

# Increasing Rates of Emergency Department Visits for Elderly Patients in the United States, 1993 to 2003

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**Study objective:** In 2005, the Centers for Disease Control and Prevention reported increasing emergency department (ED) visit rates per 100 people. The greatest increase in visit rate was among individuals 65 years and older. Given that older ED visitors have longer lengths of stay in the ED, are more likely to be admitted, and compose a growing proportion of the American population, this finding could have a significant negative effect on ED crowding. The first step toward addressing this issue is a better understanding of the nature of these visits.

**Methods:** We performed trend analysis for persons aged 65 years and older using 1993 to 2003 National Hospital Ambulatory Medical Care Survey data, an annual national sample of visits to the EDs of nonfederal general and short-stay hospitals. SAS 9.1 computed population estimates and standard errors for number of ED visits. Annual census data were used to compute visit rates per 100 persons. A least-squares test for trend determined slopes and 95% confidence intervals.

**Results:** Visits for patients aged 65 to 74 years increased 34% during the study period. The visit rate for blacks increased 93% to 77 visits per 100 population, whereas the rate for whites increased 26% to 36 visits per 100. The admission rate did not change significantly during the study period. The number of visits at which 3 or more medications were prescribed increased 44%. The increased visits occurred primarily in the category of "other and undefined" diagnoses (90% increase).

**Conclusion:** If these trends continue, ED visits in the United States for the 65- to 74-year-old group could nearly double from 6.4 million visits to 11.7 million visits by 2013. [Ann Emerg Med. 2007;xx:xxx.]

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## INTRODUCTION

Emergency department (ED) crowding is an increasing problem in the United States.<sup>1-3</sup> One cause of crowding was reported by the Centers for Disease Control and Prevention in the results of the National Hospital Ambulatory Medical Care Survey (NHAMCS, available at <http://www.cdc.gov/nchs/about/major/ahcd/ahcd1.htm>) between 1993 and 2003: an increase in both the absolute number of visits (up 26% from 90.3 million to 113.9 million visits) and in the overall visit rate per 100 persons (up 12%) while the number of EDs concomitantly decreased 14%.<sup>4</sup> Throughout the study, individuals aged 65 years and older visited the ED at a higher rate than other age groups. However, from 1993 to 2003 the visit rate per 100 persons also increased *faster* than the visit rate for any other age group, increasing 26% during the 11 years of study (compared with little change for those younger than 21

years, 19% for those 22 to 49 years, and 16% for those 50 to 64 years). Those aged 65 years and older are also the fastest growing segment of the US population and as ED visitors have the greatest degree of resource utilization, longest length of stay, and highest admission rate of any age group.<sup>5</sup> Without an intervention, the implications of these trends are predictable: a serious increase in the problem of ED crowding.

Definitive reasons for the increase in visits in the 65 years and older age group are not fully understood. It may be an effect of improved medical care throughout the last century, leading to a greater number of older people surviving with chronic medical issues and now developing emergency complications.<sup>6</sup> Alternatively, it may be that the visits are related to access problems: patients coming to the ED for low-acuity health issues that could have been addressed in a physician's office, but timely and convenient care was unavailable. We set

**Editor's Capsule Summary***What is already known on this topic*

Persons older than 65 years compose a growing proportion of the American population. The elderly typically have longer and more resource-intensive emergency department (ED) visits and are more likely to require hospital admission.

*What question this study addressed*

The authors use data from the National Hospital Ambulatory Medical Care Survey to determine how the number of US ED visits by those older than 65 years changed from 1993 to 2003.

*What this study adds to our knowledge*

The number of ED visits by those older than 65 years is increasing and is likely to continue to do so as the population ages.

*How this might change clinical practice*

The aging of the US population may be yet another source of ED crowding to be considered when future emergency care needs are planned.

out to examine the NHAMCS data set from 1993 to 2003 to statistically verify previously reported increases in ED visits in the 65 years and older age group and to identify the main characteristics of the patients and visits.

**MATERIALS AND METHODS**

The NHAMCS collects data from ambulatory care visits to hospital-based EDs and outpatient departments or clinics in nonfederal, acute care institutions located in the 50 states and the District of Columbia. A complex 4-stage probability design is used to identify sampled visits, and each visit is weighted to create a nationally representative set of data. This study focused solely on visits to hospital-based EDs.

The NHAMCS data include information such as patient demographics, vital signs, reason for visit, discharge disposition, and information on interventions such as treatments and drug regimens performed during the visit. The latter can provide some measure of the severity of the patient's condition when presenting at the ED and of the level of resource use associated with that visit.

The NHAMCS survey uses a 4-stage probability design, with samples of primary sampling units (112 geographic segments), hospitals within primary sampling units, clinics/EDs within hospitals, and patient visits within clinics/EDs. The design variables embody survey and demographic information—selection probabilities for each sampling stage, adjustment for nonresponse, and population weighting ratio adjustments—permitting survey data to be extrapolated to population estimates and associated standard errors to be calculated.<sup>7,8</sup>

Initial analysis of raw data sets to determine ED visit rates per population was done on a year-by-year basis using SAS, version 9.1 (SAS Institute, Inc., Cary, NC). PROC SURVEYFREQ, with functionality that is newly available in this version of SAS, estimates the population frequency and standard error from the sample by using 2 masked design variables (CSTRATM and CPSUM) and the variable patient visit weight (PATWT). These design variables, which were provided for the first time with the 2002 data set, were calculated for the older data sets from the SUDAAN design variables provided in those sets, and used in the SAS programs, following special guidance provided by the National Center for Health Statistics.<sup>9</sup>

Population data are provided in NHAMCS background documentation for each survey year and are described as postcensus estimates of the civilian, noninstitutionalized population of the United States as of July 1 in each survey year. Overall population and estimates of subgroups by age, sex, and race are taken from special tabulations developed by the Population Division, US Census Bureau.

The ED visit rate per 100 population and its standard error of estimate were derived by dividing the population frequency and its standard error for a given stratum by population of that stratum. A weighted least-squares regression test for trend was applied to test 11-year trends for each rate statistic for significance and to compare trends for different statistics. The trend test used a 6-fold test for significance according to 6 age categories. This methodology, which uses the reciprocal of the standard error of the population estimate as the weight for that value of the estimate, was introduced by Gardocki and Pockras<sup>10</sup> and implemented in spreadsheet form by Levy.

At the analysis, SAS 9.1 was newly available and for the first time had the ability to perform this type of analysis on data with complex sampling and weighting. To ensure accuracy, confirmation of the results was performed using more traditional SUDAAN software (S. Cleary, personal communication, January 2006). Results are described by the slope of the trend and surrounding 95% confidence intervals (CIs). Slopes ( $\beta$ ) are in units representing the annual increase in ED visits per 100 population per year.

NHAMCS data are categorized by race into 6 groups (white, black, Asian, Native Hawaiian/Other Pacific Islander, American Indian/Alaska Native, and more than 1 race reported). All but the first 2 groups (white and black) were small and for this study were grouped as "other." Ethnicity (Hispanic/Latino versus non-Hispanic/Latino) is captured in a separate variable, which was not used in this study, because further breakdown of racial groups would have resulted in groups too small to provide statistically significant results.

Discharge disposition was categorized as either an admission to the hospital (various types such as intensive care, cardiac care, medicine, surgery) or discharge (transfer or discharge with or without home health care). Admission rates were calculated by grouping all admission types divided by the number of visits.

A priori, we believed it was important to better understand the primary reason for the ED visit. We theorized that if lack of access to primary care was causing the increase in visit rate per population, the primary diagnosis would be for an exacerbation of a chronic condition rather than a new, acute problem. Using the primary diagnostic code (*International Classification of Diseases, Ninth Revision [ICD-9] code*), we intended to create 4 categories: “injuries” (*ICD-9 codes 800.0 through 999.9*); “acute noninjury” problems (eg, abscesses, cholecystitis, dehydration, vomiting, unstable angina, acute myocardial infarction); “exacerbations of chronic conditions” (eg, asthma, chronic obstructive pulmonary disease, congestive heart failure, psychiatric illnesses); and “other” (primarily ill-defined conditions: *ICD-9 codes such as weakness, dizziness, and other vague terms*).

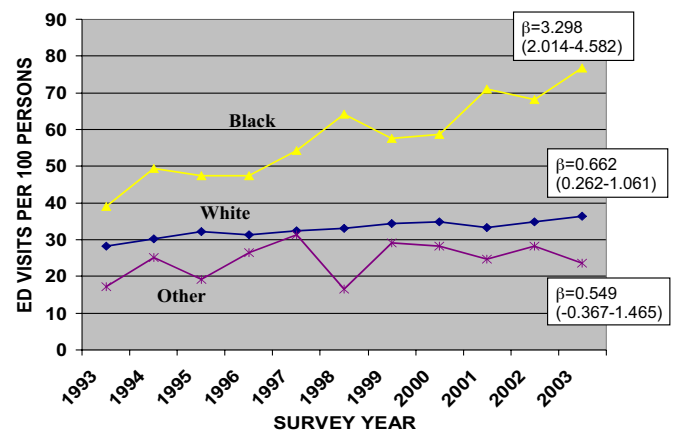
However, there is no accepted strategy for grouping visits this way. Simply using the *ICD-9* groupings by system (17 categories when using only the first digit) resulted in a number of medically unrelated categories with too few visits to be statistically useful (each with less than 2% of visits). To manually create groupings, the primary *ICD-9* codes were truncated to 3 digits to create groupings by disease type, which created groups of related diagnoses. Classification of the diagnosis as acute or chronic was performed according to face validity and ED experience by 1 author (M.P.M.). Thus, code 373 is for inflammation of the eyelids and includes blepharitis, hordeolum, infective and noninfective dermatoses, chalazion, parasitic infestations, and other. Among ED visits, these are likely acute, nontraumatic problems. Code 493 is for asthma and includes intrinsic and extrinsic disease, chronic obstructive asthma, and “unspecified.” Among ED visits, these are likely acute exacerbations of chronic disease rather than a new diagnosis.

Because publicly available, deidentified health data were used for this study, it was approved as exempt by our institutional review board.

## RESULTS

The overall trend in the rate of ED visits for the 65- to 74-year-old group was confirmed with a 34% increase in visit rate per population throughout the study period ( $\beta=0.890$ ; 95% CI 0.362 to 1.418). However, no significant increase in the rate of ED visits was found for the 75 years and older group ( $\beta=0.626$ ; 95% CI  $-0.279$  to 1.532), which is likely due to the small size (and therefore large CI) for the oldest group. Most of the subsequent analyses focus on visits among individuals aged 65 to 74 years.

Participants were grouped by race into one of 3 categories: black, white, or other. Both the black and white groups showed significant upward trends (Figure 1). Blacks began the study period with a higher ED visit rate than whites but showed a considerable increase; the visit rate nearly doubled to 77 visits per 100 persons per year (90% increase during 11 years;  $\beta=3.298$ ; 95% CI 2.014 to 4.582). For the 75 years and older age group, the upward trend for blacks was nearly as great



**Figure 1.** Change in ED visit rates by race, ages 65 to 74 years.

( $\beta=3.047$ ; 95% CI 1.071 to 5.023). The upward trends were not significant for whites or other races older than 75 years.

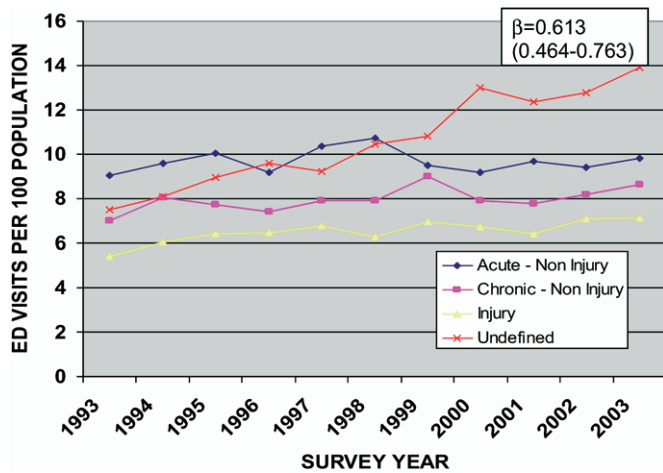
The visit rate per population was nearly identical for men and women, and there were no significant differences in the visit rates trends during the study period for either older age group by sex.

Almost all the increases in ED visit rates occurred in the other/undefined category in both 65 to 74 years and 75 years and older age groups. Three attempts were made to group primary diagnoses, as described in the “Materials and Methods” section. Results from the last attempt are presented here (Figure 2). This attempt had the lowest number of visits, with primary diagnoses remaining in the “other” category, less than 20% of visits. Visits for this group increased approximately 93% ( $\beta=0.613$ ; 95% CI 0.464 to 0.763). About 6% of visits were unable to be categorized because of a blank diagnostic code field.

Medicare was the primary payer for the majority of ED visits for persons 65 years and older (Table). For the purposes of this analysis, all visits with a non-Medicare primary payer were grouped into a single category. The majority of these visits had a private primary payer; less than 2.2% of the total was “self-pay.” For both age groups, almost all the increase in visit rates occurred among non-Medicare visits (Figure 3).

We used 2 measures as proxies for acuity of the visit: admission rate and number of medications administered. During the study period, there was a lot of variability in the admission rate for visits by patients aged 65 to 74 years. Overall, there was no significant trend; the mean admission rate was 32.8% throughout the course of the study (Figure 4).

We then grouped the number of medications administered during the ED visit into one of 3 categories: 0 medications, 1 to 2 medications, and 3 or more medications. All 3 groups showed significant increases in ED visit rate per population. However, the zero medication group showed a smaller increase than the other 2 groups, with the 3 or more medication group showing the largest increase both overall (44%;  $\beta=0.359$ ; 95% CI 0.194 to 0.525) and in average annual percentage increases. The 75 years and older age group exhibited a similar pattern.



**Figure 2.** ED visit rates by diagnosis category, ages 65 to 74 years.

**Table.** Primary payers for ED visitors 65 years and older, 2003.

Primary Payer	65–74 y		≥75 y	
	Visits, %	Standard Error	Visits, %	Standard Error
Blank	1.7	0.4	1.2	0.4
Private insurance	13.9	1.5	9.9	0.9
Medicare	72.1	1.7	80.9	1.3
Medicaid	5.1	0.8	3.9	0.7
Worker's compensation	0.3	0.1	0.1	0.0
Self-pay	2.2	0.4	1.3	0.3
No charge	0.2	0.1	0.0	0.0
Other	0.9	0.3	0.7	0.2
Unknown	3.5	1.2	2.0	0.5

## LIMITATIONS

The NHAMCS methodology is designed to allow population estimates. When the groups contain a large number of sampled cases, the results are robust, but as the subgroups are sliced into smaller pieces, the error estimates and CIs necessarily become wider. In this study, the small sample size for the 75 years and older age group limited the confidence of many results in the oldest age group. In the future, this could be addressed by oversampling visits by older adults in the NHAMCS design. We were also limited to larger groups in grouping by race, and the nature of the variables precluded analysis by Hispanic ethnicity.

We were unable to ascertain the chief complaints or diagnoses that resulted in increased visit rates. The increase was not significant for visits involving injuries or other well-defined conditions, but was both large and significant for other visit types (ill-defined or unspecified). Three attempts were undertaken to ensure that all codes that could be categorized elsewhere had been pushed out of the “other” category, each time with the same result. There may have been a change in coding practice to emphasize these diagnoses during the study period, or there may be some other explanation. A more detailed, prospective study of the reasons for visiting the ED

among older patients would be required to better understand why people are visiting at an increasing rate.

## DISCUSSION

We set out to evaluate the characteristics of the patients and the visits involved in the significant increase in ED visit rates per population for older Americans. There were several main findings, each with different implications. First, the racial disparity in ED visit rates between older blacks and whites is widening rapidly. There may be several reasons for this. Underlying differences in disease rates, particularly for diabetes and hypertension, may cause blacks to visit the ED more frequently with complications (eg, stroke, heart disease, complications related to dialysis). Nearly twice as many young blacks as whites lack health insurance, and the problem is greater for those below the poverty line.<sup>11,12</sup> By the time these persons reach age 65 years, the effect of limited access to care may result in more severe disease, requiring more frequent ED visits. Disparities between blacks and whites exist in the amount and quality of primary medical care, including immunizations,<sup>13,14</sup> and lower-quality primary care may be more likely to result in emergency visits. Because the study population is largely insured, and the gap in visit rate is actively growing, we believe it is less likely that race is primarily a marker for a confounder such as socioeconomic status, which is not available in this data set. More research is required to better elucidate the complex causes for this result.

The majority of the increase in the ED visit rate for older patients occurred among those without Medicare as the primary payer, and the majority of the effect occurred during the first half of the decade. This may reflect a 1998 policy shift in the Medicare program, under which Medicare beneficiaries, primarily lower-income segment, were able to enroll in health maintenance organizations and other managed care plans.<sup>15</sup> Those still left out would fall into the “non-Medicare” group.

Finally, the additional ED visits over time were not less urgent or emergent than at the beginning of the study; they were not frivolous. Patients continued to require medications during their visit. In fact, the number of visits in which 3 or more medications were administered during the visit increased at a faster rate than those with 0 to 2 medications. The admission rate per ED visit remained stable during the study period, meaning the absolute number of hospital admissions per 100 persons aged 65 to 74 years increased. This suggests older Americans are having more true emergencies, rather than increasingly visiting the ED for convenience or because of lack of access to nonemergency outpatient care.

These results have potentially important policy implications. The US population is aging: the 65- to 74-year age group is expected to increase from 18.3 million in 2003 to 24.4 million in 2013.<sup>16</sup> If the ED visit rate trends continue to 2013, visit rates in the 65- to 74-year age group alone will increase from 35 to 48 visits per 100 persons per year, and visit rates for blacks will increase from 77 to 110 per 100 persons. Thus, total ED visits for this age group alone could nearly double from 6.4 million visits to 11.7 million

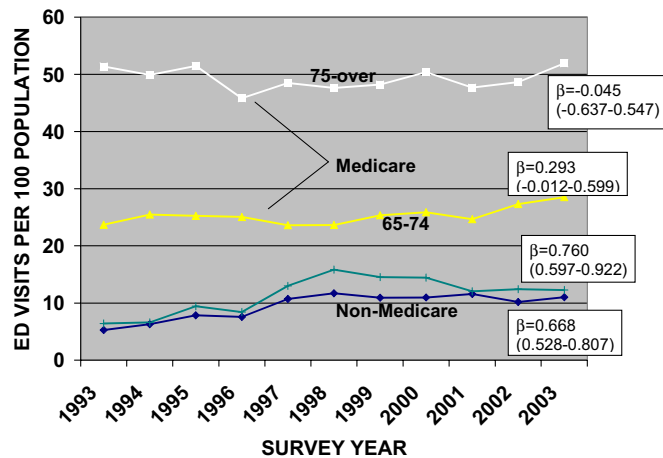


Figure 3. ED visit rate trends by primary payer.

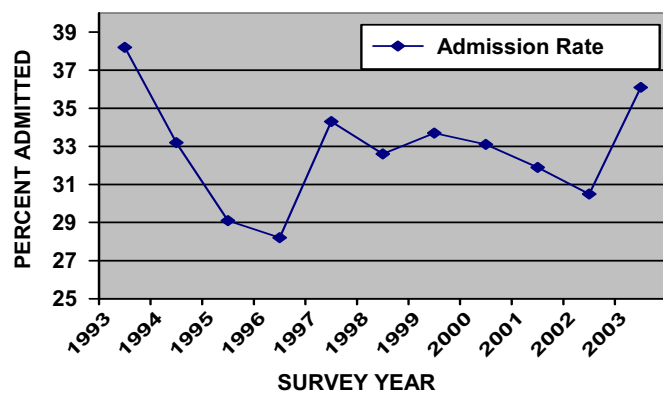


Figure 4. Percentage of ED patients admitted to the hospital.

visits per year by 2013. If the admission rate continues to be essentially static, this will mean the number of admissions from the ED for individuals older than 65 years will increase from 2.1 million to 3.8 million per year. If trends continue, the effects on ED and hospital crowding could be catastrophic, and planning should begin now.

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