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Avoidable Hospitalizations in Georgia: An Analysis of the Potential for Strategic Action

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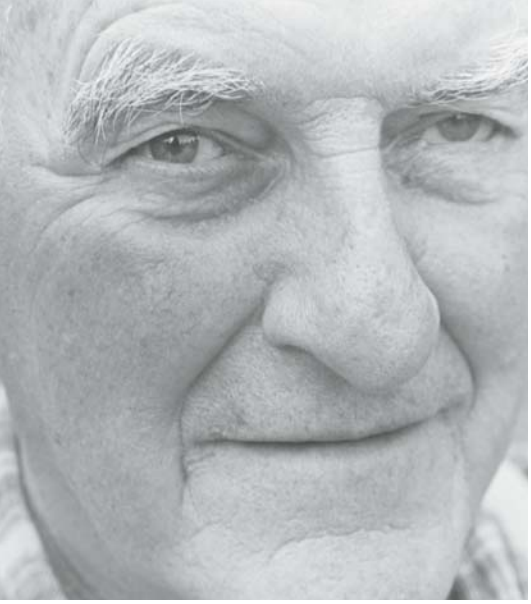

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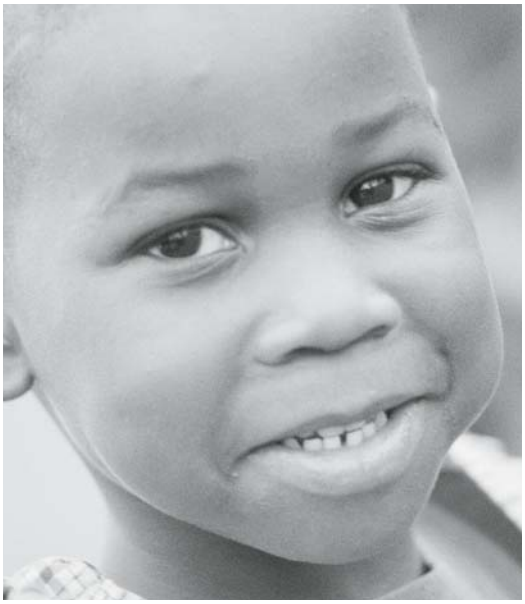


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Executive Summary

Hospital costs are driven by numerous factors, including the costs of medical technology and the employment of medical personnel. However, once you eliminate the costs of operating a hospital, the key driver of hospital costs is hospital use. This report examines avoidable hospitalizations as an issue that can potentially be addressed through policy. It attempts to build a knowledge base for shaping effective policies in Georgia by reviewing key findings on avoidable hospitalizations, identifying the size and nature of the problem within the state, and developing some preliminary guidelines on how and to what degree the state might take action.

Despite the fact that certain hospitalizations may not be avoidable, the medical research community is increasingly confident that it is possible to identify certain conditions - called ambulatory care sensitive conditions - that, in most instances, should not lead to a hospitalization if effectively managed and treated outside the hospital. Our inability to fully account for hospitalizations that are avoidable makes it more difficult to estimate the full cost of avoidable hospitalizations. However, by examining the fiscal impact of avoidable hospitalizations for the more limited set of conditions for which there is general agreement that the condition is truly avoidable, one can be fairly certain that the estimate of the impact will be a fiscally conservative one.

In order to better understand the degree to which Georgia experiences avoidable hospitalizations, the authors of this study examined records from three years of Georgia hospital discharge data (1999, 2000, and 2001). The data in this paper were drawn from hospital discharge records. During the 3-year period, Georgia hospitals recorded 2,948,173 discharges. During this period, avoidable hospitalizations comprised about ten percent of all hospitalizations. Had all of the potentially avoidable hospitalizations in Georgia during the study period actually been prevented, the savings in terms of hospital charges would have amounted to approximately $3,181,532,033.

Analyses of the factors that contribute to avoidable hospitalizations may or may not have public policy implications. In order to establish a rationale for changing health care policies and programs we must identify the likely net benefits of a policy change. With respect to avoidable hospitalizations, we must weigh the cost of a proposed policy or program change against the benefits of the expected reduction in avoidable hospitalizations. While this is simple to state in theory, in practice, avoidable hospitalizations are events that are not common enough in the general population or explicit enough in their markers to allow policy makers to easily and accurately intervene prior to the events themselves.

Current predictive modeling capability is unlikely to provide sufficient accuracy to create large-scale prevention programs that are cost-effective on the basis of avoiding hospitalizations alone. However, states can take steps to both address the limitations in our knowledge base and to begin effective, well-targeted - though small-scale - prevention programs.

Introduction

Because of the growth in health care expenditures and the role of hospital charges in that growth, there is renewed interest in efforts to contain state health care costs - hospitalization costs in particular.

Hospital costs are driven by numerous factors, including the costs of medical technology and the employment of medical personnel. However, once you eliminate the costs of operating a hospital, the key driver of hospital costs is hospital use. Hospital use can essential be contained in one of three ways: through rationing of care, through patients choosing not to be admitted to hospitals, or by preventing avoidable admissions. Rationing can take one of two forms: health insurers can limit the procedures they reimburse, or they can attempt to control where procedures will take place. By requiring pre-authorization of inpatient admissions, insurers make sure that allowed procedures take place in the least expensive environment. Similarly, when insurers limit what kinds of hospital procedures they will reimburse, this will tend to increase the level of voluntary choices not to visit a hospital for care. While rationing of care and voluntary choices to seek hospital alternatives may have some role to play in containing hospital costs, these cost containment measures are clearly less desirable than are strategies to reduce the actual need for hospitalizations. That is, while rationing and voluntary choice are likely to lead to a deterioration in health status, preventing the need for hospitalization can potentially result in lowered costs without harming health.

This report focuses on hospitalizations that may be avoidable. The terms "preventable hospitalizations" and "unnecessary hospitalizations" are used interchangeably with "avoidable hospitalizations" to indicate the presence of hospital care for patients whose primary condition or diagnosis is one that, were it detected and cared for effectively at an earlier point, may not lead to hospitalization. While not every hospitalization can be prevented through improvement in health care delivery, early detection, care, and education of persons with ambulatory care sensitive conditions may reduce rates of potentially avoidable hospitalizations and save both lives and dollars.

This report examines avoidable hospitalizations as an issue that can potentially be addressed through policy. It attempts to build a knowledge base for shaping effective policies in Georgia by reviewing key findings on avoidable hospitalizations, identifying the size and nature of the problem within the state, and developing some preliminary guidelines on how and to what degree the state might take action.

Hospitalization Costs

Hospitalization costs - the largest category of health care spending in the state - accounted for more than 37 percent of all medical spending in Georgia in 1998. This proportion was slightly more than for the U.S. as a whole.[1] Between 1991 and 1998, spending on hospitalization increased five percent annually in Georgia compared to 4.5 percent in the U.S.. However, growth in per capita hospitalization spending in Georgia (2.9 percent) was less than in the U.S. average (3.4 percent). Increases in Medicaid hospitalization costs nationwide were somewhat greater (6.3 percent) during this same period.

Table 1: Cost of Health Care by Service (in Millions): 1998 [2]

	Total	Hospital Services	Physician & Other Professional Services	Home Health Care	Nursing Home Care	Dental Services	Medical Durables	Drugs and Other Non-Durables	Other Personal Health Care
Georgia	$26,789	$10,157	$8,334	$806	$1,550	$1,362	$427	$3,367	$786
Percent of Total		37.91%	31.11%	3.01%	5.79%	5.08%	1.59%	12.57%	2.93%
United States	$1,016,383	$380,050	$296,102	$53,829	$29,255	$121,906	$15,499	$87,826	$31,917
Percent of Total		37.39%	29.13%	5.30%	2.88%	11.99%	1.52%	8.64%	3.14%

Although hospital expenditures represent the largest portion of all health care expenditures, the growth in hospital expenditures during the 80s and 90s was less than the growth of other types of health care spending. The introduction of diagnosis-based prospective payment systems (PPS) and numerous forms of managed care have limited the growth of hospital utilization (and expenditures) in recent years.[3]

However, the days of relatively mild health care cost increases have ended. Between 1999 and 2001, national health care costs rose by over seven percent per year. In 2001, a 9.7 percent rise in hospital spending accounted for 30 percent of health spending increases in that year. According to the Centers for Medicaid and Medicare Services, "this was the first time since 1992 that hospitals' contribution to the annual increase had been this significant."[4] Hospital expenses have continued to grow, though somewhat less rapidly, since that time.

Percent Change in Hospital Expenses[5]				
	1999	2000	2001	2002
Total Hospital Expenses	4.3	6.5	9.7	6.7

Increases in hospital expenditures come from two key sources: increases in hospital utilization and increases in hospital prices. Data on hospital prices, as measured by the Consumer Price Index, suggest that a large portion of recent increases in expenses can be traced to price inflation. During 2002, hospital price inflation was in the nine percent range and continued at 7.1 and 7.3 percent in the second and third quarters of 2003.[6] An analysis by the Centers for Medicaid and Medicare Services suggests that during the 1999 - 2000 period, price inflation accounted for 3.4 percentage points and utilization for two percentage points of the 5.4 percent increases in overall medical spending.[7] While the contribution of price inflation to overall expense increases is substantial, it is much less than was the case during the 1980s.

While this paper is focused on the contribution of hospital utilization (and particularly avoidable utilization) to the overall cost of hospital services, it should be recognized that utilization and price inflation are interconnected factors. For example, one of the major reasons for the decrease in the rate of hospital price inflation during the 1990s was the substantial lowering of hospital utilization rates caused by greater levels of health management and utilization review procedures. These

practices led to greater hospital bed availability, which in turn allowed insurers to bargain with hospitals for lower prices.

Defining Avoidable Hospitalizations

Determining whether or not a hospitalization is avoidable takes a considerable amount of investigation. In some cases, an individual may be hospitalized for a condition that, by itself, could be treated outside the hospital but, because it manifested with co-morbid conditions, hospitalization is appropriate. Similarly, diagnosis-based hospitalizations that might be avoidable for younger patients might not be avoidable for elderly persons in weakened conditions.

Despite the fact that certain hospitalizations may not be avoidable, the medical research community is increasingly confident that it is possible to identify certain conditions - called ambulatory care sensitive conditions - that, in most instances, should not lead to a hospitalization if effectively managed and treated outside the hospital.[8] While a number of researchers have developed lists of these conditions, the most rigorous effort to date was sponsored by the Agency for Healthcare Research and Quality and conducted by a project team from the Evidence-Based Practice Center (EPC) at the University of California San Francisco (UCSF) and Stanford University. The team reported in 2001 on their use of statistical techniques to identify which indicators performed well on empirical tests of measurement precision, bias, and construct validity. In this report, they also suggested risk-adjustment methods for use with the recommended indicators.[9]

Based on this assessment, the project team developed a list of 16 ambulatory care sensitive conditions:

- Bacterial pneumonia
- Dehydration
- Pediatric gastroenteritis
- Urinary tract infection
- Perforated appendix
- Low birth weight
- Angina without procedure
- Congestive heart failure (CHF)
- Hypertension
- Adult asthma
- Pediatric asthma
- Chronic obstructive pulmonary disease (COPD)
- Diabetes short-term complication
- Diabetes long-term complication
- Uncontrolled diabetes
- Lower-extremity amputation among patients with diabetes

While researchers agree that a large portion of these ambulatory care sensitive conditions are likely to be avoidable, there is less agreement regarding other conditions (e.g., failure to thrive, invasive cervical cancer, congenital syphilis). Our inability to fully account for hospitalizations that are avoidable makes it more difficult to estimate the full cost of avoidable hospitalizations. However, by examining the fiscal impact of avoidable hospitalizations for the more limited set of conditions for which there is general agreement that the condition is truly avoidable, one can be fairly certain that the estimate of the impact will be a fiscally conservative one. The key comparison variable is the rate of preventable hospitalizations per thousand.

Using Avoidable Hospitalizations as Quality Indicators and Policy Guides

Ideally, rates of avoidable hospitalizations would provide specific guidance as to where and how to improve health care practice and policy. That is, knowing a community's rate of avoidable hospitalizations should tell us about quality of, and access to, care. Logically speaking, communities with accessible, high quality care should have much lower rates of avoidable hospitalizations.

Unfortunately, the line between rates of avoidable hospitalizations and an understanding of the community's health care system is not entirely straightforward. While high rates of avoidable hospitalizations can be associated with poor health care quality or access, it is sometimes difficult to determine to what extent differences in area preventable hospitalization rates are also a result of differences in:

- The prevalence or underlying rate of disease in the area
- The average level of attention that residents pay to their health
- The nutritional, exercise, and other wellness behaviors of residents
- The care-seeking behavior of residents
- The customary way that medical conditions are treated by area health care providers
- The degree to which there are insurmountable barriers to timely medical care

The complexity of using information about avoidable hospitalizations to reduce cost and increase quality is illustrated by a recent study of preventable hospitalizations and socioeconomic status.[10] The authors found that poorer Medicare patients experience higher levels of avoidable hospitalizations. They suggest that this finding could be interpreted in three ways. First, (scenario 1) higher hospitalization rates among low-income patients reflect poorer health. In the second scenario, higher hospitalization rates among the poor reflect a less adequate level of care. In the third scenario, higher hospitalization rates among poorer residents reflect less effective use of the health care system.

The authors reflect on the implications of each of these scenarios for the implementation of a performance measurement and incentive system for health care plans. They write:

"Under scenario 1, report cards should clearly be adjusted for severity of illness. Under scenario 2, case-mix adjustment is not warranted. But under scenario 3, what sort of adjustment would be fair? On the one hand, we might wish to case-mix-adjust for socio-economic status (SES) - not severity of illness - to acknowledge the link between SES, care-seeking behavior, resources, and the need for hospitalization. Adjusting for SES would encourage plans to take on difficult-to-reach populations without risk of penalty. On the other hand, there are good arguments for withholding case-mix adjustment for SES under scenario 3. After all, plans should be held accountable for developing systems of care that are appropriate to the populations they serve. To put it another way, excusing poor performance by plans that serve the poor will not encourage those plans to do better."[11]

While knowing exact rates of avoidable hospitalizations is difficult, researchers have developed ways to better understand how different factors impact those rates. For example, researchers have examined how differences between avoidable hospitalization rates from community to community are affected by rates of co-morbidities or other risk factors that may vary systematically by area.[12] Similarly, research has identified when a hospitalization rate for an avoidable condition might be affected by differences in hospital admission practices.[13] For example, differences in thresholds for admission of patients with bacterial pneumonia may contribute to area rate differences. However, for other conditions such as severe angina, there is no evidence that there has been a shift in treatment from inpatient to outpatient sources. [14]

System and Demographic Contributions to Avoidable Hospitalizations

Health Care System Factors

Having access to coordinated and high quality primary health care is essential to avoiding unnecessary hospitalizations. People who pay for their own health care (all else being equal) are more likely to experience avoidable hospitalizations.[15] Self-pay status may be associated with higher rates of avoidable hospitalizations in part due to differences in the ability of individuals to practice good self-care behavior.[16] However, even if self-pay patients are the same as insured patients in all respects except for payment method, the self-pay group will likely experience higher rates of avoidable hospitalizations simply because they will have incentives to avoid treatment in general (every dollar not spent on health care will be a dollar saved). At the opposite end of the spectrum are people who may have high coverage insurance, resulting in no health care cost to the individual. Payment should not be a barrier to seeking health care at the earliest stage in a disease process.

Incentives for quality care also exist for insurers. That is, a health insurer who is paid a capitated rate for patients who are likely to be with the insurer for long periods of time may be more willing to invest in preventive care than a health insurer that earns profits by strategically choosing healthy persons to be part of more short-term health care plans. Some HMOs have put in place rigorous prevention regimens and care management practices that have effectively reduced avoidable hospitalizations.

People without insurance represent the most extreme category of self-pay patients in that these people pay for their health care on a dollar-for-dollar basis, and, therefore, have additional incentives to avoid routine health care. Because self-pay patients tend to include people who are without the resources to pay for their health care, providers have no incentive to seek them out in order to provide the care they need.

As a result, persons without insurance, compared with the insured, are more likely to experience avoidable hospitalizations. Specifically they are:[17]

* Up to 2.8 times more likely to be hospitalized for diabetes
* Up to 2.4 times more likely to be hospitalized for hypertension
* Up to 1.6 times more likely to be hospitalized for pneumonia
* Up to 1.6 times more likely to be hospitalized for a bleeding ulcer

It is not so much the type of health care plan (or lack of a plan) that results in a particular level of avoidable hospitalizations as it is the actual care that a person receives. That is, if an uninsured patient has a primary care physician who tracks her health status and takes steps to intervene before a condition becomes acute, this person should experience fewer hospitalizations than an insured person who does not have a primary health care provider.

While health care plans do not directly cause preventable hospitalizations, they do influence the more systematic causes of preventable hospitalizations. That is, a quality health care plan is one that provides standard medical care *and* provides care management from allied health providers. Care management that combines health care and social service coordination and promotes education and self-monitoring and management is believed to provide opportunities to improve health outcomes and reduce unnecessary hospitalizations.

A number of specific health care system components have been found to reduce hospitalization rates. They include:

- Exposure to intensive pharmacy consultation[18]
- Prevention efforts targeted at groups that are at high risk of injury[19]
- Differences in physician practice style[20]
- Educational efforts and targeted improvements in outpatient care[21]
- Multidisciplinary disease management programs[22]

Demographic Factors

Preventable hospitalizations have been associated with a number of demographic factors, including the following:

Gender: In a study of Medicaid hospitalizations, males were slightly more likely than females to experience an avoidable hospitalization.[23]

Age: For the first two years of life, children are at high risk of avoidable hospitalizations. This risk declines rapidly after age two but gradually increases as children become young adults and continues to increase as people age, with the elderly experiencing the highest risk of unnecessary hospitalizations.[24]

Chronic Conditions: Patients with chronic diseases generally have greater need for health care services and are more likely to experience hospitalizations due to chronic conditions adding to the treatment of other illnesses. However, Medicaid patients with chronic diseases may be substantially more likely to experience avoidable hospitalizations than the general population. The chronic conditions that appear to contribute the most to the probability of an avoidable hospitalization include: Cystic Fibrosis, Obesity, Mental Retardation, Hereditary/Degenerative CNS, and Alcohol/Drug Abuse.[25]

Racial and Ethnic Groups: Although descriptive statistics suggest that non-Hispanic whites account for a disproportionate share of avoidable hospitalizations, when one controls for other demographic and illness factors, ethnic and racial minorities are more likely to have an avoidable hospitalization. This relationship may be hidden because racial and ethnic minorities tend to be younger as a group than non-minorities, a factor that reduces overall rates of avoidable hospitalizations.[26]

Location: Residents of rural counties or areas that lack hospital facilities tend to be at greater risk of avoidable hospitalizations. [27]

Socio-Economic Status: Research has shown that preventable hospitalizations are likely to be more prevalent in areas where income is low. [28]

Estimating Rates of Excess Hospitalizations

In estimating the potential savings of an approach to reducing preventable hospitalizations, it is important to identify the percentage of hospitalizations that may actually be avoided were ideal conditions present. Unfortunately, current data do not allow for a complete accounting of the contributions of the various factors contributing to excess rates of hospitalizations. However, research has identified some basic relationships in this regard. For example, by using ZIP code based estimates of patients' incomes, Pappas (1997) found that,

> "Among persons under 65 years of age, middle- and low-income area residents were more likely to experience a hospitalization for one of these [avoidable] conditions than were residents of wealthier areas. The lowest income group (less than $20,000) had rates 2.1 to 2.6 times the rates of the highest income group ($40,000+) for each age group less than 65 years. These income differences were similar for Blacks and Whites."

As discussed above, one would expect a higher percentage of patients without insurance to experience avoidable hospitalizations, since persons in this group would, in theory, be less likely to receive adequate primary care and more likely to postpone needed medical attention than persons with health insurance. To a certain degree, this expectation holds. Pappas found, for example, that 13 percent of patients without insurance experienced avoidable hospitalizations compared to ten percent of patients with private insurance. However, the group with the highest proportion of avoidable hospitalizations was Medicaid patients. Fifteen percent experienced a hospitalization due to a condition that was potentially avoidable. The finding is most likely due to the generally poorer health status of Medicaid patients and to their overall higher rates of hospitalizations. In addition, levels of care coordination in the Medicaid program vary considerably from state to state, as they do in private programs.

Underlying factors of patient health and access to care make it difficult to estimate the potential savings that might be possible as a result of policy or program changes. Pappas has suggested that one way to begin to identify the lowest rate of avoidable hospitalizations that is realistically achievable is to identify patients who are closest to an ideal situation in terms of health access. In Pappas' own study, he used income status as defined by median income of the persons in the ZIP code where the patient lived as a proxy for social class. He then defined the rate of hospitalization of the highest income group (i.e., those from ZIP codes with $40,000 or more in annual income) as the baseline or lowest realizable rate of avoidable hospitalization. Any hospitalization for a potentially avoidable condition of persons in that ZIP code was defined as excess. Based on these assumptions, Pappas estimated that 29 percent of the potentially avoidable hospitalizations could realistically be avoided. (This represented 3.7 percent of all hospitalizations in the Pappas study). Applying the more inclusive categories of ambulatory-care sensitive hospitalizations, Pappas found similar rates of excess (28 percent), and estimated that up to 7.1 percent of all hospitalizations could, with a reasonable level of effort, be avoided.

The validity of Pappas' assumptions may be questioned as being both too conservative and too liberal. It can be argued that because Pappas had to use ZIP code median income as a proxy for real income, the income differential among patient groups is underestimated (e.g., some low-income patients are classified as higher income because of their living in a high-income ZIP code). Since differences in income are underestimated, it is likely that the differences in access to health care are also underestimated.

On the other hand, one might argue that Pappas is being overly optimistic. If one assumes that some of the avoidance of hospitalization achieved by higher SES patients is due to patients practicing high levels of care seeking behavior and self-care management, can one expect that lower SES patients will behave in the same manner once they are provided with better access to health care? On this point, the evidence is somewhat mixed.

For example, Pappas' study found that the income and racial differences in rates of potentially avoidable hospitalization tended to disappear once patients reached age 65. He suggests that the narrowing of the age gap in avoidable hospitalizations may be due to increased access to primary care afforded by Medicare. Similarly, cross-cultural studies suggest that differences in health care seeking behavior among socio-economic groups tends to be minor in countries with universal health care,[29] and other studies suggest that care-seeking behavior for specific conditions that could lead to hospitalization may be the result of more regular or habitual health care utilization. In the aggregate, these studies suggest that it should be possible, over time, to reduce class or income-based differences in care seeking behavior once other barriers to access have been removed.[30]

While it may be possible to substantially increase the level of care-seeking behavior among patients who have traditionally experienced income-related barriers to health care, the evidence for being able to achieve substantial reductions in class-based differences in health outcomes or in excess hospitalizations is less certain.

For example, Lerch (2002) studied avoidable hospitalizations among Medicaid recipients who are largely low-income. Lerch found that timely visits to a physician for a condition related to hospitalization failed to prevent the "avoidable" hospitalization.[31] For conditions such as pneumonia, cellulitis, urinary tract infection, and congestive heart failure, Lerch discovered that 31 to 40 percent of the patients had had an outpatient care visit within a month of the hospitalization for the same or related health problem. This counter-intuitive finding can be partially understood as an artifact of the relationships between demographic factors and hospitalizations. That is, the elderly experience more chronic conditions and more avoidable hospitalizations, but they also make more visits to the doctor.[32] Hence, one would expect some correlation between doctor visits and avoidable hospitalizations. However, after controlling for demographic and chronic conditions, Lerch continued to find that increased numbers of doctor visits per month contributed to a higher probability of experiencing an avoidable hospitalization.

A recent study by Goldman and Smith (2002) may help explain some of Lerch's findings. These researchers suggest that the greater capacity of persons in higher SES categories to self-manage their disease is a major factor in the differences between health outcomes for these patients and lower SES patients. Goldman and Smith found that for both diabetes and HIV, patients with high SES were much more likely to adhere to health care regimens and that this adherence led to improved general health. The researchers assert that the less educated were more likely to switch treatment, which led to worsening general health. However, they also found that intensive treatment regimens could compensate for poor adherence and could lead to improvements in glycemic control for the less educated.[33]

What this and similar disease management[34] research suggests is that for lower income groups, it may be necessary to move toward a higher degree of care management if one is to avoid ambulatory care sensitive hospitalizations. Lerch's finding that more doctor visits lead to more avoidable hospitalizations now becomes potentially explainable. Patients who fail to adequately self-manage their conditions will typically need to visit their doctors more often than similarly situated patients who are better at self-management.

The Georgia Situation

Georgia's Medicaid program expanded rapidly in the late 1980s and early 1990s. Like many other states, Georgia made plans to move the Medicaid program to an at-risk managed care model as part of a cost-containment effort. However, because opposition to the plan was strong in both the provider and consumer communities, Georgia did not succeed in moving to a fully capitated plan. Instead, Georgia decided to offer enrollees a choice between a primary care case management program (Georgia Better Health Care - GBHC) and an HMO. However, because HMOs were interested only in serving a small geographic area and only certain subgroups of beneficiaries, they were not seen as viable alternatives to the GBHC program. Also, because the HMO options were not mandatory, they were not able to obtain sufficient enrollment to insure effective management of costs. Ultimately, the voluntary HMO program was discontinued with the gap being filled by an expansion of the GBHC Program.

In February 2003, the Georgia Department of Community Health announced an interest in hearing from the research, provider, and consumer communities about how the state might do a better job of managing the Medicaid system to control costs and increase the quality of care. The avoidance of potentially preventable hospitalizations is clearly in this category.

In order to better understand the degree to which Georgia experiences avoidable hospitalizations, the authors of this study examined records from three years of Georgia hospital discharge data (1999, 2000, and 2001). The data in this paper were drawn from hospital discharge records. The Georgia Hospital Association provides the Georgia Department of Public Health with an abridged data set of hospital discharge records on an annual basis. Discharge information is obtained from the UB-92 (Uniform Billing Form, 1992) from all acute-stay hospitals excluding federal and some psychiatric facilities. These data include one record for each inpatient stay. Each record contains information on admission date, discharge date, length of stay, birth date, race, sex, county and ZIP code of residence, diagnosis, procedures and other information. Records were selected based on whether the patient's primary diagnosis matched those identified in the literature as potentially preventable (Figure 1).

Figure 1
Conditions Suggesting Potentially Avoidable Hospitalizations with Corresponding ICD-9-CM Codes

Pneumonia	481-483, 485-486,
Congestive Heart Failure	402.01, 402.11, 402.91,428
Asthma	493
Cellulitis[1]	681, 682
Perforated or bleeding ulcer	532.0, 532.2, 532.4, 532.6, 531.0, 531.2, 531.4, 531.6, 533.0-533.2, 533.4-533.6
Pyelonephritis[2]	590.0, 590.1, 590.8
Diabetes with ketoacidosis[3] or coma	250.1-250.3, 251.0
Ruptured appendix	540.0-540.1
Malignant hypertension	401.0, 402.0, 403.0, 404.0, 405.0, 437.2
Hypokalemia[4]	276.8
Immunizable Conditions[5]	032, 033, 037, 045, 055, 072
Gangrene	785.4

[1]Inflammation or abscess of the skin.
[2]Kidney infection.
[3]A profound insulin deficiency which results in the buildup of acids in the blood.
[4]Potassium deficiency.
[5]Diptheria, whooping cough, tetanus, acute poliomyelitis, Measles, and mumps.

These conditions are essentially the same as those used to identify avoidable hospitalizations in a recent study of preventable hospitalizations conducted by the North Carolina Department of Health and Human Services.[35] Because Georgia and North Carolina are very similar in terms of population size and the cultural, racial, and ethnic backgrounds of their residents, the results of the North Carolina study may be used to validate those in this study.

Prevalence and Sources of Potentially Avoidable Hospitalizations in Georgia

Georgia hospitals provided over 293,945 episodes of care in 1999, 2000, and 2001 where hospitalization might not have been necessary. The average rate of preventable hospitalization per 100,000 for the state of Georgia during that time was 1,197. This rate was only slightly greater than the 1,118 avoidable hospitalizations per 100,000 residents found in the 1997 North Carolina study.

During the same 3-year period, Georgia hospitals recorded 2,948,173 discharges. Hence, during this period, avoidable hospitalizations comprised about ten percent of all hospitalizations in Georgia. For comparison, an analysis of the 1990 National Hospital Discharge Survey found that approximately 12 percent of all hospitalizations in the United States were potentially avoidable.[36] Had all of the potentially avoidable hospitalizations in Georgia during the study period actually been prevented, the savings in terms of hospital charges would have amounted to approximately $3,181,532,033. This amount is based on actual hospital charge data and represents an average savings of over $1 billion dollars per year. Moreover, were all these hospitalizations to be continually avoided, the state of Georgia would be able to avoid the construction and maintenance cost for over 1,354 hospital beds that are needed to serve patients with avoidable conditions. However, just because a hospitalization can be avoided does not mean that all the dollars that would have been spent on hospital charges can be magically used for non-health related purposes. The cost of the ambulatory care that is needed to prevent hospitalization is likely to consume some percentage of these funds. However, the savings, while likely to vary depending on the condition, are likely to be substantial.

Rates and Costs of Potentially Preventable Hospitalizations in Georgia

Figure 2 displays the percentage of avoidable hospitalizations that are associated with particular primary diagnoses. Pneumonia, heart failure, and asthma are three conditions that account for approximately 75 percent of all avoidable hospitalizations. Table 2 presents data on the rate, cost, conditions, charges, and lengths of stay for avoidable hospitalizations during the three-year period from 1999 through 2001. While pneumonia, heart failure, and asthma account for approximately three-fourths of all avoidable hospitalizations, they account for more than 78 percent of avoidable hospitalization charges. Hospitalization for asthma appears to be the least expensive admission for preventable conditions, while hospitalizations for a ruptured appendix, gangrene, or an immunizable condition are the most expensive.

Figure 2: Sources of Avoidable Hospitalizations (1999-2001)

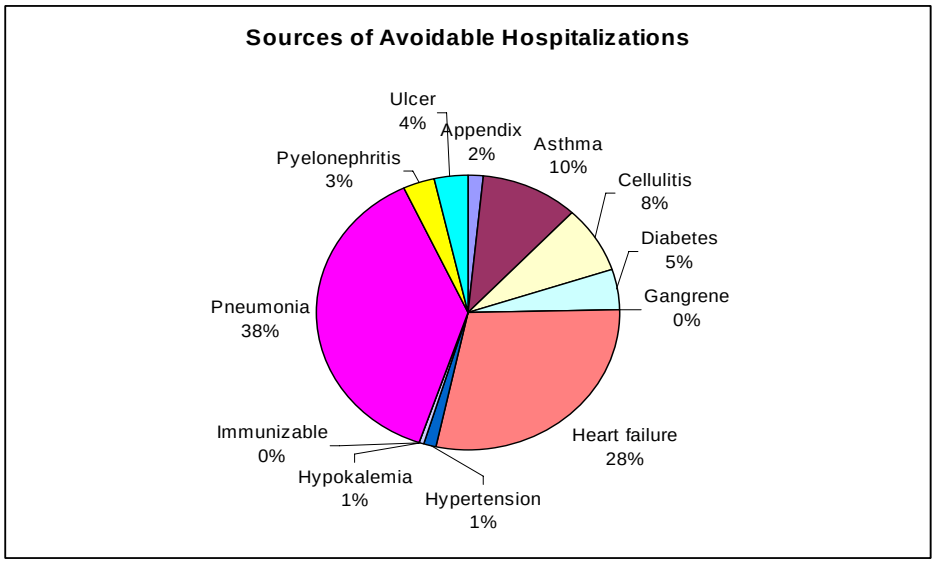


Table 2: Avoidable Hospitalizations by Condition, Charges, and Length of Stay (1999-2001)

Primary Diagnosis	Number for 3- Year Period	Rate per 100,000 Population	Charges for 3-Year Period	Average Yearly Charges	Average Cost per Discharge	Average Length of Stay (Days)
Pneumonia	110,759	450.98	$1,335,722,819	$445,240,939.67	$12,059.72	5.67
Heart failure	83,555	340.22	$964,380,193	$321,460,064.33	$11,541.86	5.18
Asthma	29,850	121.54	$193,722,136	$64,574,045.33	$6,489.85	3.36
Cellulitis	23,781	96.83	$203,821,565	$67,940,521.67	$8,570.77	5.02
Diabetes	13,461	54.81	$116,103,201	$38,701,067.00	$8,625.15	3.95
Ulcer	10,302	41.95	$139,836,638	$46,612,212.67	$13,573.74	4.92
Pyelonephritis	10,065	40.98	$66,656,338	$22,218,779.23	$6,622.59	3.70
Appendix	5,276	21.48	$101,201,454	$33,733,818.00	$19,181.47	6.19
Hypertension	4,154	16.91	$30,611,213	$10,203,737.73	$7,369.09	3.39
Hypokalemia	1,888	7.69	$13,808,145	$4,602,714.87	$7,313.64	3.93
Gangrene	695	2.83	$12,857,805	$4,285,934.87	$18,500.44	8.81
Immunizable	159	0.65	$2,810,527	$936,842.25	$17,676.27	7.08
Total	293,945	1196.88	$3,181,532,033	$1,060,510,677.62	$10,823.56	5.05

Avoidable Hospitalizations and Age

Table 3 presents data on preventable hospitalizations by primary diagnosis and age. These data suggest a number of age-related patterns for avoidable hospitalizations. For example, it is clear that children with asthma problems appear to be much more at risk of avoidable hospital stays than older adults. Similarly, teens and young adults are most at risk for preventable hospital stays for diabetes and ruptured appendix. For diabetes and asthma, it may be that as people age they become more proficient in taking the measures needed to avoid hospital care. Conversely, older individuals appear to be much more at risk for heart failure, gangrene, and ulcer-related avoidable hospitalizations. For pneumonia, the ages of highest risk for avoidable hospitalizations appear to be at both ends of the age spectrum (i.e., both the 1-10 and the 60+ age groups).

Table 3: Avoidable Hospitalizations by Age and Primary Diagnosis (Aggregate for 1999-2001)

		1-10	11-19	20-29	30-39	40-49	50-59	60+
Asthma	Number	9,894	2,021	1,689	3,005	4,049	3,555	5,637
	Percent of Total for Age Cohort	34.38%	23.56%	14.22%	15.29%	13.32%	9.61%	3.57%
Heart failure	Number	120	113	573	1,862	5,893	11,316	63,668
	Percent of Total for Age Cohort	0.42%	1.32%	4.82%	9.47%	19.39%	30.61%	40.36%
Appendix	Number	671	907	686	716	837	677	782
	Percent of Total for Age Cohort	2.33%	10.57%	5.78%	3.64%	2.75%	1.83%	0.50%
Cellulitis	Number	1294	736	1,470	2,926	4,020	3,892	9,441
	Percent of Total for Age Cohort	4.50%	8.58%	12.38%	14.88%	13.22%	10.53%	5.98%
Diabetes	Number	407	1,827	2,352	2,669	2,572	1,741	1,892
	Percent of Total for Age Cohort	1.41%	21.30%	19.80%	13.58%	8.46%	4.71%	1.20%
Gangrene	Number	2	2	11	26	57	100	496
	Percent of Total for Age Cohort	0.01%	0.02%	0.09%	0.13%	0.19%	0.27%	0.31%
Hypertension	Number	7	21	131	530	1,001	839	1,625
	Percent of Total for Age Cohort	0.02%	0.24%	1.10%	2.70%	3.29%	2.27%	1.03%
Hypokalemia	Number	15	29	49	137	265	377	1,016
	Percent of Total for Age Cohort	0.05%	0.34%	0.41%	0.70%	0.87%	1.02%	0.64%
Immunizable	Number	119	7	6	4	2	9	12
	Percent of Total for Age Cohort	0.41%	0.08%	0.05%	0.02%	0.01%	0.02%	0.01%
Pneumonia	Number	15,132	1,840	2,987	5,604	9,020	11,844	64,305
	Percent of Total for Age Cohort	52.57%	21.45%	25.15%	28.51%	29.67%	32.03%	40.77%
Pyelonephritis	Number	1,104	1,004	1,625	1,473	1,305	1,005	2,548
	Percent of Total for Age Cohort	3.84%	11.71%	13.68%	7.49%	4.29%	2.72%	1.62%
Ulcer	Number	17	70	247	707	1,318	1,619	6,323
	Percent of Total for Age Cohort	0.06%	0.82%	2.08%	3.60%	4.34%	4.38%	4.01%

Table 4 outlines some of the relationships between age groups and the cost and length of stay of avoidable hospitalizations. The overall pattern suggests that avoidable hospitalizations are least likely to be experienced by individuals in their teenage and young adult years. As individuals age beyond their young adult years, however, the risk of avoidable hospitalization tends to increase. Also, young children are at higher risk of avoidable hospitalizations than teens or young adults.

Table 4: Age and Avoidable Hospitalization Costs (Averages for 1999-2001)

Age Group	Average Number of Discharges per Year	Percent of Discharges	Average Cost Per Stay	Average Length of Stay	Average Annual Costs	Percent of Annual Costs
1-10	9,594	9.79%	$5,444.09	3.07	$52,230,608	4.93%
11-19	2,859	2.92%	$8,370.45	3.64	$23,931,130	2.26%
20-29	3,942	4.02%	$9,077.47	4.03	$35,783,390	3.37%
30-39	6,553	6.69%	$9,346.79	4.23	$61,249,500	5.78%
40-49	10,113	10.32%	$10,864.11	4.72	$109,868,709	10.36%
50-59	12,325	12.58%	$12,061.26	5.1	$148,650,955	14.02%
60+	52,582	53.67%	$11,957.85	5.71	$628,763,436	59.29%
Totals	97,968	100.00%	$10,824.82	5.05	$1,060,477,728	100.00%

Avoidable Hospitalizations and Race

Table 5 presents data on avoidable hospitalizations by race. Historically, it has been possible to draw fairly accurate conclusions regarding the under- or over-representation of a particular racial group in a category such as "those experiencing an avoidable hospitalization." However, new Census categories related to race have made it much more difficult to relate the racial proportion in the general population to the data on race found in a database such as the Hospital Discharge Database. As a consequence, it is difficult to know for certain that persons of one race are actually experiencing different rates than persons of other races.

Table 5: Avoidable Hospitalizations by Race

Racial Group	Average Number of Avoidable Hospitalizations	Percent of Total
Black	31,959	33.27%
White	62,370	64.92%
Hispanic	1,743	1.81%
Asian	468	0.48%

However, it is still possible to make some tentative observations. This is particularly the case with data on African Americans, as there is less likelihood of there being confusion across categories. The data suggest that African American Georgians likely experience higher than expected rates of avoidable hospitalizations. This conclusion is based on comparing the proportion of African Americans in the state (28.7 percent according to the 2000 Census) to the proportion of avoidable hospitalizations associated with patients recorded as African American (33.3 percent).

This is further supported by the difference in median age between African-Americans and Caucasian Americans. Because the median age of African-Americans is less than that of Caucasian Americans, we would expect the avoidable hospitalization rate for African-Americans to be lower than for Caucasian Americans. Consequently, it is likely that were we able to control for age, the difference in the rates between Caucasians and African-Americans would be even greater than the difference in the nominal rates.

The low proportion of avoidable hospitalizations that is associated with Hispanics may be due, in part, to the fact that members of this ethnic group tend to be younger than average in the Georgian population. However, national data suggest that working-age and elderly Hispanics are more likely to experience an avoidable hospitalization than are non-Hispanic whites.[37]

When we examine the pattern of primary diagnoses of avoidable hospitalizations by race, we find some differences between the overall rates of avoidable hospitalizations by racial group and the rates for individual diseases. Specifically, we find that African-Americans have higher than expected numbers of primary diagnoses for asthma, heart failure, diabetes, gangrene, and hypertension, but lower than expected numbers of diagnoses for pneumonia, pyelonephritis, ulcers, and ruptured appendix. (The expected number for an individual disease for a racial group is assumed to be the same as the proportion of the overall avoidable hospitalization rate for that racial group applied to the total number for the individual diagnosis). Caucasians tend to have the opposite pattern of expected versus observed diagnoses of African-Americans.

Avoidable Hospitalizations and Gender

Table 6 presents data on avoidable hospitalizations by gender and condition. Pneumonia and heart failure account for the largest proportion of avoidable hospitalizations for both sexes. For all conditions except appendix, gangrene, and ulcers, females have higher rates of avoidable conditions than males. For hypertension, asthma, hypokalemia, and pyelonephritis, the difference in female and male rates of avoidable hospitalizations is substantial. The higher rate of hospitalization for females may be due, in part, to gender-related differences in the rate of disease. However, it also appears that rates of hospital utilization for women are more sensitive to socio-demographic factors. Specifically, among women, societal factors such as poverty and lack of access to health insurance may contribute to disparities in access to health services.[38]

Table 6: Avoidable Hospitalizations by Condition and Gender (Annual Average for Three Year Period)

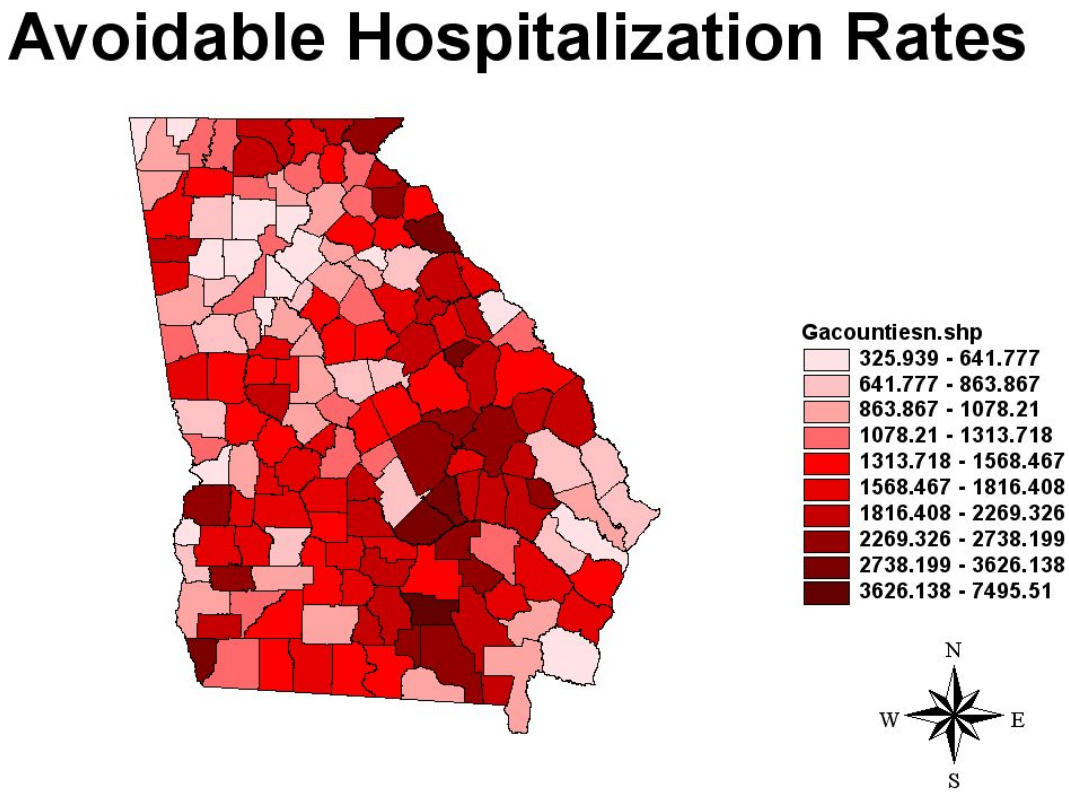
	Female		Male	
Condition	**Number**	**Rate**	**Number**	**Rate**
Asthma	6,056	145.61	3,894	96.67
Heart Failure	15,572	374.45	12,275	304.77
Appendix	701	16.86	1,058	26.26
Cellulitis	4,041	97.18	3,885	96.45
Diabetes	2,345	56.38	2,142	53.17
Gangrene	111	2.67	121	3.00
Hypertension	863	20.74	522	12.96
Hypokalemia	444	10.68	185	4.60
Immunizable	27	0.66	26	0.64
Pneumonia	19,673	473.05	17,238	427.98
Pyelonephritis	2,839	68.27	515	12.79
Ulcer	1,512	36.36	1,922	47.71
TOTAL	54,184	1,302.89	43,782	1,087.00

Rates and Cost of Avoidable Hospitalizations by County

Figure 3 presents a choropleth map of potentially avoidable hospitalization rates by Georgia county for the study period. The location of an avoidable hospitalization is defined as the county of residence of the hospital patient - not the county in which the hospital is located. Counties in darker red have higher rates of avoidable hospitalizations. These counties tend to be clustered in the rural areas of the state.

Of Georgia's 159 counties, 100 have avoidable hospitalization rates that are higher than the state average of 1,197 per 100,000 residents. Actual hospitalization rates may be higher in some counties for two reasons. First, residents in counties that are near health care centers in adjacent states may go to hospitals in these states and are not included in our data set. Second, counties where large military bases are located may have fewer reported hospitalizations and lower rates because the Georgia hospital discharge database does not contain data for military or federal hospitals. Also, special circumstances may bias county-by-county comparisons. For example, rates of counties with large proportions of young adults may be lower than would otherwise be the case.

Figure 3: Avoidable Hospitalization Rates by County



Avoidable Hospitalization Rates and Community Income

Table 7 presents avoidable hospitalization rates for counties with particular median incomes. The data suggest a fairly strong relationship between median income and rates of preventable hospitalizations: as median income rises, rates of avoidable hospitalizations fall. Moreover, the avoidable hospitalization rates of the lowest income communities are approximately four times that of the highest income communities.

Table 7: Avoidable Hospitalizations Rates and Median Income

Median Income	Avoidable Hospitalization Rate per 100,000 Population
<$25,000	2,199.39
>$25,000 and < $30,000	1,630.58
>$30,000 and < $35,000	1,376.82
>$35,000 and < $40,000	1,160.18
>$40,000 and < $50,000	918.49
>$50,000	598.94

Communities with High Rates of Avoidable Hospitalizations

As outlined in Table 8, 11 counties have hospitalization rates that are exceptionally high (above 2,600 per 100,000 residents). In addition to low income, the counties tend to have small populations and often are geographically distant from regional medical centers. These characteristics are often citied in the literature as influencing avoidable hospitalizations. The lack of access to medical care probably results in patients waiting until their condition demands a more serious level of treatment.

Table 8: Counties with High Avoidable Hospitalization Rates

County	Rate
ATKINSON	7,496
CLINCH	2,738
ELBERT	2,974
EMANUEL	2,650
GLASCOCK	3,482
JEFF DAVIS	2,736
LANIER	2,642
RABUN	2,718
SEMINOLE	3,120
TELFAIR	3,626
WHEELER	2,913

Avoidable Hospitalizations and Payment Type

Table 9 presents data on the relationship between avoidable hospitalizations and the type of payment made for both avoidable hospitalizations and all hospital services. These data suggest that payment source tends to be associated with the likelihood of being admitted for an avoidable or preventable condition. Specifically, patients with commercial insurance tend to be less likely than expected (i.e., given their total rate of hospitalization) to experience an avoidable hospitalization. Patients who are self-pay or whose medical bills are paid for by a government program (e.g., Medicare) tend to be more likely to experience avoidable hospitalizations.

Table 9: Avoidable Hospitalization and Payment Type (Totals for 1999, 2000, 2001)*

	Commercial Insurance	Georgia Better Health Care	Government Payer	Self-Pay
Number of Avoidable Hospitalizations	74,084	7,082	185,668	26,781
Number of All Hospitalizations	1,127,163	77,204	1,507,316	236,490
Percent of Avoidable Hospitalizations	25.23%	2.41%	63.24%	9.12%
Percent of All Hospitalizations	38.23%	2.62%	51.13%	8.02%
Avoidable as a Percent of All	6.57%	9.17%	12.32%	11.32%

*Percentages based on known payers. The entire data set had 8,439 discharges with unknown payers.

The relationship between payer type and rate of avoidable hospitalizations is complex in that the various payers are different in ways that substantially impact avoidable hospitalization rates. For example, within the government payer group, the Medicare group is comprised entirely of those who are over 65 years old or disabled, while the Medicaid group is comprised primarily of those under age 65 and is weighted more toward younger persons due to the association between poverty and age. A group that is comprised of those above age 60 will likely have much higher rates of avoidable hospitalizations than a group that is substantially younger. Therefore, when specific government payers are examined (Table 10), it becomes clear that the association between government payers and avoidable hospitalizations is due in large measure to the age-to-avoidable hospitalization relationship for the over age 65 Medicare population.

Similarly, with respect to the Medicaid population, one would expect the rate of avoidable hospitalizations to be lower. In fact, the data indicate that Medicaid avoidable hospitalization rates are very similar to those of individuals with commercial insurance. This finding seems to be counter-intuitive in that Medicaid patients are, by definition, persons with low-income who would be expected to have higher rates of avoidable hospitalizations than higher income, commercially

insured patients. However, this finding is understandable when one considers that the Medicaid population is more heavily skewed toward younger participants than is the commercial insurance group (i.e., approximately 22 percent of avoidable hospitalizations are experienced by persons age 60 and older with commercial insurance versus only 9.81% by persons age 60 and older with Medicaid).

The fact that self-pay patients are more likely than expected to experience avoidable hospitalizations is understandable in terms of economic interests. That is, persons who do not have health insurance may be more likely to forgo preventive medical care than persons who have insurance and, therefore, have fewer economic disincentives to seek preventive medical care. The risk of avoidable hospitalizations for persons in this payment group is even higher when one considers that the self-pay group is substantially younger, on average, than the commercial group.

The percent of avoidable hospitalizations within the Georgia Better Health Care group is slightly less than its share of total hospitalizations. This lower than expected avoidable hospitalization rate is likely due to the fact that this payer group is, on average, comprised of persons who are younger than participants in other payer groups.

Table 10: Medicaid and Medicare Hospitalizations

	Medicaid	Medicare	Total Hospitalizations	Medicaid Percent of Total	Medicare Percent of Total
Avoidable	31,440	153,386	293,945	10.7%	52.18%
All	501,499	983,818	2,956,612	16.96%	33.28%
Avoidable as % of All	6.27%	15.59%	9.94%		

Trends in Avoidable Hospitalizations

Table 11 presents data on the most recent three years of Georgia hospitalizations. As one would expect, the numbers of total hospitalizations and avoidable hospitalizations have both increased as overall resident populations have increased. However, the percentage of all hospitalizations that is considered to be avoidable has decreased by roughly .2 percent each year.

Table 11: Trends in Avoidable Hospitalizations

Year	All	Avoidable	Avoidable as a Percent of All
1999	957,985	96,913	10.12%
2000	986,485	97,678	9.90%
2001	1,012,142	99,354	9.82%
Total/Average	2,956,612	293,945	9.94%

From Raw Data to Usable Information

Analyses of the factors that contribute to avoidable hospitalizations may or may not have public policy implications. In order to establish a rationale for changing health care policies and programs we must identify the likely net benefits of a policy change. With respect to avoidable hospitalizations, we must weigh the cost of a proposed policy or program change against the benefits of the expected reduction in avoidable hospitalizations. While this is simple to state in theory, in practice, avoidable hospitalizations are events that are not common enough in the general population or explicit enough in their markers to allow policy makers to easily and accurately intervene prior to the events themselves.

Were everyone to experience an avoidable hospitalization with equal likelihood, we could simply implement programs designed to reach the general population and identify the point where the cost of the intervention becomes greater than the benefit. Or, were the markers for avoidable hospitalizations so clear that one could predict exactly who would experience such a hospitalization, we could target our program to these individuals. Because neither of these conditions is true, there is a danger that we will waste resources by either developing broad-spectrum programs that reach people who are not at risk or implementing effective and well-financed programs that are so narrowly targeted that they miss their mark.

The policy maker's first task is to identify the level of predictive accuracy needed to justify some investment in prevention programs. With sufficiently accurate prediction, we are able to target resources to individual patients (or parts of the health care system) that are sufficient to prevent unnecessary hospitalizations. Without sufficient accuracy in prediction, it is likely that the resources needed to prevent avoidable hospitalizations will be more costly than the avoidable hospitalizations themselves.

Even though avoidable hospitalizations may represent between seven and 14 percent of total hospitalizations, the relevant universe of cases from which we must make predictions is the entire population at risk. For a communitywide effort, this would include all the residents in the community. For a particular health plan, this would include all the members of the health plan. In previous studies of avoidable hospitalizations, the rate of persons experiencing avoidable hospitalizations was between one and two percent of the relevant population.[39]

For purposes of illustration, we will assume that we can design a program that prevents avoidable hospitalizations by identifying and educating patients (and their care givers). The previously discussed Pappas research suggests that our ability to improve the system of care and the behavior of patient groups may be quite limited. However, as suggested in the discussion of disease management, as we learn more about how to design and implement high quality programs of care and disease management, our ability to prevent unnecessary hospitalizations is likely to improve. Hence, while Pappas' research suggests that slightly less than a third of avoidable hospitalizations can realistically be avoided, a more optimistic estimate might be in the area of 50 percent.

Also, we need to consider that different geographic areas may provide greater opportunities for targeted prevention programs. In our analysis of avoidable hospitalizations in Georgia, the low income counties, on average, had rates of preventable hospitalizations that were approximately four times those of the high income communities. Were these high-risk communities able to match the hospitalization rates of the high-income community group, they would experience a 75 percent drop

in unnecessary hospitalizations. For illustration purposes, we will assume a 50 percent reduction in preventable hospitalizations to calculate an economically efficient budget for programs designed to prevent hospitalizations.

In estimating the value of an avoidable hospitalization, we need to consider not only the cost of the hospital stay but also the lost economic and leisure value of the unnecessarily hospitalized patient's time. Using our estimate of the number of unnecessary days of hospitalization and the value of this time based on the median income of Georgia residents, we estimate this lost-time value at approximately $39,218,728.81 per year.[40]

When we add the economic cost due to lost time to the direct cost of avoidable hospitalizations, we estimate the total economic loss at approximately $1,099,729,406 per year. Next, in order to estimate the value of a program that could move the state from its current rate of avoidable hospitalizations to a rate that is half the current rate, we calculate 50 percent of the economic loss due to avoidable hospitalizations, or $549,864,703.

One-half billion dollars represents the yearly economic value of a program that could meet the goal of reducing avoidable hospitalizations by half. It also represents the maximum expenditure that should be allocated to implement such a program.[41] Were more to be spent, the economic cost of the prevention program would exceed the expected benefits.

Spending the recommended amount on prevention programs for unnecessary hospitalizations will cost $5,612 per potentially avoidable hospitalization. In order to determine if it is cost effective to implement a prevention program, we need to know the per-patient cost. For illustration purposes, we will assume that an effective prevention program costs one-tenth of the economic cost of an avoidable hospitalization itself. Based on this assumption, the per-participant cost of a prevention program would be approximately $1,082. (This figure is comparable to a fairly effective diabetes prevention program that was reported to cost $2,780 per participant for a three-year period).[42] Assume further that for each person who receives the prevention program hospitalization is prevented 50 percent of the time.

In this scenario, the prevention program would be extremely cost effective if we had perfect knowledge of who was going to experience an avoidable hospitalization. In such a case, we would simply spend $1,082 on each person who was predicted to experience an avoidable hospitalization, and, in half the cases, it would be successful in saving approximately $11,224 per case. However, because it would only be successful half the time, one would need to spend $2,164 in order to achieve $11,224 in savings.

Using these figures and assumptions, it becomes possible to identify another crucial piece of program design information: the level of predictive accuracy that is needed to achieve a particular level of savings from a prevention program. That is, before going forward with a prevention program, one needs to know how many false positives on which one can expend program efforts in order to prevent an actual, unnecessary hospitalization.

The Current State of Predictive Ability

In any given year, if we simply choose a person at random and predict that that person will experience an avoidable hospitalization, we will be accurate in one to two percent of the cases. Based on an estimate of two percent of the patient population experiencing an avoidable hospitalization, we will, by chance, accurately predict that a person will experience an avoidable hospitalization only two out of every 100 times.

The most sophisticated analysis of avoidable hospitalizations conducted to date used regression analysis to identify the contribution of a number of demographic, health, and treatment factors to the probability of experiencing an avoidable hospitalization.[43] The researchers used this analysis to develop a number of predictive models and then applied these models to a data set of Medicaid patients. The best of their predictive models correctly identified approximately seven percent of those with an avoidable hospitalization. This is a substantial improvement over prediction by chance but is still very weak in predictive ability.

These results should not be surprising, however, as it is typically very difficult to achieve high predictive accuracy of events that are relatively rare. A seven percent predictive accuracy would be insufficient to justify the development of a program with 50 percent effectiveness. In this instance, we would end up spending too much of our budget on persons who did not need the program because they were not going to experience an unnecessary hospitalization in any event.

Despite problems in achieving a high rate of predictive accuracy, there are ways to develop population targets for which the accuracy of the prediction is sufficient to justify the cost of the program. Obviously, it is not possible to use any one factor *by itself* to identify persons who will experience avoidable hospitalizations, and while multivariate modeling provides only a weak predictive ability overall, it can be applied to the design of cost effective prevention programs. What makes the design of cost effective prevention programs feasible is the difference between overall predictive accuracy and the accuracy of predictions about the subgroups of people we expect to experience avoidable hospitalizations.

One can develop models that predict avoidable hospitalizations for a specific segment of the population. For example, when Lerch developed a model for Washington State Medicaid enrollees, it predicted that 890 of the Medicaid recipients would experience an avoidable hospitalization. Of these 890 people, nearly half (or 410 persons) actually had one or more avoidable hospitalizations. For this subgroup of people, the model had a predictive accuracy of nearly 50 percent. Using actual medical claims data, Lerch was able to estimate the value of preventing these hospitalizations at nearly $8.4 million.

Given our scenario assumptions, we can conclude that in order to go forward with a prevention program, we would need to accurately predict who is going to experience an avoidable hospitalization 20 percent of the time. That is, with an economic value of $11,224 per avoidable hospitalization, we should spend up to this value to prevent unnecessary hospitalizations. Because we must spend twice the per-participant cost of the program to achieve success, we can be wrong about our prediction in four of every five cases and still achieve net benefits. However, we need to be right about this prediction in at least 20 percent of the cases in order to insure that our expenditures will produce at least one prevented hospitalization for every ten persons exposed to the program.

Because we specified that our prevention program's cost is one-tenth of the cost of an avoidable hospitalization, we also know that we should only provide the prevention program to approximately five times the number of persons experiencing avoidable hospitalizations. If we were to offer it to more than this number, the cost of the program would outstrip the expected economic benefits. The program's reach should be only five times the number of avoidable hospitalizations because we can only *realistically* expect to be successful with half of the persons experiencing avoidable hospitalizations.

Given these scenario assumptions, the total number of persons who we would want to target in Georgia for participation in a prevention program with the cost, characteristics, and predictive accuracy outlined above would be approximately 50,000 persons.

Obviously, this scenario is only one of any number of scenarios that could be constructed. Depending on one's assumptions as to the cost and capability of any particular prevention intervention, the level of accuracy needed to make a program cost effective will change. Similarly, if we can achieve a higher level of accuracy in predicting who is likely to experience an avoidable hospitalization, we could increase the per-participant expenditures for prevention programs in order to make them more effective.

As we learn more about the relative cost and effectiveness of prevention efforts, we can begin to estimate the break-even points within the constraints of the current state of our ability to predict who will experience an avoidable hospitalization.

Managed Care

One of the most debated issues in health policy is the degree to which managed care can decrease the unnecessary use of hospitals for ambulatory care. With respect to managed care provision of Medicaid and Medicare health services, the issue is complicated by the lack of broad service availability and the potential for avoidance of patients who are most likely to need high levels of care. Table 12 presents data on all Georgia Medicaid (GBHC) and Medicare managed care hospital discharges, including avoidable hospitalizations, for the three-year study period. When one compares the avoidable percentage of all hospitalizations with comparable percentages for all Medicaid or all Medicare hospital patients, the evidence for a managed care benefit is mixed.

For the Medicaid-Managed Care group, the avoidable-to-all hospitalizations ratio is lower than the same ratio for the more inclusive all-Medicaid group (i.e., 6.02% versus 6.27%). However, the Medicare-Managed Care group's avoidable hospitalization ratio was higher than for the all-Medicare group (i.e., 17.05% versus 15.59%). It should be recognized that there may be unexpected differences in patients participating in these groups versus the fee-for-service Medicare and Medicaid groups. Consequently, drawing any definitive conclusions from these findings is difficult.

Table 12: Government Managed Care and Avoidable Hospitalizations

	All	Avoidable	Avoidable % of All
Medicaid Managed Care	15,793	950	6.02%
Medicare Managed Care	5,460	931	17.05%

Moving Toward Improved Disease Management

One of the ways in which states had hoped to move toward greater disease management was to increase reliance on managed care as a delivery model for Medicaid recipients. From 1991 to mid-1998, the proportion of Medicaid beneficiaries enrolled in managed care plans grew from 9.5 percent to 53.6 percent nationally.[44] Theoretically, managed care provides a framework within which care regimens can be more consistently achieved and self-care education and disease management can be targeted to those who need it. In reality, the advantages of managed care depend on the quality of the provider and the ability to maintain the member base over a long period of time. Because these factors vary, expected quality of care differences between managed care plans and other plans may not be evident. What is evident from the National Medicaid HEDIS Database/Benchmark Project is that certain managed care plans are very effective in achieving high levels of health care check-up and treatment compliance. [45]

The measures below were chosen because they are ones reported by a substantial number of Medicaid plans, are of special interest to the public health community, and are considered to be useful for charting practice differences among the states. Based on these criteria, the following nine measures were selected for reporting national benchmarks for the pilot year: childhood immunization status, adolescent immunization status, cervical cancer screening, check-ups after delivery, eye exams for people with diabetes, children's access to primary care providers (reported separately for each of three age groups), well-child visits, inpatient hospital utilization, and hospital emergency room visits. Details on these measures are presented in Table 13.

Table 13: Medicaid Benchmark Measures[46]

Benchmark	Definition	Range of Achievement
Childhood Immunization	Percentage of children who reached age 2 in the reporting year who received all 12 recommended immunizations	10 to 86%
Adolescent Immunization	Percentage of children who turned 13 in the reporting year who received the recommended second MMR immunization	0 to 91%
Cervical Cancer Screening	Percentage of women ages 21 through 64 who received one or more Pap tests during the reporting year or the two years prior to the reporting year	24 to 100%

Benchmark	Definition	Range of Achievement
Check-Ups After Delivery	Percentage of women who had a postpartum visit three to eight weeks after delivery	0 to 72%
Eye Exams for People with Diabetes	Percentage of members age 31 years or older with diabetes who received a retinal eye exam in the reporting year	10 to 99%
Children's Access to Primary Care	Percentage of children who saw a primary care provider during the year: Ages 12 to 24 months Ages 25 months to 6 years Ages 7 to 11 years	35 to 100% 32 to 97% 37 to 100%
Well-Child Visits	Percentage of children ages 3, 4, 5, or 6 who received one or more well-child visit(s) with a primary care provider during the year	22 to 90%
Inpatient Hospital Utilization, Acute Care Inpatient Hospital Utilization, Acute Care	Number of hospital discharges per 1,000 member months 12 days per 1,000 member months Average length of stay	0 to 103 1 to 7
Hospital Emergency Room Visits	Number of emergency room visits per 1,000 member months that do not result in admission 38 visits per 1,000 member	2 to 137

The data from the benchmark project also covered two plans that were Primary Care Case Management plans. The benchmark achievement of these plans tended to be in the middle of the range for at-risk managed care plans. What these data suggest is that while at-risk managed care plans are not inherently superior to other plans with respect to increasing the kind of adherence to health care regimens that are associated with successful avoidance of unnecessary hospitalizations, some of these plans do reach a level of achievement that suggests more effective avoidance of excess hospitalization.

Public Policy Strategy for the Future

Current predictive modeling capability is unlikely to provide sufficient accuracy to create large-scale prevention programs that are cost-effective on the basis of avoiding hospitalizations alone. However, states can take steps to both address the limitations in our knowledge base and to begin effective, well-targeted - though small-scale - prevention programs. First, states can support research designed to help boost the predictive accuracy of models used to account for additional factor contributions made to the "avoidable hospitalization" event.

Research using multivariate analysis to assess the contributions of the following factors could potentially lead to more accurate predictions of which resident or health plan member will experience an avoidable hospitalization:

- Location and access barriers experienced by patients with respect to receiving treatment
- Patient past behavior with respect to compliance with treatment recommendations
- Patient personality and behavioral health factors that might affect self-management of care and care-seeking behavior
- Care/treatment experience and satisfaction levels

Second, states can begin developing a variety of small-scale prevention programs that target subgroups for which there is adequate predictive accuracy with regard to avoidable hospitalizations. Each prevention program should be designed to test different theories as to the underlying causes of avoidable hospitalization events. Program designs should vary with regard to intervention approaches, subgroups targeted, and cost per program participant. It is important to track program effectiveness against expected rates of avoidable hospitalizations for persons in the impacted groups and subgroups. Because of the relatively small numbers involved, this type of research will need to be longitudinal in nature in order to afford a sufficient number of observations.

The purpose of developing various program designs is to allow future decision makers to identify optimal combinations of predictive accuracy, program impact, program coverage, and program cost. It may be that a low-cost program with less impact will, nevertheless, be more effective overall. Although the potential savings that can be achieved from reducing avoidable hospitalizations is very large, because of the relatively small numbers involved, we are unlikely to know if our prevention efforts will be cost effective without well-designed research.

On their own, the findings in this report certainly support increased investment in precisely targeted prevention programs. However, these findings should also be read in light of a more complete understanding of health and health care in the United States. Specifically, when we recognize that 40 percent of all deaths are caused by behavior patterns that can be prevented, it is likely that a case can be made for investing in more broadly-targeted prevention programs that address patient-based conditions and behaviors that lead to both avoidable hospitalization and early mortality.[47]

[1] Centers for Medicaid and Medicare Services. State Health Care Expenditures and Funding: 1980-1998. Baltimore MD. Found July 15, 2003 at: http://cms.hhs.gov/statistics/nhe/state-trends/ . Also, see: http://www.cms.hhs.gov/statistics/nhe/historical/chart.asp
[2] Op. cit., Centers for Medicaid and Medicare Services.
[3] Ibid.; Bernstein AB, Hing E, Moss AJ, Allen KF, Siller AB, Tiggle RB. *Health care in America: Trends in utilization*. Hyattsville, Maryland: National Center for Health Statistics. 2003.
[4] Medicare News, Wednesday, January 08, 2003, Report Details National Health Care Spending Increases In 2001
[5] Centers for Medicaid and Medicare Services, Health Indicators, Table 2: Found October 22, 2004 at http://www.cms.hhs.gov/statistics/health-indicators/t2.asp
[6] SOURCE: U.S. Department of Labor, Bureau of Labor Statistics: *CPI Detailed Report.* Citied by Centers for Medicaid and Medicare Services, Health Indicators Analysis 2. Found October 22, 2004 at http://www.cms.hhs.gov/statistics/health-indicators/analysispart2.asp
[7] *Source:*CMS, Office of the Actuary, National Health Statistics Group., June 2002, Section 1, Page 5.
[8] Jones-Vessey, Kathleen. Potentially Avoidable Hospitalizations in North Carolina, 1997. SCHS Studies: A Special Report Series by the State Center for Health Statistics, No. 118, November 1999. *Guide to Prevention Quality Indicators: Hospital Admission for Ambulatory Care Sensitive Conditions*. Department of Health and Human Services: Agency for Healthcare Research and Quality. www.ahrq.gov, October 2001
[9] Op.Cit., *Guide to Prevention Quality Indicators.*
[10] Jan Blustein, Karla Hanson, and Steven Shea. Preventable Hospitalizations and Socioeconomic Status; Failure to consider patients' characteristics may lead to the false conclusion that care is of poor quality. *Health Affairs*, Ma**r**ch**,** 1998 - April, 1998.
[11] Ibid.
[12]Op.Cit., *Guide to Prevention Quality Indicators.;*.; Wennberg, J. E., E. S. Fisher, and J. S. Skinner. 2002. Geography and the debate over Medicare reform. HealthAffairs 13:96-114. http://www.healthaffairs.org
[13] Billings J, Zeital L, Lukomnik J, et al. Analysis of variation in hospital admission rates associated with area income in New York City. Unpublished report
[14] Op.Cit., *Guide to Prevention Quality Indicators, p. 33.*
[15] Weissman, J. S., C. Gatsonis, and A. M.Epstein. 1992. Rates of avoidable hospitalization by insurance status in Massachusetts and Maryland. *Journal of the American Medical Association* 268 (17): 2388-94.
[16] Pappas G, Hadden W, Kozak Z, Fisher G. Potentially avoidable hospitalizations: inequalities in rates between US socioeconomic groups. *Am J Public Health* 1997.
[17] The American College of Physicians/American Society of Internal Medicine, No Health Insurance? It's Enough to Make You Sick, Nov. 30, 1999.
[18] Pharmacy consultations cut death, hospitalization rates. *Managed Care Weekly Digest F*ebruary_10,_2003
[19] Judy A. Stevens, Ph.D. , Sarah Olson, M.S Reducing Falls and Resulting Hip Fractures Among Older Women. Recommendations and Reports, March 31, 2000 / 49(RR02);1-12. *National Center for Injury Prevention and Control, Division of Unintentional Injury Prevention.*
[20] Wennberg JE, Barnes BA, and Zubkoff M. Professional uncertainty and the problem of supplier-induced demand. *Soc Sci Med* 1982; 16: 811-824.
Chassin MR. Explaining geographic variations: The enthusiasm hypothesis. *Medical Care* 1993; 31: YS37-YS44.
[21] ADULT ASTHMA INPATIENT ADMISSIONS: Reducing Hospitalizations With Better Outpatient Care. National Committee for Quality Assurance, Found at: http://www.qualityprofiles.org/quality_profiles/case_studies/Chronic_Illness/1_2.asp
[22]Research on case management is not consistently positive, but the following studies indicate improved health outcomes, lower costs, or both as a result of case management: K. Lorig et al., "Evidence Suggesting That a Chronic Disease Self-Management Program Can Improve Health Status While Reducing Hospitalization: A Randomized Trial," Medical Care 37, no. 1 (2000); J. Hawks et al., "The Virginia Health Outcomes Project: A Unique Approach to Lowering Medicaid Costs and Improving Health Outcomes," American Journal of Managed Care 2 (1996); M. Rich et al., "Multidisciplinary Intervention to Prevent the Readmission of Elderly Patients with Congestive Heart Failure," New England Journal of Medicine 333, no. 18 (1995). FA McAlister et al. A systematic review of randomized trials of disease management programs in heart failure. American Journal of Medicine 2001 110: 378-384.
[23] Avoidable Hospitalizations Among Medicaid Recipients in Washington State, Steve Lerch, Ph.D.
August 2002, Washington State Institute for Public Policy**.**
[24] Op. cit., Pappas, et. al. ; Op.Cit., *Guide to Prevention Quality Indicators.*
[25] Op.Cit., *Guide to Prevention Quality Indicators.*
[26] Op. cit., Pappas, et. al.
[27] Jones-Vessey, Kathleen. Potentially Avoidable Hospitalizations in North Carolina, 1997. SCHS Studies: A Special Report Series by the State Center for Health Statistics, No. 118, November 1999.
[28] Op. cit., Pappas, et. al.
87: 811-816. Ray N, Thamer M, Fadillioglu B, Gergen P. Race, income, urbanicity, and asthma hospitalizations in California: a small area analysis. *Chest* 1998; 113: 1277-1284. Bindman AB, Grumbach K, Osmond D, Komaromy M, Vranizan K, Lurie N, Billings J, Stewart A. Preventable
hospitalizations and access to health care. *JAMA* 1995; 274: 305-11. Culler S, Parchman M, Przybylski M. Factors related to potentially preventable hospitalizations among the elderly. *Medical Care* 1998; 36: 804-817.
[29] *Casanova C, Starfield B. Hospitalizat'lons of children and access to primary care: a cross-national comparison. Int J Health Serv. 1995;25:283-294.*
[30] *J Am Geriatr Soc 42: 2, 208-12, Feb, 1994* . Treatment seeking for urinary incontinence in older adults. Burgio KL, Ives DG, Locher JL, Arena VC, Kuller LH
[31] Avoidable Hospitalizations Among Medicaid Recipients in Washington State, Steve Lerch, Ph.D.
August 2002, Washington State Institute for Public Policy .
[32] Ibid.

[33] Goldman DP, Smith JP. Can Patient Self-Management Help Explain The SES Health Gradient? *Proceedings of the National Academy of Sciences United States of America,* Vol. 99, No. 16, August 6 2002, pp. 10929-10934.
[34] Disease management program significantly improves outcomes. *Health & Medicine Week* - December 16, 2002.
[35] Op. Cit. , Jones-Vessey.
[36] Pappas G, Hadden W, Kozak Z, Fisher G. Potentially avoidable hospitalizations: inequalities in rates between US socioeconomic groups. *Am J Public Health* 1997; 87: 811-816
[37] Laditka, J. N., S. B. Laditka, and M. P. Mastanduno. 2003. Hospital utilization for ambulatory care sensitive conditions: Health outcome disparities associated with race and ethnicity. *Social Science and Medicine* 57:1429-41.
[38] Iron, K and Goel, V. Sex differences in the factors related to hospital utilization: results from the 1990 Ontario Health Survey. Journal of Women's Health. 1998 Apr;7(3):359-69.
[39] Based on Op.Cit, Pappas who identified 3.1 million avoidable hospitalizations in 1990 when the U.S. population was 248 million.
[40] Based on Bureau of Economic Analysis, Median Income for a 4-Person Family, 2000 (Dollars) 59,489, Because adults are much more likely to experience hospitalizations, we divided family median income by 3, instead of by 4. Next we divided the result by 250 working days to achieve an economic value of $79.32 per day lost. Lost-time value = Number of hospital days (494437) * $79.32 = $39,218,728.81
[41] The analysis in this section does not attempt to address the problem presented by the fact that the State of Georgia would not be the recipient of all the savings that would be generated by a reduction in avoidable hospitalizations. It should be recognized that in purely economic terms the primary beneficiary of programs to prevent unnecessary hospitalization would be commercial and federal government health insurance providers.
[42] S. Teutsch. The Cost of Preventing Diabetes: What do we know and what do we need to know? *Diabetes Care*, January 1, 2003; 26(1): 238 - 239.
[43] Op.cit., Lerch.
[44] Lee Partridge. The Quality Of Care Provided By Medicaid Managed Care Plans. February 2000. American Public Human Services Association. Found at: http://www.cmwf.org/programs/quality/partridge_hedis_366.pdf ; NATIONAL MEDICAID HEDIS DATABASE/BENCHMARK PROJECT, Pilot-Year Experience and Benchmark Results, Lee Partridge ,American Public Human Services Association, February 2000.
[45] Ibid.
[46] Ibid.
[47] McGinnis, J. M. & Foege, W.H. (1993). Actual causes of death in the United States. Journal of the American Medical Association, 270(18), 2207-2212.