Total Hospital Charges	Avg. Charges per Stay	Avg. Charge per Day
East Tennessee	5.0	$ 449,640,746	$ 12,542	$ 2,488
Middle Tennessee	4.8	$ 620,153,594	$ 11,172	$ 2,312
West Tennessee	6.2	$ 469,828,757	$ 14,348	$ 2,326
Total	**5.3**	**$ 1,539,623,097**	**$ 12,687**	**$ 2,375**

Note: The sum total of hospital charges are smaller than those shown earlier because of missing data.

Trends of Avoidable Hospitalization: 1996-2002. Table 13 presents potentially avoidable hospitalization trends in Tennessee for 1996, 1999, and 2002. Total avoidable hospitalizations increased from 111,777 in 1996 to 127,097 in 1999 and to 132,973 in 2002. These trend data for 1996-2002 represent a total of 19% of growth, with 14% of the percentage growth occurring between the 1996-99 period and 4% in the 1999-2002 period. In contrast, total Tennessee population increased 4% between 1996 and 1999 and 3% between 1999 and 2002. It is interesting to note that total potentially avoidable hospitalizations as a percentage of total hospitalizations did not show a persistent rising trend, changing from 14.7% in 1996 to 16.4% in 1999 and to 15.8% in 2002. The increases in the absolute numbers of potentially avoidable hospitalizations seemed to follow the overall rising trend of inpatient hospitalizations

Among the different categories of avoidable hospitalizations, bacterial pneumonia, dehydration, and low birth weight births exhibited the largest percentage growth between 1996 and 2002 (47%, 29% and 25%, respectively). In contrast, angina without procedure and pediatric gastroenteritis showed a substantial decline (-46% and -13%, respectively). The other diagnostic categories showed varying degrees of increases during the same period.

Table 14 presents average length-of-stay (LOS) data by diagnosis for 1996, 1999, and 2002. Mirroring the mild but steady declining trend of LOS for all hospitalizations in Tennessee, the average LOS for potentially avoidable hospitalizations declined from 5.6 days in 1996 to 5.4 days in 1999 and to 5.3 days in 2002. For the 1996-2002 period, average LOS for all potentially avoidable hospitalizations declined by 4% as compared to the 4.5% decline of average LOS for hospitalization for all conditions.

Table 13. Potentially Avoidable Hospializations Trends, Selected Years 1996-2002

Primary Diagnosis	1996	1999	2002	Percentage Change 1996-99	1999-02	1996-02
Diabetes	9,637	9,984	11,486	3.6%	15.0%	19.2%
Congestive Heart Failure	23,918	24,995	25,969	4.5%	3.9%	8.6%
Hypertension	2,328	2,217	2,753	-4.8%	24.2%	18.3%
Angina, without procedure	4,231	2,651	2,291	-37.3%	-13.6%	-45.9%
Adult Asthma	4,647	4,612	4,987	-0.8%	8.1%	7.3%
Pediatric Asthma	2,925	3,211	3,123	9.8%	-2.7%	6.8%
Chronic Obstructive Pulmonary Disease	15,275	18,270	18,353	19.6%	0.5%	20.2%
Dehydration	8,535	8,851	11,012	3.7%	24.4%	29.0%
Bacterial Pneumonia	21,519	31,751	31,722	47.5%	-0.1%	47.4%
Urinary Tract Infection	10,405	11,342	11,832	9.0%	4.3%	13.7%
Perforated Appendix	1,386	1,512	1,576	9.1%	4.2%	13.7%
Pediatric Gastroenteritis	2,134	2,186	1,846	2.4%	-15.6%	-13.5%
Low Birth Weight Birth	4,837	5,512	6,023	14.0%	9.3%	24.5%
Total Avoidable Hospitalizations	111,777	127,094	132,973	13.7%	4.6%	19.0%
Total Population - TN (HIT Estimates)	5,416,643	5,638,706	5,786,527	4.1%	2.6%	6.8%

Table 14. Length of Stay of Potentially Avoidable Hospializations, Selected Years 1996-2002

Primary Diagnosis	1996	1999	2002	Percentage Change 96-99	99-02	96-02
Diabetes	6.0	5.9	5.7	-1.4%	-4.8%	-6.1%
Congestive Heart Failure	5.8	5.5	5.5	-5.8%	0.4%	-5.4%
Hypertension	3.2	3.1	3.1	-4.2%	0.0%	-4.2%
Angina, without procedure	2.6	2.4	2.3	-6.7%	-5.8%	-12.1%
Adult Asthma	4.1	3.9	3.9	-5.3%	1.3%	-4.1%
Pediatric Asthma	2.4	2.3	2.2	-4.5%	-0.7%	-5.2%
Chronic Obstructive Pulmonary Disease	5.5	5.0	4.8	-7.5%	-4.9%	-12.0%
Dehydration	4.3	4.0	3.9	-5.6%	-2.1%	-7.6%
Bacterial Pneumonia	5.5	5.2	5.2	-3.9%	-0.6%	-4.4%
Urinary Tract Infection	4.6	4.5	4.5	-2.8%	-0.2%	-3.0%
Perforated Appendix	6.9	6.5	6.4	-4.9%	-2.0%	-6.9%
Pediatric Gastroenteritis	2.2	2.2	2.0	0.4%	-7.2%	-6.8%
Low Birth Weight Birth	16.7	16.6	16.3	-0.7%	-1.9%	-2.6%
Total Avoidable Hospitalizations	5.6	5.4	5.3	-3.0%	-1.1%	-4.0%
Total Hospitalizations for All Conditions	5.0	4.9	4.8	-2.0%	-2.5%	-4.5%

This study analyzes Tennessee hospitalization records for potentially avoidable hospitalizations defined as inpatient admissions that can be avoided by timely and effective access to primary care. The results illustrate that potentially avoidable hospitalizations, especially those related to diabetes, bacterial pneumonia, congestive heart failure, asthma and low birth weight birth, are a serious problem in Tennessee. The problem seems to be worsening as evidenced by the 19% increase in the total number of potentially avoidable cases between 1996 and 2002, a period during which the total population of the state increased by only 6.8%.

The economic costs associated with these hospitalizations are staggering. Total charges for treating patients with potentially avoidable hospitalizations were more than $1.7 billion for 2002 alone. Though it is true that hospitals typically charge more than their actual costs, undoubtedly millions of dollars of treatment costs can be saved if even a fraction of the excessive and avoidable hospitalizations are eliminated by providing effective and less expensive primary care in the community setting.

The analysis also reveals that the rate of potentially avoidable hospitalizations varies by gender, race, age, and insurance status. In general, females have preventable hospitalization rates somewhat higher than males. Blacks are more likely than whites to have potentially avoidable hospitalizations, especially for diabetes, hypertension, congestive heart failure, and low birth weight birth. The young and old in Tennessee have higher rates of potentially avoidable hospitalizations than those in the middle age range. Medicare, with a heavy concentration of older enrollees, exhibited the highest rates of avoidable hospitalizations while TennCare and Uninsured have similar rates that are much lower than those for Medicare. Individuals insured by commercial plans including those offered by BlueCross and BlueShield of Tennessee have, on average, the lowest rates of potentially avoidable hospitalizations.

Additional findings of the study include:

- The retired and unemployed patients tend to have high rates of hospitalizations for congestive heart failure, pneumonia, and chronic obstructive pulmonary disease.

- The rates of avoidable hospitalizations are the highest in the Middle Grand Region of the State and lowest in the East. The West Grand Region's rate is about equal to the state average.

- Over time, between 1996 and 2002, potentially avoidable hospitalizations increased by a total of 19%, with 14% of the percentage growth occurring in the 1996-1999 period and 4% between 1999 and 2002. In contrast, total Tennessee population increased 4% between 1996 and 1999 and 3% between 1999 and 2002.

Much more needs to be done in Tennessee to reduce inpatient hospitalizations, especially those that are due to medical conditions that can be prevented by improved access to effective primary care. This effort should be focused on both physicians and consumers regarding health, prevention, and cost-effective approaches to treating preventable hospitalizations for asthma, diabetes, congestive heart failure, hypertension, and low birth weight birth. The data presented in this analysis makes a small but concrete contribution to this critical and worthwhile effort.

V. REFERENCES

1. Billings, J., Zeitel, L., and Lukomnik, J. et al. 1993. Impact of socioeconomic status on hospital use in New York City. *Health Affairs* 12(1):162-173.

2. Pappas, G., Hadden, W. C., Kozak, L. J., and Fisher, G. F. 1997. Potentially avoidable hospitalizations: Inequalities in rates between U.S. socioeconomic groups. *American Journal of Public Health* 87: 811-816.

3. Blustein, J., Hanson, K., and Shea, S. 1998. Preventable hospitalizations and socioeconomic status. *Health Affairs* 17: 177-189.

4. Agency for Healthcare Research and Quality. 2004. *AHRQ Quality Indicators—Guide to Prevention Quality Indicators: Hospital Admission for Ambulatory Care Sensitive Conditions. Rockville, MD: Agency for Healthcare Research and Quality*. Revision 3. AHRQ Pub. No. 02-RO203. Revision 4 (November 24, 2004).

5. Kruzikas, D. T., Jiang, H. J., Remus, D., Barrett, M. L., Coffey, R. M., and Andrews, R. 2004. *Preventable Hospitalizations: A Window into Primary and Preventive Care, 2000*. Rockville, MD: Agency for Healthcare Research and Quality. HCUP Fact Book No. 5; AHRQ Pub. No. 04-0056 (September 2004).

6. Agency for Healthcare Research and Quality. *Number of private-sector establishments by firm size and State* (Table II.A.1), years 1996-2003: 1996 (Revised March 2000), 1997 (March 2000), 1998 (August 2000), 1999 (August 2001), 2000 (August 2002), 2001 (August 2003), 2002 (July 2004), 2003 (July 2005). Medical Expenditure Panel Survey Insurance Component Tables. Generated using MEPSnet/IC. <http://www.meps.ahrq.gov/mepsnet/IC/MEPSnetIC.asp> (April 16, 2006)

7. McKinsey & Company. *Achieving a Critical Mission in Difficult Times – TennCare's Financial Viability*. Part 1 of a two-part report, December 11, 2003.

8. Tennessee Department of Health. Tennessee Hospital Discharge Data System. Nashville, Tennessee: Tennessee Department of Health, Health Statistics and Research, November 2002. http://www2.state.tn.us/health/statistics/PdfFiles/ HDDS.pdf

Dr. Cyril F. Chang
Professor of Economics and Director
Methodist LeBonheur Center for Healthcare Economics
Fogelman College of Business and Economics
The University of Memphis
Memphis, Tennessee 38152
Phone: 901-678-3565
Fax: 901-678-2685
E-mail: cchang@memphis.edu
http://healthecon.memphis.edu/

VI. APPENDIX A – DETAILED TABLES

Contents

Appendix Table 1. Conditions Suggesting Potentially Avoidable Hospitalizations and Corresponding ICD-9-CM Codes

	Primary Diagnosis	ICD-9-CM Diagnosis Codes Included*
Chronic conditions		
1	Diabetes	Discharges with principal diagnosis codes 25000-25003,25010-25013,25020-25023,25030-25033,25040-25043,25050-25053,25060-25063,25070-25073,25080-25083,25090-25093; Age 18 years and older
2	Congestive heart failure	Discharges with principal diagnosis codes 39891,40201, 40211,40291,40401,40403,40411,40413,40491,40493,4280,4281,42820-42823,42830-42833,42840-42843,4289; Age 18 years old and over; Exclude any patient with a cardiac procedure in any field (36.01, 36.02, 36.05, 35.06, 36.10-36.17, 36.19, 37.5, 37.70-37.79)
3	Hypertension	Discharges with principal diagnosis codes 4010,4019, 40200,40210,40290,40300,40310,40390,40400,40410, 40490; Age 18 years and older; Exclude any patient with a cardiac procedure in any field (36.01, 35.02, 36.05, 36.06, 36.10-36.17, 36.19, 37.5, 37.70-37.79)
4	Angina without procedure	Discharges with principal diagnosis codes 4111,41181,41189,4130,4131,4139; Age 18 years and older; Exclude any patient with a surgical procedure in any field (01.0-86.99)
5	Adult asthma	Discharges with principal diagnosis codes 49300-49302,49310-49312,49320-49322,49381,49382,49390-49392; Age 18 years and older
6	Pediatric asthma	Discharges with principal diagnosis codes 49300-49302,49310-49312,49320-49322,49381-49382,49390-49392; Under age 18
7	Chronic obstructive pulmonary disease	Discharges with principal diagnosis codes 490,4660,4910,4911,49120,49121,4918-4920,4928,494,4940, 4941,496; Age 18 years and older
Acute conditions		
8	Dehydration	Discharges with principal diagnosis code 2765
9	Bacterial pneumonia	Discharges with principal diagnosis codes 481,4822,48230-48232,48239,481,4822,4829-4831,4838,485-486,4829-4830; Exclude any hospitalization with a diagnosis code for sickle cell anemia or HB-S disease (28260-2826, 28269) and patients les than 8 weeks of age.
10	Urinary tract infection	Discharges with principal diagnosis codes 59000,59001,59010,59011, 5902-5903,59080,59081,5909,5950,5959,5990
11	Perforated appendix	Discharges with principal diagnosis codes or other diagnosis codes 5400,5401,5409,541
12	Pediatric gastroenteritis	Discharges with principal diagnosis codes 00861-00867,00869,0088, 0090-0093,5589; Under age 18
Birth outcomes		
13	Low birth weight birth	Discharges with principal diagnosis codes or other diagnosis codes 76400-76408,76410-76418,76420-76428,76490-76498,76500-76508,76510-76518

Source: AHRQ Guide to Prevention Quality Indicators: Hospital Admission for Ambulatory Care Sensitive Conditions, AHRQ Pub. No. 02-RO203, Revision 4, November 24, 2004, Appendix A

*Transfers from another institution are excluded in all ambulatory care sensitive conditions

Appendix Table 1. Conditions Suggesting Potentially Avoidable Hospitalizations and Corresponding ICD-9-CM Codes (cont'd)

	Primary Diagnosis	ICD-9-CM Procedure Codes Excluded
Chronic conditions		
1	Diabetes	
2	Congestive heart failure	0050-0054,3500-3504,3510-3514,3520-3528,3531-3535,3539,3541-3542,3550-3554,3560-3563,3570-3573,3581-3584,3591-3596,3598-3599,3601-3607,3609-3617,3619,362,363,3631-3632,3639,3691,3699,3731-3735,375,3751-3754,3770-3783, 3785-3787,3789,3794-3798
3	Hypertension	0050-0054,3500-3504,3510-3514,3520-3528,3531-3535,3539,3541-3542,3550-3554,3560-3563,3570-3573,3581-3584,3591-3596,3598-3599,3601-3617,3619,362-363,3631-3632,3639,3691,3699,3731-3735,375,3751-3754,3770-3783,3785-3787,3789,3794-3798
4	Angina without procedure	0050-0054,3500-3504,3510-3514,3520-3528,3531-3535,3539,3541-3542,3550-3554,3560-3563,3570-3573,3581-3584,3591-3596,3598,3599,3601-3607,3609-3617,3619,362-363,3631,3632,3639,3691,3699,3731-3735,375,3751-3754,3770-3783,3785-3787,3789,3794-3798
5	Adult asthma	
6	Pediatric asthma	
7	Chronic obstructive pulmonary disease	
Acute conditions		
8	Dehydration	
9	Bacterial pneumonia	
10	Urinary tract infection	
11	Perforated appendix	
12	Pediatric gastroenteritis	
Birth outcomes		
13	Low birth weight birth	

Appendix Table 2. Potentially Avoidable Hospitalizations in 2002 - By Charges and Length of Stay - White

Primary Diagnosis	Total No. of Discharges	Discharge Rate	Avg. Length of Stay	Total Hospital Charges	Avg. Charge per Stay	Avg. Charge per Day
Diabetes	7,649	222.5	5.32	$ 107,539,233	$ 14,059	$ 2,643
Congestive Heart Failure	19,225	559.2	5.26	$ 251,900,646	$ 13,103	$ 2,493
Hypertension	1,734	50.4	2.90	$ 13,505,541	$ 7,789	$ 2,684
Angina, without procedure	1,835	53.4	2.14	$ 13,810,990	$ 7,526	$ 3,510
Adult Asthma	3,491	101.5	3.97	$ 30,786,021	$ 8,819	$ 2,221
Pediatric Asthma	1,726	170.6	2.27	$ 8,793,976	$ 5,095	$ 2,241
Chronic Obstructive Pulmonary Disease	16,050	360.7	4.73	$ 178,407,048	$ 11,116	$ 2,350
Dehydration	8,594	193.1	3.74	$ 64,307,066	$ 7,483	$ 2,002
Bacterial Pneumonia	26,405	593.4	5.13	$ 319,113,444	$ 12,085	$ 2,354
Urinary Tract Infection	9,429	211.9	4.31	$ 80,324,027	$ 8,519	$ 1,979
Perforated Appendix	1,228	33.8	6.04	$ 28,163,210	$ 22,934	$ 3,796
Pediatric Gastroenteritis	1,488	147.0	2.01	$ 4,618,760	$ 3,104	$ 1,541
Low Birth Weight Birth	3,578	6.4	15.14	$ 131,057,598	$ 36,629	$ 2,419
Total	**102,432**	**2,301.9**	**5.05**	**$ 1,232,327,560**	**$ 12,031**	**$ 2,382**

Appendix Table 3. Potentially Avoidable Hospitalizations in 2002 - By Charges and Length of Stay - Black

Primary Diagnosis	Total No. of Discharges	Discharge Rate	Avg. Length of Stay	Total Hospital Charges	Avg. Charge per Stay	Avg. Charge per Day
Diabetes	3,300	535.0	6.34	$ 53,816,846	$ 16,308	$ 2,573
Congestive Heart Failure	5,567	902.5	6.07	$ 90,373,820	$ 16,234	$ 2,673
Hypertension	873	141.5	3.39	$ 8,850,311	$ 10,138	$ 2,989
Angina, without procedure	338	54.8	2.84	$ 3,504,442	$ 10,368	$ 3,650
Adult Asthma	1,248	202.3	3.87	$ 11,579,664	$ 9,279	$ 2,396
Pediatric Asthma	1,165	401.9	2.19	$ 6,564,720	$ 5,635	$ 2,567
Chronic Obstructive Pulmonary Disease	1,470	162.1	5.16	$ 18,497,459	$ 12,583	$ 2,441
Dehydration	1,823	201.1	4.77	$ 16,884,415	$ 9,262	$ 1,942
Bacterial Pneumonia	3,767	415.4	5.72	$ 52,870,885	$ 14,035	$ 2,453
Urinary Tract Infection	1,822	200.9	5.20	$ 20,243,615	$ 11,111	$ 2,136
Perforated Appendix	195	40.3	9.16	$ 6,738,415	$ 34,556	$ 3,773
Pediatric Gastroenteritis	216	74.5	2.03	$ 716,492	$ 3,317	$ 1,636
Low Birth Weight Birth	1,637	9.8	18.99	$ 73,189,800	$ 44,710	$ 2,355
Total	**23,421**	**2,583.0**	**6.26**	**$ 363,830,883**	**$ 15,534**	**$ 2,481**

Appendix Table 4. Potentially Avoidable Hospitalizations in 2002 - By Charges and Length of Stay - Hispanic

Primary Diagnosis	Total No. of Discharges	Discharge Rate	Avg. Length of Stay	Total Hospital Charges	Avg. Charge per Stay	Avg. Charge per Day
Diabetes	54	58.8	4.98	$ 927,702	$ 17,180	$ 3,449
Congestive Heart Failure	34	37.0	4.53	$ 574,641	$ 16,901	$ 3,731
Hypertension	7	7.6	3.86	$ 102,487	$ 14,641	$ 3,796
Angina, without procedure	5	5.4	1.80	$ 30,891	$ 6,178	$ 3,432
Adult Asthma	15	16.3	3.67	$ 123,402	$ 8,227	$ 2,244
Pediatric Asthma	54	132.3	2.37	$ 318,880	$ 5,905	$ 2,491
Chronic Obstructive Pulmonary Disease	13	9.8	5.00	$ 144,200	$ 11,092	$ 2,218
Dehydration	69	52.0	2.38	$ 268,870	$ 3,897	$ 1,639
Bacterial Pneumonia	113	85.2	4.23	$ 1,272,692	$ 11,263	$ 2,663
Urinary Tract Infection	70	52.8	3.37	$ 380,185	$ 5,431	$ 1,611
Perforated Appendix	37	37.4	6.43	$ 825,645	$ 22,315	$ 3,469
Pediatric Gastroenteritis	47	115.1	2.04	$ 154,484	$ 3,287	$ 1,609
Low Birth Weight Birth	97	3.7	12.33	$ 2,164,873	$ 22,318	$ 1,810
Total	**615**	**463.5**	**5.07**	**$ 7,288,952**	**$ 11,852**	**$ 2,340**

Appendix Table 5. Potentially Avoidable Hospitalizations in 2002 - By Charges and Length of Stay - Other Races

Primary Diagnosis	Total No. of Discharges	Discharge Rate	Avg. Length of Stay	Total Hospital Charges	Avg. Charge per Stay	Avg. Charge per Day
Diabetes	169	159.9	5.74	$ 2,404,514	$ 14,228	$ 2,479
Congestive Heart Failure	284	268.7	5.04	$ 3,742,565	$ 13,178	$ 2,615
Hypertension	48	45.4	2.85	$ 369,225	$ 7,692	$ 2,695
Angina, without procedure	48	45.4	2.60	$ 456,131	$ 9,503	$ 3,649
Adult Asthma	108	102.2	3.08	$ 716,082	$ 6,630	$ 2,150
Pediatric Asthma	91	183.0	2.51	$ 609,905	$ 6,702	$ 2,675
Chronic Obstructive Pulmonary Disease	283	182.1	4.58	$ 3,124,635	$ 11,041	$ 2,411
Dehydration	161	103.6	4.21	$ 1,514,875	$ 9,409	$ 2,234
Bacterial Pneumonia	400	257.4	4.75	$ 4,882,477	$ 12,206	$ 2,572
Urinary Tract Infection	195	125.5	4.45	$ 2,418,768	$ 12,404	$ 2,787
Perforated Appendix	24	9.4	7.50	$ 801,385	$ 33,391	$ 4,452
Pediatric Gastroenteritis	32	64.4	1.91	$ 105,212	$ 3,288	$ 1,725
Low Birth Weight Birth	123	5.1	12.07	$ 2,567,955	$ 20,878	$ 1,729
Total	**1,966**	**1,265.1**	**4.93**	**$ 23,713,730**	**$ 12,062**	**$ 2,447**

Appendix Table 6. Potentially Avoidable Hospitalizations in 2002 - By Charges and Length of Stay - Medicare

Primary Diagnosis	Total No. of Hospitalizations	Avg. Length of Stay	Total Hospital Charges	Avg. Charges per Stay	Avg. Charge per Day
Diabetes	5,765	6.49	$ 95,404,201	$ 16,549	$ 2,552
Congestive Heart Failure	20,413	5.60	$ 277,891,480	$ 13,613	$ 2,431
Hypertension	1,386	3.23	$ 11,155,950	$ 8,049	$ 2,489
Angina, without procedure	1,242	2.46	$ 9,544,390	$ 7,685	$ 3,118
Adult Asthma	1,923	4.82	$ 20,491,784	$ 10,656	$ 2,212
Pediatric Asthma	2	1.50	$ 7,096	$ 3,548	$ 2,365
Chronic Obstructive Pulmonary Disease	13,128	5.00	$ 150,367,937	$ 11,454	$ 2,289
Dehydration	6,312	4.73	$ 58,641,829	$ 9,291	$ 1,964
Bacterial Pneumonia	19,579	5.83	$ 259,122,766	$ 13,235	$ 2,270
Urinary Tract Infection	7,409	5.08	$ 73,058,289	$ 9,861	$ 1,943
Perforated Appendix	236	10.05	$ 9,624,111	$ 40,780	$ 4,059
Pediatric Gastroenteritis	2	2.50	$ 8,971	$ 4,485	$ 1,794
Low Birth Weight Birth	5	0.80	$ 11,371	$ 2,274	$ 2,843
Total	**77,402**	**5.40**	**$ 965,330,174**	**$ 12,472**	**$ 2,308**

Appendix Table 7. Potentially Avoidable Hospitalizations in 2002 - By Charges and Length of Stay - TennCare

Primary Diagnosis	Total No. of Hospitalizations	Avg. Length of Stay	Total Hospital Charges	Avg. Charges per Stay	Avg. Charge per Day
Diabetes	2,470	4.78	$ 30,634,630	$ 12,403	$ 2,595
Congestive Heart Failure	2,199	5.14	$ 31,911,294	$ 14,512	$ 2,824
Hypertension	426	3.01	$ 3,884,481	$ 9,118	$ 3,030
Angina, without procedure	323	2.08	$ 2,473,270	$ 7,657	$ 3,686
Adult Asthma	1,183	3.29	$ 8,910,028	$ 7,532	$ 2,290
Pediatric Asthma	1,716	2.28	$ 9,229,284	$ 5,378	$ 2,360
Chronic Obstructive Pulmonary Disease	2,570	4.21	$ 28,026,703	$ 10,905	$ 2,592
Dehydration	1,787	2.99	$ 9,863,790	$ 5,520	$ 1,844
Bacterial Pneumonia	4,651	4.20	$ 49,500,575	$ 10,643	$ 2,533
Urinary Tract Infection	1,775	3.64	$ 13,382,336	$ 7,539	$ 2,073
Perforated Appendix	293	6.28	$ 6,376,820	$ 21,764	$ 3,464
Pediatric Gastroenteritis	865	2.05	$ 2,773,279	$ 3,206	$ 1,568
Low Birth Weight Birth	2,646	15.92	$ 97,313,799	$ 36,778	$ 2,311
Total	**22,904**	**5.27**	**$ 294,280,289**	**$ 12,848**	**$ 2,437**

Appendix Table 8. Potentially Avoidable Hospitalizations in 2002 - By Charges and Length of Stay - Commercial/BCBS

Primary Diagnosis	Total No. of Hospitalizations	Avg. Length of Stay	Total Hospital Charges	Avg. Charges per Stay	Avg. Charge per Day
Diabetes	2,349	5.05	$ 33,682,548	$ 14,339	$ 2,840
Congestive Heart Failure	2,512	5.11	$ 38,078,455	$ 15,159	$ 2,968
Hypertension	723	2.81	$ 6,268,606	$ 8,670	$ 3,080
Angina, without procedure	592	2.00	$ 5,233,531	$ 8,840	$ 4,416
Adult Asthma	1,444	3.56	$ 11,710,999	$ 8,110	$ 2,278
Pediatric Asthma	1,148	2.21	$ 5,947,796	$ 5,181	$ 2,344
Chronic Obstructive Pulmonary Disease	2,055	4.44	$ 22,005,136	$ 10,708	$ 2,411
Dehydration	2,409	2.81	$ 14,365,318	$ 5,963	$ 2,126
Bacterial Pneumonia	5,906	4.23	$ 64,126,478	$ 10,858	$ 2,570
Urinary Tract Infection	2,134	3.27	$ 15,420,222	$ 7,226	$ 2,208
Perforated Appendix	845	5.48	$ 17,414,986	$ 20,609	$ 3,761
Pediatric Gastroenteritis	846	2.03	$ 2,626,314	$ 3,104	$ 1,532
Low Birth Weight Birth	2,708	16.10	$ 108,259,215	$ 39,978	$ 2,482
Total	**25,671**	**5.20**	**$ 345,139,605**	**$ 13,445**	**$ 2,588**

Appendix Table 9. Potentially Avoidable Hospitalizations in 2002 - By Charges and Length of Stay - Uninsured

Primary Diagnosis	Total No. of Hospitalizations	Avg. Length of Stay	Total Hospital Charges	Avg. Charges per Stay	Avg. Charge per Day
Diabetes	555	3.86	$ 5,600,930	$ 10,092	$ 2,611
Congestive Heart Failure	422	4.51	$ 5,594,362	$ 13,257	$ 2,941
Hypertension	137	2.74	$ 1,175,634	$ 8,581	$ 3,127
Angina, without procedure	76	2.11	$ 641,330	$ 8,439	$ 4,008
Adult Asthma	259	2.79	$ 1,715,212	$ 6,622	$ 2,376
Pediatric Asthma	83	2.05	$ 379,830	$ 4,576	$ 2,234
Chronic Obstructive Pulmonary Disease	246	3.77	$ 2,346,995	$ 9,541	$ 2,532
Dehydration	195	2.57	$ 1,165,949	$ 5,979	$ 2,323
Bacterial Pneumonia	743	4.22	$ 8,669,086	$ 11,668	$ 2,764
Urinary Tract Infection	264	3.14	$ 2,246,663	$ 8,510	$ 2,710
Perforated Appendix	129	5.93	$ 2,832,867	$ 21,960	$ 3,703
Pediatric Gastroenteritis	56	1.64	$ 141,536	$ 2,527	$ 1,538
Low Birth Weight Birth	188	15.47	$ 6,395,900	$ 34,021	$ 2,199
Total	**3,353**	**4.36**	**$ 38,906,293**	**$ 11,603**	**$ 2,658**

Appendix Table 10. Potentially Avoidable Hospitalizations in 2002 - By Charges and Length of Stay - Other Insurance

Primary Diagnosis	Total No. of Hospitalizations	Avg. Length of Stay	Total Hospital Charges	Avg. Charges per Stay	Avg. Charge per Day
Diabetes	182	5.25	$ 2,523,037	$ 13,863	$ 2,639
Congestive Heart Failure	224	6.62	$ 5,051,195	$ 22,550	$ 3,406
Hypertension	32	3.34	$ 343,631	$ 10,738	$ 3,212
Angina, without procedure	20	1.75	$ 134,372	$ 6,719	$ 3,839
Adult Asthma	100	3.54	$ 782,027	$ 7,820	$ 2,209
Pediatric Asthma	116	2.19	$ 726,309	$ 6,261	$ 2,859
Chronic Obstructive Pulmonary Disease	243	3.83	$ 2,517,172	$ 10,359	$ 2,704
Dehydration	207	2.65	$ 1,231,870	$ 5,951	$ 2,244
Bacterial Pneumonia	441	4.25	$ 4,944,437	$ 11,212	$ 2,636
Urinary Tract Infection	150	3.50	$ 1,173,986	$ 7,827	$ 2,236
Perforated Appendix	33	6.12	$ 811,630	$ 24,595	$ 4,018
Pediatric Gastroenteritis	55	1.93	$ 175,738	$ 3,195	$ 1,658
Low Birth Weight Birth	365	19.96	$ 18,388,463	$ 50,379	$ 2,525
Total	**2,168**	**6.76**	**$ 38,803,867**	**$ 17,898**	**$ 2,647**

VII. Appendix B – Report Briefs Based on Tennessee Hospital Discharge Data

Contents

Hospital Discharge Data, 2002

From The University of Memphis
Methodist LeBonheur Center for Healthcare Economics

March 14, 2006

Potentially Avoidable Hospitalizations in Tennessee, 2002

by Cyril F. Chang, Ph.D.

Research suggests that hospitalizations for certain conditions called Ambulatory Care Sensitive Conditions (ACSCs) may be preventable.[1,2,3] These hospitalizations can be prevented when clinicians deliver timely and effective outpatient treatment to individuals who actively participate in their own care, follow a healthy life style, and engage in responsible personal behavior.[4] Nationally, nearly five million inpatient admissions to U.S. hospitals in 2000 involved treatment for one or more of these ACSCs, resulting in a total cost of more than $26.5 billion.[5] Thus, high rates of hospitalizations for these conditions present opportunities for improving health system effectiveness and efficiency in an environment of rising demand for scarce resources.

This report analyzes Tennessee hospitalization records for potentially avoidable admissions. These include specific ACSCs in three major diagnostic categories: (1) *chronic conditions* such as diabetes (including uncontrolled diabetes, short-term diabetes complications, long-term diabetes complications, and lower-extremity amputations among patients with diabetes), circulatory diseases (congestive heart failure, hypertension, and angina without procedure), and respiratory diseases (adult asthma, pediatric asthma, and chronic obstructive pulmonary disease); (2) *acute conditions* including dehydration, bacterial pneumonia, urinary tract infection, perforated appendix, and pediatric gastroenteritis; and (3) *birth outcomes* including low birth weight birth.[4] Selected summary results of the prevalence of ACSC hospitalizations for Tennessee are presented here.

Method: Tennessee law (Tennessee Code Annotated (TCA), Section 68-1-108) requires that every licensed hospital report all claims data found on the BU-92 Form to the Tennessee Department of Health. The Division of Health Statistics in the Office of Policy Planning and Assessment of the Department of Health has established a Hospital Discharge Data System (HDDS) to collect, compile, and disseminate patient-level discharge information since 1997.[6] The data presented in this report contain excerpts from the 2002 HDDS dataset. For better comparability, the data used are only from acute-care general hospitals, including general medical and surgical hospitals, women's or OB/GYN hospitals, and pediatric hospitals. Excluded are long-term care hospitals, psychiatric hospitals, rehabilitation hospitals, and other specialty hospitals. The data cover the period from January 1, 2002 through December 31 2002.

Acknowledgments

The author thanks the BlueCross BlueShield of Tennessee for partial financial support and acknowledges capable computer programming assistance from Rebecca Pope of the Department of Economics at The University of Memphis. The views expressed are those of the author and do not necessarily represent those of the funding agencies.

A critical first step in the analysis of the prevalence of potentially avoidable hospitalizations involves the identification of diseases or conditions for which timely and effective primary care can prevent the need for hospitalization. Lists of preventable admissions have been determined and reported by panels of experts.[1-3] Recently, the Agency for Healthcare Quality (AHRQ) asked researchers from the Evidence-Based Practice Center at the University of California San Francisco and Stanford University to review the literature and use validation tests to determine a narrow set of inpatient admissions with ACSC conditions. The results were reported in a recent AHRQ publication under the Prevention Quality Indicators (PQIs) project.[4]

For this report, we used the AHRQ definitions and combined the four diabetes-related ACSCs categories ("uncontrolled diabetes," "short-term diabetes complications," "long-term diabetes complications," and "lower-extremity amputations among patients with diabetes") into a single condition, Diabetes, thus reducing the number of ACSCs from 16 to 13. The specific definitions of the ACSCs and their corresponding ICD-9 CM Codes can be found in AHRQ Publication, *AHRQ Quality Indicators - Guide to Prevention Quality Indicators: Hospital Admission for Ambulatory Care Sensitive Conditions,* Pub. No. 02-RO203, November 24, 2004.

Results: In 2002, a total of 132,973 ACSC hospitalizations occurred in Tennessee (Table 1), representing about 16% of all inpatient discharges at acute-care hospitals. The leading ACSC was bacterial pneumonia, accounting for 31,722 (24% of total) ACSC hospitalizations, followed by congestive heart failure (25,969 or 19.5% of total), and chronic obstructive pulmonary disease (18,353 or 13.8% of total). Across all ACSCs, Tennesseans experienced a higher rate of hospitalizations than did the U.S., with Tennessee exceeding the U.S. by a large margin in congestive heart failure, hypertension, bacterial pneumonia, pediatric gastroenteritis, and low birth weight birth.

Table 2. Potentially Avoidable Hospitalizations in 2002 - TN and the U.S.

	Tennessee		U.S.
Primary Diagnosis	Total No. of Discharges	Discharge Rate[1]	Discharge Rate[1]
Diabetes	11,486	270.6	224.5
Congestive Heart Failure	25,969	610.7	457.7
Hypertension	2,753	64.7	44.4
Angina, without procedure	2,291	53.9	55.1
Adult Asthma	4,987	117.3	110.9
Pediatric Asthma	3,123	224.3	188.8
Chronic Obstructive Pulmonary Disease	18,353	325.1	248.6
Dehydration	11,012	195.1	139.9
Bacterial Pneumonia	31,722	562.0	349.7
Urinary Tract Infection	11,832	209.6	137.9
Perforated Appendix [a]	1,576	36.5	30.5
Pediatric Gastroenteritis	1,846	132.6	87.7
Low Birth Weight Birth [b]	6,023	8.0	5.9
Total	132,973		

[1] Rates are per 100,000 population. For Diabetes, CHF, hypertension, angina, and adult asthma the population is all persons 18 years and older. For pediatric conditions, the population is all persons 0 through 17 years. The rates for COPD, dehydration, bacterial pneumonia, and urinary tract infection the population is all state residents.

[a] The rate for perforated appendix is calculated per 100 admissions for appendicitis.

[b] The rate for low birth weight birth (less than 2500 grams) is calculated per 100 births.

Female patients were responsible for 77,289 (58.1% of total) hospitalizations for ACSCs, while males were responsible for the remaining 55,682 (41.9% of total). There appeared to be little gender difference in ACSC hospitalizations as a percentage of total hospitalizations in Tennessee in 2002.

Table 2 - Discharges for ACSCs by Gender, 2002

Gender	All Discharges	ACSC Discharges	Percent ACSC of Total
Female	504,982	77,289	15.3%
Male	338,881	55,682	16.4%
Unknown	19	2	10.5%
Total	843,882	132,973	15.8%

Table 3 summarizes ACSC hospitalizations by race. In 2002, Black and White Tennesseans reported 133,064 (16% of total) and 650,576 (77% of total) inpatient hospitalizations, respectively, for all conditions. Black patients appeared to have a slightly higher rate of ACSC hospitalizations than White patients, while Hispanics and other small racial groups, such as Asians, Native Americans, and Pacific Islanders, exhibited much lower rates than either the White or Black population subgroup.

Table 3 - Discharges for ACSCs by Race, 2002

Race	All Discharges	ACSC Discharges	Percent ACSC of Total
White	650,576	102,432	15.7%
Black	133,064	23,421	17.6%
Hispanic	7,505	615	8.2%
Other	12,929	1,966	15.2%
Unknown	39,808	4,539	11.4%
Total	843,882	132,973	15.8%

Table 4 reports ACSC hospitalizations by major payer group. There appeared to be substantial inter-group differences. Medicare led the proportion of ACSC hospitalizations, with 22.3% of its inpatient discharges being potentially preventable in 2002. In comparison, only 13.3% of hospitalizations paid by TennCare (Tennessee's managed-care Medicaid program) were for ACSCs while the same percentage for Commercial and BlueCross BlueShield plans were only 9.8%.

The Self Insured/Self Pay category includes mostly patients who reported that they had no insurance coverage at the time of admission and, therefore, can be considered as uninsured. About 12.8% of Self Insured/Self Pay patients' hospitalizations were for ACSCs. Finally, the "Other" category, which includes Champus (military) and Workers Compensation, reported a rate of hospitalizations for ACSC conditions of 10.2%, lower than the state average of about16%.

Table 4 - Discharges for ACSCs by Payer Group, 2002

Payer	All Discharges	ACSC Discharges	Percent ACSC of Total
Medicare	346,601	77,402	22.3%
TennCare	172,353	22,904	13.3%
Commercial and BC/BS	262,829	25,671	9.8%
Self Insured/Self Pay	26,169	3,353	12.8%
Other	21,337	2,168	10.2%
Unknown	14,593	1,475	10.1%
Total	843,882	132,973	15.8%

Discussion. In Tennessee, admissions for ACSC conditions comprised 16% of hospitalizations for all conditions in 2002. There appeared to be little gender difference in the percentage of ACSCs, and the same can also be said about the Black and White population subgroups. However, Medicare exhibited a much higher proportion of ACSC hospitalizations than the state average because of the aged population it serves, while TennCare accounted for a proportionately smaller share of ACSCs. The other insurance categories reported still lower percentages of ACSCs than the two major public-sector insurance programs.

Hospitalizations for ACSCs have been referred to as potentially avoidable hospitalizations. They are believed to be a reliable indicator of the access to and quality of the ambulatory care system that serves the general population. Thus, the higher prevalence of ACSCs in Tennessee adds urgency for improving the adequacy and quality of the primary care system that serves the general population. Similarly, the reported high rates of ACSCs among the Medicare population deserve further scrutiny by both federal authorities and state and local health care decision makers. The elimination of even a portion of these expensive hospitalizations should free substantial resources for other health care services and can even reduce the pressure on health care costs in a state that is struggling with many health care challenges.

References:

1. Billings, J., Zeitel, L., and Lukomnik, J., et al. 1993. Impact of socioeconomic status on hospital use in New York City. *Health Affairs* 12(1):162-173.

2. Pappas, G., Hadden, W. C., Kozak, L. J., and Fisher, G. F. 1997. Potentially avoidable hospitalizations: Inequalities in rates between U.S. socioeconomic groups. *American Journal of Public Health* 87: 811-816.

3. Bustein, J., Hanson, K., and Shea, S. 1998. Preventable hospitalizations and socioeconomic status. *Health Affairs* 17: 177-189.

4. Agency for Healthcare Research and Quality. 2004. *AHRQ Quality Indicators—Guide to Prevention Quality Indicators: Hospital Admission for Ambulatory Care Sensitive Conditions. Rockville, MD: Agency for Healthcare Research and Quality*. Revision 3. AHRQ Pub. No. 02-RO203. Revision 4 (November 24, 2004).

5. Kruzikas, D. T., Jiang, H. J., Remus, D., Barrett, M. L., Coffey, R. M., and Andrews, R. 2004. *Preventable Hospitalizations: A Window into Primary and Preventive Care, 2000*. Rockville,

MD: Agency for Healthcare Research and Quality. HCUP Fact Book No. 5; AHRQ Pub. No. 04-0056 (September 2004).

6. Tennessee Department of Health. Tennessee Hospital Discharge Data System. Nashville, Tennessee: Tennessee Department of Health, Health Statistics and Research, November 2002. http://www2.state.tn.us/health/statistics/PdfFiles/ HDDS.pdf

Dr. Cyril F. Chang
Professor of Economics and Director
Methodist LeBonheur Center for Healthcare Economics
Fogelman College of Business and Economics
The University of Memphis
Memphis, Tennessee 38152
Phone: 901-678-3565
Fax: 901-678-2685
E-mail: cchang@memphis.edu
http://healthecon.memphis.edu/

Hospital Discharge Data, 2002

From The University of Memphis
Methodist LeBonheur Center for Healthcare Economics

March 3, 2006

Tennessee Inpatient Discharges, 2002

by Cyril F. Chang, Ph.D.

This report summarizes hospital inpatient discharge data for patients treated in Tennessee's acute-care hospitals in 2002. Many of these patients are severely affected by acute illness and injuries and also expensive to treat. The analysis presented in this report focuses on the incidence and prevalence of leading acute and chronic conditions that require hospitalization. The results are useful for gauging the health status of the general population and the delivery of hospital services a state that is facing major health and health care challenges.

Method. Tennessee law (Tennessee Code Annotated (TCA)), Section 68-1-108 requires that every licensed hospital report all claims data found on the BU-92 Form to Tennessee Department of Health. The Division of Health Statistics in the Office of Policy Planning and Assessment of the Department of Health, has established a Hospital Discharge Data System (HDDS) to collect, compile, and disseminate the patient-level discharge information since 1997.[1] The data presented in this report are excerpts from the 2002 HDDS dataset.

The analysis includes inpatient discharge data from all acute-care general hospitals including general medical and surgical hospitals, women's or OB/GYN hospitals, and pediatric hospitals. Excluded are long-term care hospitals, psychiatric hospitals, rehabilitation hospitals, and other specialty hospitals. The data cover the period form January 1, 2002, through December 31, 2002.

The analysis uses data on patients' gender and racial/ethnic characteristics, and principal diagnosis code (PDC). Diagnoses are coded in the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM), and are grouped in accordance with published national hospital discharge data.[2] Population-based utilization rates for leading PDC groups are computed using 2000 Census data for Tennessee.[3] Comparative rates for the US for 2002 are provided by the Centers for Disease Control and Prevention.[2]

Acknowledgments

The author thanks the BlueCross BlueShield of Tennessee Health Foundation for partial financial support and acknowledges capable computer programming assistance from Rebecca Pope of the Department of Economics at The University of Memphis. The views expressed are those of the author's and they do not necessarily represent those of the funding agencies.

Results. In 2002, the 135 general acute-care hospitals in Tennessee reported a total of 843,882 inpatient discharges with an average length of stay (LOS) of 4.8 days, a rate comparable to the US average of 4.9 days (See Table 1). Female patients were responsible for 504.982 or 59.8% of the total inpatient discharges while males accounted for the remaining 338,881 or 40.2%. Male patients' average LOS was slightly higher than that of female patients in Tennessee as well as in the United States. The data in Table 1 include 19 patient records with missing gender information. Forty four (44) cases were excludes from the total count of inpatient discharges because of having a reported long LOS of greater than 365 days.

Table 1
Tennessee Inpatient Discharges

	No. of Discharges	Percent	Average LOS	
			TN	US
All	843,882	100.0%	4.8	4.9
Sex				
Female	504,982	59.8%	4.6	4.6
Male	338,881	40.2%	5.1	5.3
Unknown	19	0.0%	9.4	

The inpatient discharge rate per 10,000 population was 1,485.7, a rate that was significantly (26%) higher than the discharge rate for the United States (See Table 2). Following the national pattern, heart diseases were the most common principal diagnosis code (PDC), followed by deliveries of infants. For both PDCs, the Tennessee's rates were18% and 7%, respectively, higher than the corresponding national rates.

The next two leading PDCs in Tennessee were pneumonia and psychoses and they were both substantially higher (40% and 30%, respectively) than the national rates. Tennesseans experienced lower (11% lower) rate of malignant neoplasms while the rate of cerebrovascular diseases was about the same as the corresponding national rate. Among the next six PDCs, Tennesseans reported higher rates than the nation as a whole except for asthma which, at a rate of 14.6 per 10,000 population, was 13% lower than the national rate. In contrast, Tennesseans experienced 69% high rate of hospitalization for chronic bronchitis than the nation as a whole.

Table 2
Hospital Inpatient Discharges with Most Common First-Listed Diagnoses,
per 10,000 Population, Tennessee and U.S., 2002

First-Listed Diagnosis (ICD-9)*	Rate per 10,000 population		Tennessee as a % of U.S.
	Tennessee	U.S.	
All Conditions	1,485.7	1,174.6	126%
Heart diseases	183.2	154.8	118%
Females with delivery**	147.5	137.6	107%
Pneumonia	64.1	45.7	140%
Psychoses	54.7	59.4	130%
Malignant Neoplasms	52.9	42.1	89%
Cerebrovascular diseases	42.8	32.8	102%
Fractures, all sites	41.2	34.7	119%
Chronic bronchitis	30.6	18.1	169%
Diabetes	21.1	20.1	105%
Osteoarthrosis and allied disorders	20.0	19.8	101%
Benign neoplasms	16.4	14.9	110%
Asthma	14.6	16.8	87%

*The 12 leading first-listed diagnoses represented 46.4% of all discharges in 2002

**Females with delivery includes Normal delivery, Females with delivery, and liveborn

Table 3 reports gender differences in inpatient discharges rates for Tennessee and the United States. Males in Tennessee and the U.S. experienced, respectively, 40% and 46% higher rates hospitalization than females in 2002. Among the leading PDCs, females experienced a higher rate of hospitalization than males in every major diagnostic category except the leading PDC, Heart Conditions. When Tennessee is compared with the U.S., male Tennesseans' 1,231.1 inpatient discharges per 10,000 male population were 29% higher than the corresponding national rate while female Tennesseans' discharge rate exceeded the national rate slightly less, by 24%. Tennessee's delivery rate was also higher than the national rate (286.4 vs. 269.7).

Table 3
Hospital Inpatient Discharges with Most Common First-Listed Diagnoses,
per 10,000 Population by Sex, Tennessee and U.S., 2002

First-Listed Diagnosis (ICD-9)	Male		Female	
	Tennessee	U.S.	Tennessee	U.S.
All Conditions	1,231.1	952.3	1,725.3	1,388.0
Heart diseases	196.8	164.9	170.4	145.2
Females with delivery*			286.4	269.7
Pneumonia	60.3	44.0	67.7	47.3
Psychoses	46.6	58.1	62.4	60.5
Malignant Neoplasms	53.3	41.2	52.6	42.9
Cerebrovascular diseases	38.2	30.7	47.3	34.8
Fractures, all sites	36.3	30.8	45.8	38.4
Chronic bronchitis	27.0	16.3	33.9	19.8
Diabetes	20.7	20.1	21.5	20.1
Osteoarthrosis and allied disorders	14.9	15.7	24.8	23.7
Benign neoplasms	4.2	3.5	27.9	25.8
Asthma	11.5	13.9	17.4	19.7

*Females with delivery includes Normal delivery, Females with delivery, and liveborn

Table 4 reports racial differences in inpatient discharge in 2002. For all conditions, black and white Tennesseans experienced about the same rates of inpatient hospitalization while Hispanics reported much lower rates. Asians and other smaller racial groups, such as American Indians, Alaska Natives, and Pacific Islanders, who were groups under the "Other" racial category reported even lower rate at 281.4 discharges per 10,000 population, a rate which was 81% lower than the state average rate for all conditions.

Between black and white population subgroups, whites led in the rate of inpatient hospitalization in most of the PDCs while black led in delivery, diabetes, benign neoplasms and asthma. Hispanics had lower rates of inpatient hospitalization than both blacks and whites as noted earlier. But they had substantially higher delivery rate (67% higher) than the statewide average rate for delivery.

Table 4
Hospital Inpatient Discharges with Most Common First-Listed Diagnoses,
per 10,000 Population by Race/Ethnicity, 2002

	Race/Ethnicity				
First-Listed Diagnosis (ICD-9)	White	Black	Hispanic	Other	Total
All conditions	1,430.0	1,455.5	823.3	281.4	1,485.7
Heart diseases	184.9	149.1	31.7	13.9	183.2
Females with delivery*	123.2	183.7	246.8	78.7	147.5
Pneumonia	66.8	46.2	14.7	7.7	64.1
Psychoses	57.0	44.3	11.8	6.8	54.7
Malignant Neoplasms	52.8	44.8	14.3	6.1	53.0
Cerebrovascular diseases	42.4	39.7	7.0	5.1	42.8
Fractures, all sites	43.2	25.8	18.2	3.7	41.2
Chronic bronchitis	33.5	14.7	2.0	2.0	30.6
Diabetes	17.6	37.0	5.8	2.3	21.1
Osteoarthrosis and allied disorders	21.4	11.6	6.8	1.7	20.0
Benign neoplasms	13.3	27.6	7.5	3.0	16.4
Asthma	11.7	26.8	5.9	2.8	14.6

*Females with delivery includes Normal delivery, Females with delivery, and liveborn

Discussion. This brief report presents data describing utilization patterns of inpatient care in Tennessee's general acute-care hospitals during the year 2002. The leading diagnoses analyzed such as heart conditions, pneumonia, psychoses, neoplasms, and cerebrovascular diseases reflect the major illnesses and diseases that affect the health of the state's general population.

The analysis reveals that patients in Tennessee's hospitals reported, on average, 26 percent higher rate of inpatient hospitalization than the nation as a whole. This by itself does not necessarily suggest excessive use of the expensive inpatient care because utilization has long been understood to be the result of the interaction of many interlocking and cross-cutting supply and demand factors. However, further in-depth analysis is needed to explore the implications of this reported higher utilization rates experienced by Tennesseans on the health of the general population and the costs of providing health care.

The report further reveals substantially gender and racial differences in the patterns of utilization of inpatient care. The patient-level hospital discharge data used in this analysis contains information on a wide range of variables including primary and secondary diagnoses, utilization of services, comorbidity conditions, procedure performed, and hospital charges. They can be used for public health surveillance and evaluation and for improving the efficiency and productivity of the health delivery system.

References:

1. Tennessee Department of Health. Tennessee Hospital Discharge Data System. Nashville, Tennessee: Tennessee Department of Health, Health Statistics and Research, November 2002. http://www2.state.tn.us/health/statistics/PdfFiles/ HDDS.pdf

2. DeFrances CJ and Hall, MJ. 2002 National Hospital Discharge Survey. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, May 21, 2004.

3. U.S. Census Bureau. American Community Survey Profile 2002. http://www.census.gov/acs/www/Products/Profiles/Single/2002/ACS/Tabular/040/04000US471.htm

Dr. Cyril F. Chang
Professor of Economics and Director
Methodist LeBonheur Center for Healthcare Economics
Fogelman College of Business and Economics
The University of Memphis
Memphis, Tennessee 38152
Phone: 901-678-3565
Fax: 901-678-2685
E-mail: cchang@memphis.edu
http://healthecon.memphis.edu/