PREVENTABLE HOSPITALIZATIONS AMONG SENIORS IN NEW JERSEY, 2002

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Abstract

This study examines hospital admissions among older adults in New Jersey for a selected group of chronic and acute conditions that have been characterized as "potentially preventable" by the Agency for Healthcare Research and Quality (AHRQ). This group of diagnoses includes diabetes-related, respiratory, circulatory, and several acute conditions which are considered to be sensitive to primary and preventive care as well as patient behavior. We used the New Jersey State Inpatient Database for the years 1998 through 2002 to analyze these admissions. There were approximately 85,000 admissions each year between 1998-2002 for "potentially preventable" diagnoses in New Jersey for the population aged 65 years and older, with an average length of stay of slightly over seven days. Hospitalization rates for these selected conditions were comparable in New Jersey and the nation as a whole, although length of stay was higher in New Jersey. Overall hospital admission rates for these diagnoses remained stable between 1998 and 2002. However, while admissions rates for circulatory diseases declined, rates for selected acute conditions increased. Significant racial and ethnic differences were found to exist, with hospital admission rates highest among Hispanics and higher in non-Hispanic blacks as compared with non-Hispanic whites.

Introduction

Certain medical conditions, such as complications from diabetes, are considered to be more sensitive to primary care and patient behavior than are others - for example, acute appendicitis. Hospitalizations from such ambulatory care sensitive (ACS) conditions are considered to be at least potentially preventable, and are influenced by a variety of complex factors, including the supply and quality of primary and preventive care, and patient education and behavior. The AHRQ has identified a list of such conditions, including both chronic and acute causes, and hospitalization rates for these conditions are widely interpreted as one indicator of the quality of preventive care (Kruzikas et al., 2004).[1] Preventable hospitalizations are an important

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[1] For convenience and in keeping with standard practice, we will refer to the AHRQ Prevention Quality Indicators list as "preventable" hospitalizations, although we acknowledge these hospitalizations are by no means always preventable.

component of medical costs overall, particularly among racial and ethnic minorities, low income populations, and the elderly.

Rates of preventable hospitalizations are highest among the elderly, and are estimated to constitute nearly 20 percent of the Medicare costs (Culler et al., 1998). In New Jersey, preventable hospitalizations account for more than 20 percent of all hospitalizations of older adults. In 2002, there were approximately 85,500 preventable hospitalizations among older adults in New Jersey, resulting in roughly 625,000 hospital days. Reducing unnecessary hospitalizations among older adults is valuable for health as well as financial reasons, since the acquisition of secondary infections while hospitalized is not uncommon among this population. Yet while primary care and patient behavior are important in preventing hospitalizations, it is also true that depression, dementia, and the presence of multiple chronic conditions greatly influence the likelihood of hospitalization for "preventable" conditions among older adults (Bynum et al., 2004; Himelhoch et al., 2004; Wolff et al., 2002). The goal of this study is to examine preventable hospital admissions among older adults in New Jersey between 1998 and 2002. We describe patterns of preventable hospitalization by age, gender, race, and ethnicity, and compare New Jersey to the U.S. as a whole.

Data

Data on hospital discharges come from the New Jersey State Inpatient Database (SID), 1998-2002 and the Nationwide Inpatient Sample (NIS), 2002. New Jersey SID is derived from the Uniform Billing (UB92) data collected monthly by the New Jersey Department of Health and Senior Services (NJDHSS). The UB data contain the universe of New Jersey's hospital inpatient discharge records. In 2002, the total number of inpatient hospital discharges in the state was 1,153,654 (AHRQ, 2005). NJDHSS provides the UB data to AHRQ, which sponsors Healthcare Cost and Utilization Project (HCUP), a Federal-State-Industry partnership to build a multi-State health care data system. In 2002, 36 States contributed data files to build the uniform HCUP database, based upon which the 2002 NIS was drawn. The NIS data are weighted to obtain estimates representing the total number of inpatient hospital discharges in the United States, more than thirty-seven million in 2002 (Merrill and Elixhauser, 2005).

Using a software tool developed and freely distributed by AHRQ, a set of AHRQ Prevention Quality Indicators may be created (AHRQ Quality Indicators, 2001b). Prevention Quality Indicators are coded from ICD-9-CM Codes. They measure hospital admissions that are potentially preventable, at least in part, through better access to high-quality outpatient care. Details on the development of Prevention Quality Indicators can be found in "Guide to Prevention Quality Indicators: Hospital Admission for Ambulatory Care Sensitive Conditions" (AHRQ Quality Indicators, 2001a). The list of potentially preventable hospitalizations is organized into four categories – three chronic (diabetes-related, respiratory, and circulatory) and one acute. We used 12 diagnoses from this list that are appropriate to the population aged 65 years and older.

Results

National comparison
We calculated five-year hospital admission rates for these 12 potentially preventable conditions in New Jersey between 1998 and 2002 for the population aged 65 years and over. These rates were age-adjusted to the 2000 U.S. standard population using the direct method of age-

adjustment. Of the 12 diagnoses, the major causes of admissions are congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), and bacterial pneumonia. As seen in both Figure 1 and Table 1, overall hospitalization rates and rates for preventable conditions are similar in New Jersey and the United States as a whole for the population aged 65 and over. However, within major categories there are some differences. For circulatory conditions, in particular congestive heart failure, hospital admission rates are higher in New Jersey, as are rates for diabetes-related conditions. On the other hand, although hospitalization rates for acute conditions have increased between 1998 and 2002 (see Table 2), New Jersey rates are slightly lower than the national average. Hospital admission rates for respiratory conditions are also slightly lower in New Jersey. In general, length of stay for hospitalizations is longer in New Jersey than for the nation as a whole, and this is true with respect to preventable hospitalizations among the elderly, where the average length of stay is 7.3 days in New Jersey, as compared with 5.4 days for the nation as a whole.

Figure 1. Age-adjusted preventable hospital admission rates for people aged 65+ years, New Jersey and the U. S., 2002
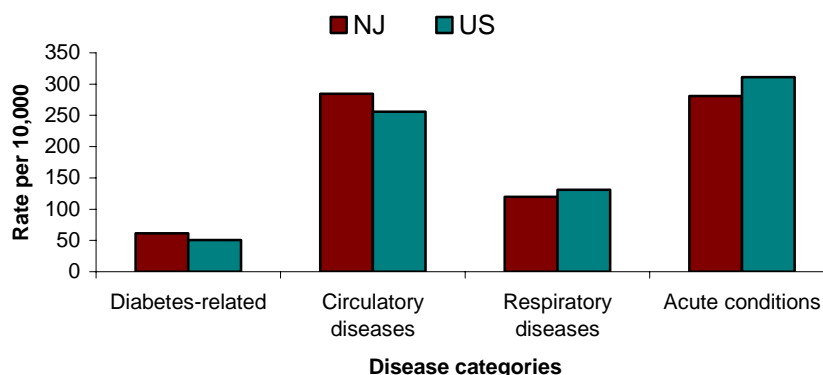

Table 1. Age-adjusted hospitalization rates (per 10,000 population) and average length of stay (LOS) in days for people aged 65+ years, New Jersey and the United States, 2002

	Overall Hospitalization		Preventable Hospitalization	
	Rate	LOS	Rate	LOS
New Jersey	3,624.8	6.7	746.2	7.3
U.S.	3,680.6	5.8	748.7	5.4

Change over time

Nationally, rates of preventable hospitalization have declined substantially for certain diagnoses. For example, between 1994 and 2000, hospitalizations for treatment of angina without a procedure dropped more than 70 percent, while hospitalization for uncontrolled diabetes without complications declined nearly 30 percent (Kruzikas et al., 2004). Yet hospital admission rates for several conditions have increased during this time period, most notably COPD, which rose by 20 percent, hypertension, which increased by 13 percent, and bacterial pneumonia, which rose nearly 10 percent between 1994 and 2000 (Kruzikas et al., 2004).

As can be seen in Table 2, overall rates of preventable hospitalizations remained fairly constant in New Jersey between 1998 and 2002. Hospital admission rates for diabetes-related conditions changed relatively little. However, rates for respiratory conditions (COPD and asthma) increased somewhat, from 111.3 to 119.5 (per 10,000 population) during this period. Additionally, the hospital admission rate for asthma increased between 2000 and 2002. Hospitalization rates for circulatory conditions declined more than any other category. Hospital admission rates for angina, in particular, declined by nearly 50 percent, consistent with national trends. Among the acute conditions listed, admissions for dehydration increased by 16 percent, admissions for bacterial pneumonia increased by 10 percent, and admissions for urinary tract infection increased by 19 percent. As shown in Figure 2, increases in hospital admission rates for acute conditions and respiratory conditions offset declines in admissions for circulatory conditions. It can also be seen that acute and circulatory conditions account for most preventable hospitalizations for this age group.

Table 2. Five-year age-adjusted rates of preventable hospital admissions by conditions for New Jersey residents aged 65+ years, 1998-2002*

|	1998	1999	2000	2001	2002
	Rate per 10,000 population				
Diabetes-related [a]	*60.7*	*60.4*	*60.6*	*63.7*	*61.2*
Short-term complications of diabetes	5.4	5.7	5.4	6.1	5.5
Long-term complications of diabetes	40.8	41.2	42.2	44.6	43.2
Uncontrolled diabetes without complication	8.0	7.9	7.7	7.3	7.5
Lower extremity amputations	15.2	14.1	13.4	14.3	13.0
Circulatory diseases [b]	*324.6*	*309.7*	*308.7*	*296.5*	*284.4*
Hypertension	13.8	13.8	14.0	13.6	14.1
Congestive heart failure	270.5	265.5	269.7	260.2	249.7
Angina without a procedure	40.3	30.4	25.0	22.7	20.6
Respiratory diseases	*111.3*	*122.2*	*116.4*	*114.5*	*119.5*
COPD	95.6	106.7	101.2	97.3	99.3
Adult asthma	15.7	15.5	15.2	17.2	20.2
Acute conditions	*248.5*	*282.3*	*280.1*	*269.4*	*281.1*
Dehydration	59.5	66.9	66.2	67.7	69.2
Bacterial pneumonia	138.8	165.4	161.9	145.6	152.2
Urinary tract infection	50.2	50.0	52.0	56.1	59.7
Grand total	*745.1*	*774.6*	*765.8*	*744.1*	*746.2*

Note: Lower extremity amputation—long-term circulatory problems caused by diabetes can lead to gangrene and necrosis of the muscle and skin in the legs; often, these complications will lead to the amputation of the feet and/or legs.

*All admissions are based on principal diagnosis except for lower extremity amputations, for which counts are included in the numerator if the condition is indicated in any diagnosis field.

[a] ICD-9-CM Codes: Short-term complications of diabetes include diabetic ketoacidosis (250.1), hyperosmolarity (250.2), and coma (250.3); Long-term complications of diabetes include renal (250.4), eye (250.5), neurological (250.6), circulatory (250.7), or complications not otherwise specified (250.8-250.9); Uncontrolled diabetes without complication (250.02, 250.03); Lower extremity amputation includes ICD-9-CM procedure codes 84.1, diagnosis codes for diabetes (250), and excludes ICD-9-CM diagnosis codes associated with trauma (895.0, 895.1, 896.0-896.3, 897.0-897.7).

[b] For ICD-9-CM Codes for the circulatory, respiratory, and acute conditions, refer to Appendix A in the Guide to Prevention Quality Indicators: Hospital Admission for Ambulatory Care Sensitive Conditions" (AHRQ Quality Indicators, 2001a).

Figure 2. Age-adjusted preventable hospital admission rates for patients aged 65+ years, New Jersey, 1998-2002
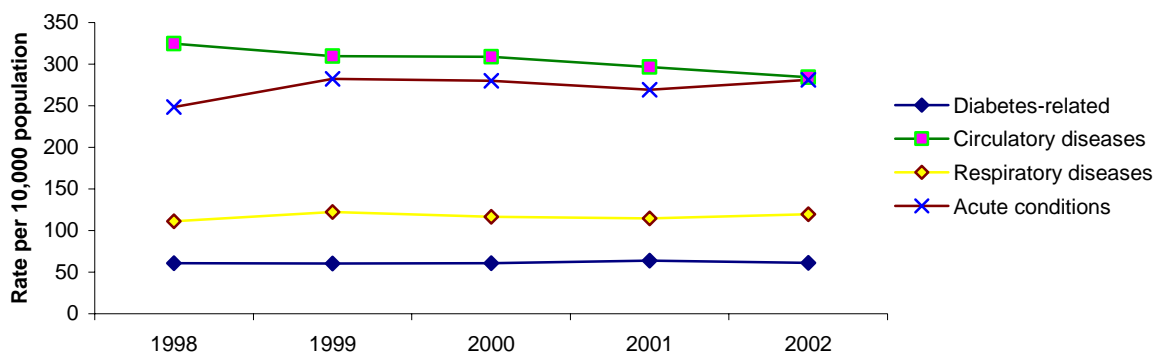
Race and ethnicity

As can be seen in Figure 3 and Table 3, there are significant racial and ethnic differences in rates of preventable hospitalizations among older adults. In particular, hospitalization rates are considerably higher for Hispanics and non-Hispanic blacks than for non-Hispanic whites. Admissions rates for Hispanics are highest for every major category. Overall, hospitalization rates among Hispanics are more than twice as high as those for whites. With the exception of diabetes-related conditions, hospital admission rates among Hispanics are also significantly higher than are those for blacks. For admissions for short and long term complications of diabetes, we can see that blacks and Hispanics have very similar rates, which are more than three times the rates for whites. This is also the case for lower extremity amputations, where blacks have the highest rate, but the difference between blacks and Hispanics is modest. However, in the case of uncontrolled diabetes without complications, the rate for Hispanics is approximately five times as high as that for whites, and is considerably higher than the rate for blacks. For circulatory diseases, blacks and Hispanics are evenly matched and approximately three times as likely as older white adults to be admitted for hypertension. But for congestive heart failure and angina without a procedure, which are both major causes of admission, it can be seen that the gap between Hispanics and blacks widens considerably, and Hispanics have by far the highest rates.

Figure 3. Age-adjusted preventable hospital admission rates for people aged 65+ years, New Jersey, 2002
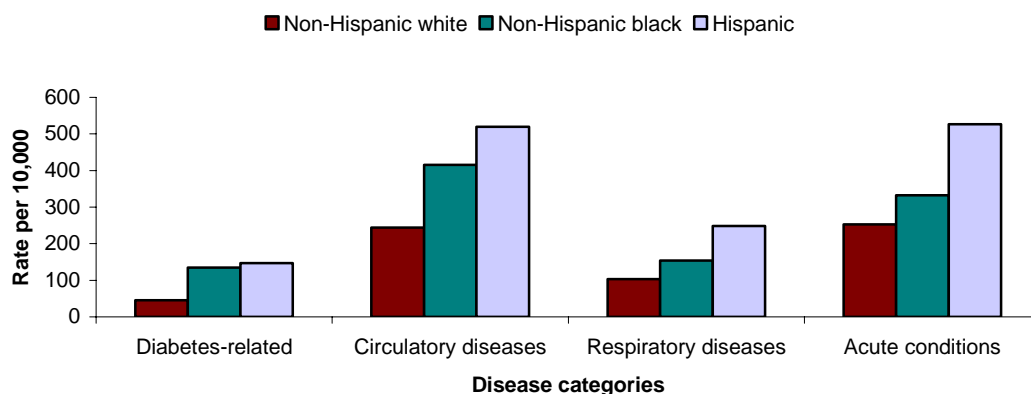

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Table 3. Twelve preventable hospital admission conditions for New Jersey white, black, and Hispanic residents aged 65+ years, 2002*

Diagnosis Category	Non-Hispanic Whites		Non-Hispanic Blacks		Hispanics	
	Discharge	Age-adjusted rate [a]	Discharge	Age-adjusted rate [a]	Discharge	Age-adjusted rate [a]
Diabetes-related	**4,250**	**45.6**	**1,329**	**134.7**	**909**	**147.2**
Short-term complications of diabetes	370	3.9	139	14.5	86	14.7
Long-term complications of diabetes	3,056	32.9	925	93.9	598	96.9
Uncontrolled diabetes without complication	471	5.0	161	15.6	161	25.4
Lower extremity amputations	919	10.0	282	28.5	171	26.9
Circulatory diseases	**23,603**	**243.7**	**4,011**	**415.4**	**3,014**	**519.4**
Hypertension	982	10.3	301	30.7	202	33.3
Congestive heart failure	21,035	216.5	3,412	355.1	2,541	442.5
Angina without a procedure	1,586	16.9	298	29.6	271	43.6
Respiratory diseases	**9,705**	**103.5**	**1,510**	**154.0**	**1,489**	**248.5**
COPD	8,387	89.4	1,146	118.1	1,078	182.8
Adult asthma	1,318	14.1	364	36.9	411	65.7
Acute conditions	**24,702**	**252.7**	**3,046**	**332.1**	**2,936**	**526.7**
Dehydration	5,889	59.8	977	108.6	753	137.8
Bacterial pneumonia	13,542	139.2	1,464	156.5	1,563	276.0
Urinary tract infection	5,271	53.7	605	67	620	112.9
Grand total	**62,260**	**645.5**	**9,896**	**1,036.2**	**8,348**	**1,441.8**

* All admissions are based on principal diagnosis except for lower extremity amputations, for which counts are included in the numerator if the condition is indicated in any diagnosis field.
[a] Rate per 10,000 population = hospital discharges/NJ population in the same age and racial and ethnic group

This pattern is seen again in the category of respiratory disease, where Hispanics have very high rates of COPD and asthma, relative to both whites and blacks. In the case of acute conditions, hospitalization rates for dehydration are highest among Hispanics, but rates for blacks and Hispanics are closer to each other than they are to rates for whites. For the other two conditions, bacterial pneumonia and urinary tract infections, however, the reverse is true. While rates for blacks are higher than those for whites, rates for Hispanics are considerably higher, and are close to twice as high as those for blacks.

While Hispanics have the highest hospital admission rates overall, they tend to have the lowest average length of stay, as can be seen in Figure 4. In fact, for every major category with the exception of acute conditions (in which there is a tie), Hispanics have the lowest average length of stay, closely followed by whites. Average length of stay is considerably longer for blacks, particularly in the case of acute conditions.

Figure 4. Average length of stay by preventable hospital admissions and racial/ethnic groups for people aged 65+ years, New Jersey, 2002
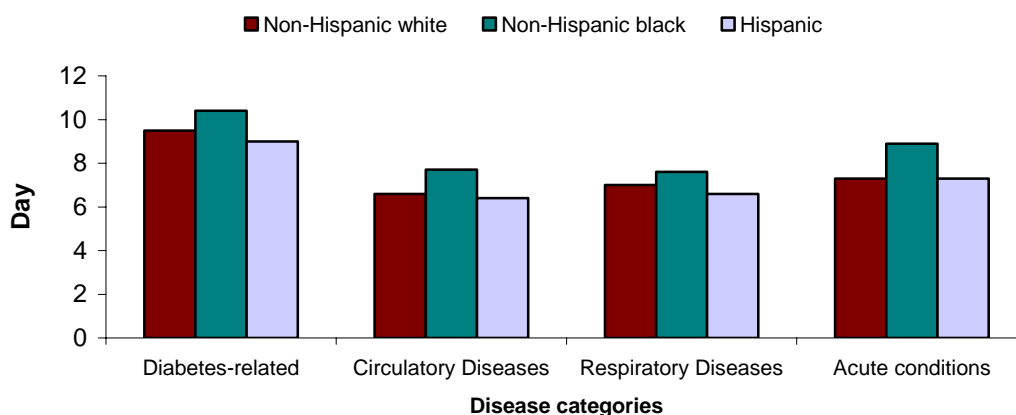

Table 4. Rates (per 10,000 population) by age groups and sex for 12 preventable hospital admission conditions for New Jersey residents aged 65+ years, 2002 [a]

Diagnosis Category	65-74		75-84		85+	
	Male	Female	Male	Female	Male	Female
Diabetes-related	**65.7**	**47.3**	**82.3**	**61.9**	**67.3**	**58.9**
Short-term complications of diabetes	5.3	3.8	5.8	7.6	5.0	7.3
Long-term complications of diabetes	47.4	33.2	59.1	41.8	50.3	40.3
Uncontrolled diabetes without complication	6.4	7.3	8.6	8.3	7.5	7.6
Lower extremity amputations	18.4	8.3	21.1	10.2	14.0	7.9
Circulatory Diseases	**191.2**	**157.7**	**381.1**	**318.2**	**589.5**	**595**
Hypertension	8.9	13	10.2	20.7	11.3	22.9
Congestive heart failure	164.8	125.2	348.8	275.1	553.4	547.9
Angina without a procedure	17.5	19.5	22.1	22.4	24.8	24.2
Respiratory Diseases	**91.4**	**102.5**	**145.8**	**139.9**	**167.9**	**137.9**
COPD	79.8	78.9	130.7	114.0	151.0	110.8
Adult asthma	11.6	23.6	15.1	25.9	16.9	27.1
Acute conditions	**150.3**	**129.3**	**365.9**	**311.3**	**779.2**	**721.2**
Dehydration	31.0	29.5	82.2	80.0	195.1	203.7
Bacterial pneumonia	93.9	71.6	216.7	156.5	447.5	341.8
Urinary tract infection	25.4	28.2	67.0	74.8	136.6	175.7
Grand total	**498.6**	**436.8**	**975.1**	**831.3**	**1,603.9**	**1,513**

[a] Rate per 10,000 population = hospital discharges/NJ population in the same age and sex groups; All admissions are based on principal diagnosis except for lower extremity amputations, for which counts are included in the numerator if the condition is indicated in any diagnosis field.

Age

Not surprisingly, for most categories the age pattern in hospital admission rates is very sharp. One exception is for diabetes-related admissions, where admission rates peak in the age group 65-74 years. For other diagnoses, there are dramatic increases in hospitalization rates at older ages, for both males and females. This can be seen in Table 4. For circulatory and respiratory disease, the increase between ages 65-74 years and 75-84 years is the sharpest, but in the

case of acute conditions, the age pattern remains fairly consistent through the age range, with rates approximately doubling with each age group. Hospital admission rates for the acute category surpass those for the circulatory category in the oldest age group, making this the leading category of preventable hospitalizations. Length of stay varies very little by age, as the overall average length of stay increases from only 7.1 to 7.4 days between ages 65-74 years and 85 years and over, and the age pattern differs little within diagnostic categories.

Gender

Figures 5a – 5c show hospital admission rates by age and sex groups for 11 of the 12 diagnoses. (The rates for CHF were not graphed in Figure 5b because the rates are so much higher than those for the other conditions.) Considering the significant sex differences in mortality at older ages, differences in admission rates are relatively modest. In the case of diabetes-related admissions, male admission rates are higher for long-term complications and lower extremity amputations. However male and female admission rates are relatively similar for uncontrolled diabetes without complications, and female rates are actually higher for admissions for short-term complications. With regard to circulatory and respiratory conditions, female rates are higher than male rates for asthma and hypertension, and for angina, for those aged 65-74 years. However, male rates are higher for COPD and CHF, both of which are major causes for admission. Among the acute conditions listed, females have higher admission rates for urinary tract infections, and lower rates for bacterial pneumonia.

Figure 5a. Hospital admissions for diabetes-related conditions by age and sex groups, New Jersey, 2002
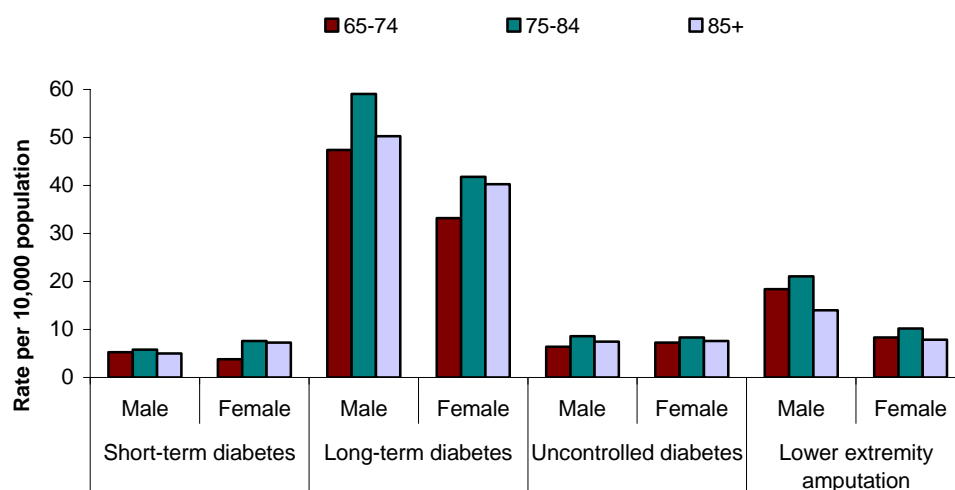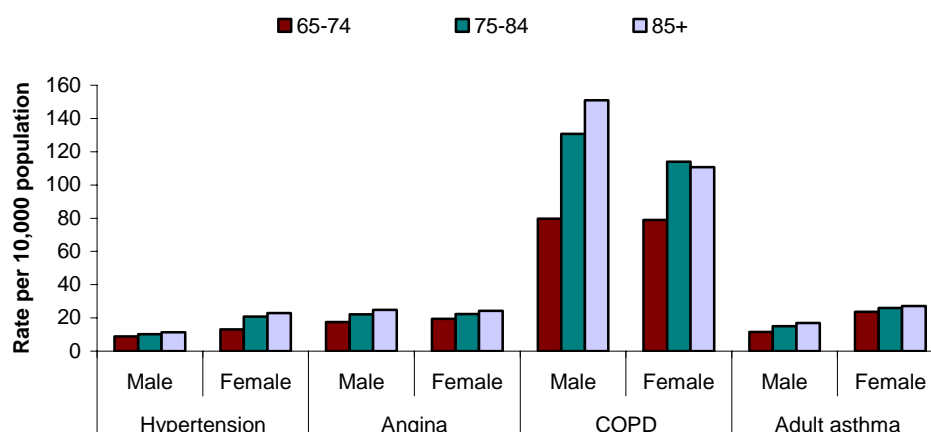
Figure 5b. Hospital admissions for circulatory and respiratory conditions by age and sex groups, New Jersey, 2002*

* CHF was excluded because of its high rates compared with others. Refer to Table 4 for CHF rates by age and sex. The rates for CHF increase by age. The rates are much higher for men than women aged between 65-84 years.

Figure 5c. Hospital admissions for acute conditions by age and sex groups, New Jersey, 2002
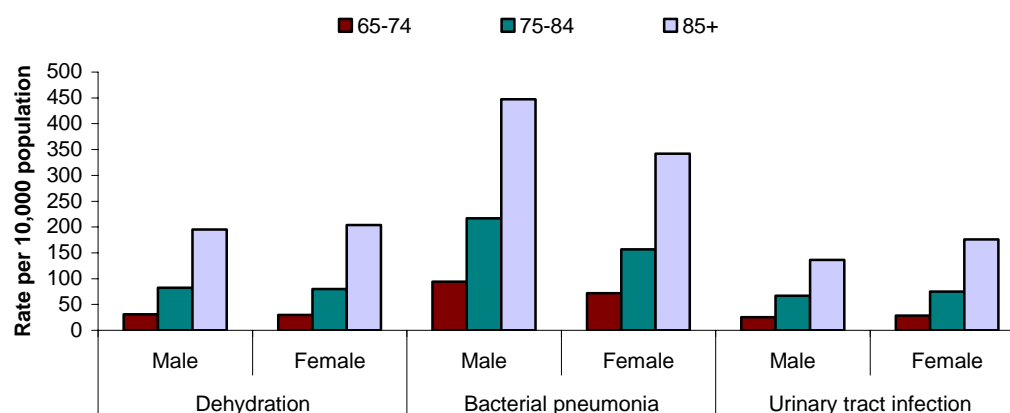
Discussion

There is an enormous amount of interest in reducing preventable hospitalizations overall, and particularly in reducing racial and ethnic disparities in hospitalization rates for these conditions. There are many factors that affect rates of preventable hospitalizations. The most fundamental of these may be the population prevalence of the diseases linked to these hospitalizations. Yet this group of hospitalizations is categorized as "potentially preventable" because primary care as well as patient behavior are believed to affect the extent to which these conditions can be managed in an outpatient setting. Barriers to care such as distance and supply of providers have been considered as potential influences on preventable hospitalization rates, as have socioeconomic factors such as income, educational attainment, and insurance status. The presence of co-morbidities and physical limitations is also significant. A recent study of a

national sample of Medicare beneficiaries found that extreme age, physical limitations, black race, and residence affected hospitalization rates for preventable conditions (Culler et al., 1998).

Studies have found that insurance status is also significant, even after controlling for disease prevalence. In the early days of health maintenance organizations (HMOs), for example, many theorized that managed care would provide better preventive care relative to traditional fee-for-service providers. Studies of the relationship between HMO penetration and hospitalization rates for ACS conditions have shown a modest but statistically significant effect (Weissman et al., 1992). Among older adults, the vast majority of whom are covered by Medicare, insurance issues may not be as important. While nearly all New Jersey seniors receive Medicare, and only approximately 15 percent belong to an HMO, there are other sources of variation in coverage that may be relevant. One national study which examined both hospitalization and Medicare outpatient data found that older adults who received Medicaid as well as Medicare had higher rates of ACS hospitalizations, and that those with private supplemental insurance had lower rates. This difference may be indicative of differences in health status, quality of or access to primary care, or patient behaviors that vary by socioeconomic status among the population of older adults (Laditka and Laditka, 2004). The importance of prescription drugs in managing many chronic conditions also suggests that the ability to pay for medication is another potentially significant component of avoiding preventable hospitalizations (Kozak et al., 2001).

In the case of an older population, other factors, particularly living arrangements and marital status, might also play a major role in the ability to manage a chronic condition or avoid developing an acute condition such as dehydration (Williams, 2004). One study of readmissions for congestive heart failure found that factors such as diet, non-adherence with medications, and lack of a social support system were important factors that influenced the rate of hospitalizations considered preventable (Vinson et al., 1991).

The large racial and ethnic disparities observed in rates of preventable hospitalizations among older New Jerseyans reflect in part racial and ethnic differences in prevalence of the underlying chronic conditions. However, differences in disease prevalence cannot alone account for the extremely high rates of preventable hospitalization, particularly among Hispanics. Race and ethnicity are highly correlated with socioeconomic status, which is a known determinant of rates of ACS admissions (Blustein et al., 1998). Blacks and particularly Hispanics are more likely to be uninsured, which may affect both access to care and the quality of care received. However, one study found that even after controlling for insurance status, Hispanic and non-Hispanic black older patients were still more likely to be hospitalized for preventable conditions than were white patients, suggesting that other factors, perhaps related to quality of care or patient education, also contribute to unequal health outcomes among racial and ethnic groups (Gaskin and Hoffman, 2000; Institute of Medicine, 2003). Differences in preventive behavior may also play a role in explaining the elevated hospital admission rates found among older Hispanics. For most preventive behaviors associated with diabetes care, such as eye exams and foot care, Hispanics report relatively lower levels of preventive behaviors, which may explain their higher rates of admission for conditions such as uncontrolled diabetes (NJBRFS, 2003).

There are a wide array of medical, economic, and social factors that affect the rate of preventable hospitalizations. In the case of a senior population, issues such as co-morbidities, overall frailty, and living arrangements are also particularly important. Some share of preventable hospitalizations among seniors can be avoided through improvements in the primary care system, patient education, and perhaps improvements in social support networks. In particular, these results suggest that there are racial and ethnic differences in the health-related quality of life among older adults that should be addressed.

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