

**CHARACTERISTICS AND UTILIZATION PATTERNS OF  
HIGH-COST RECIPIENTS IN MEDICAID POPULATION**

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## SUMMARY

The primary objectives of this study were 1) to describe the characteristics and utilization patterns of Medicaid patients with high health care costs and 2) to assess the risk factors associated with those high-cost recipients. “High-cost” recipients were defined as those whose average monthly Medicaid expense was at or above the 90th percentile of the Medicaid fee-for-service population. Comparison recipients were randomly selected from the 5<sup>th</sup> through 90<sup>th</sup> percentiles. Based on this selection process, 23,965 non-nursing home recipients and 14,421 nursing home recipients were studied through retrospective data analysis of Ohio Medicaid claims from 1/1/1999 to 12/31/2000. Adjusted Clinical Groups® (ACG) software<sup>1</sup> was used to categorize population-based clinical characteristics for high cost. Logistic regression analysis was conducted to assess the risk factors associated with high cost utilization. Multiple regression analysis was used to estimate the relationship between Medicaid total expense and its associated economic determinants.

For the sample of non-nursing home recipients, there were 12,222 high-cost recipients with a total service cost of \$399 million (61% female, 26.5% black, average age 38.5, 53% disabled or blind, 6.5% deaths, and 45% with 10+ comorbidities) and 11,743 comparison recipients with a total service cost of \$30 million (59% female, 26.5% black, average age 22.4, 12% disabled or blind, 0.7%

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<sup>1</sup> Adjusted Clinical Groups (ACG) Software. The Johns Hopkins University Bloomberg School of Public Health. Baltimore, MD. 2001. <http://acg.jhsph.edu>.

deaths, and 10% with 10+ comorbidities). High cost recipients spent 13 times \$cost/per recipient more than comparison recipients. Major cost components were hospitalization, outpatient care, prescription drugs and mental health. For both non-nursing home high-cost and comparison recipients, mental health costs, as a proportion of total cost, was very high (26%-34%) for school-age children ages 6–17, followed by young adults ages 18-44 (12%), middle-age adults ages 45-64 (5%-10%), preschool children (4%) and elderly persons (2%-5%).

For the sample of nursing home recipients, there were 7,293 high-cost recipients with a total service cost of \$1.23 billion (42% female, 15% black, average age 46, 90% disabled or blind, 8.7% deaths, and 54% with 10+ comorbidities) and 7,128 comparison recipients with a total cost of \$406 million (72% female, 12% black, average age 81, 12% disabled or blind, 36% deaths, and 35% with 10+ comorbidities). Major cost components were long-term care, mental health services, and prescription drugs. Mental health illnesses were frequently diagnosed for over 65% of high cost recipients, and over 40% of comparison recipients.

Total Medicaid costs varied between non-nursing home recipients and nursing home recipients. The odds ratios of the risk for high cost also varied between both groups, i.e., 1.9- to 6.7-fold higher for disabled or blind recipients; 2- to 4.6-fold higher for recipients who died; 8%-38% higher per comorbidity; 80% higher for urban residents; and 35%-51% higher for males.

In conclusion, most high-cost Medicaid recipients were adults who had chronic diseases and many comorbidities. Controlling some comorbidities for high-risk recipients might control increased future health care costs. It is important to conduct evaluation programs (e.g., drug utilization review or disease management) for high-risk recipients who have severe chronic diseases and many comorbidities, as well as being disabled/blind eligible, short period of enrollment, being male, and/or live in urban areas. Due to high utilization of mental health services among school-age children and adolescents, it might be beneficial for Medicaid to cooperate with School-Based Health Centers that aim to prevent or control mental health illness. For nursing home residents, a major factor should be on the utilization of mental health services.

## INTRODUCTION

The enactment of Medicare/Medicaid legislation may have had the greatest impact on the US healthcare system. Medicaid covers families with low incomes, children, pregnant women, and people who are aged, blind, or disabled. The federal law requires that state programs include hospital care, physician care, diagnostic tests, family planning, and care in skilled nursing facilities (SNFs). States can also optionally include care in intermediate-care facilities (ICFs), dental care, drugs, eyeglasses, and other services. The Ohio Medicaid program provides health care coverage to mainly four different groups of low-income people:

- 1) Individuals who are disabled or blind;
- 2) Families with children up to age 19, pregnant women, and families in the Ohio Works First Program (OWF);
- 3) Uninsured children up to age 19 in families with incomes below 200% of the Federal Poverty Level; and
- 4) Persons age 65 or older, or individuals who are dual-eligible for Medicare and Medicaid. Many elderly persons reside in long-term institutions.

While Medicaid programs have been able to make healthcare more financially accessible to individuals, total health care spending in the Medicaid programs has

grown dramatically since the 1980s. The net expenditures of the national Medicaid program, which were at \$24 billion in 1980, grew to \$68.7 billion in 1990, \$184.7 billion in 1995, and \$314 billion in 2000 (Iglehart, 1993; Ku, Guyer, 2002). The average annual rate of this growth was 11.2% from 1980 to 2000 (Ku, Guyer, 2002). For the Ohio Medicaid program, total expenditures grew from \$6.0 billion in 1995, to \$6.3 billion in 1996, \$6.4 in 1997, \$6.6 billion in 1998, and \$7.0 billion in 1999 (Ohio Department of Job and Family Services, 1997-2001).

Many factors influence this tremendous growth in Medicaid expenditures. The Congressional Budget Office (CBO) indicates that the increase in total Medicaid expenditures is related mainly to health care inflation and changes in health service utilization (Ku, Guyer, 2002). The growth of Medicaid expenditures is also due to the expansion in the number of eligible Medicaid recipients, the large proportion of elderly recipients, increased prevalence of diseases such as diabetes mellitus and AIDS/HIV, and increased prices of prescription drugs and medical services (Iglehart, 1993; Pollard, Coster, 1991; Guo, et al., 1998). Higher Medicaid pharmacy expenditures also may be due to direct consumer advertisement and to higher entry-level drug pricing to Medicaid pharmacies. In addition, total Medicaid expenditures in the U.S. may be influenced by both the lack of an effective control mechanism for health care demand and appropriate cost-containment strategies to deal with the economic problem of information asymmetries. More specifically, individual coverage is largely assured, irrespective of cost accuracy and price of

prescription or other costs of health care (Levit, Lazenby, 1995; Guo, Gibson, Hancock, Barker, 1995).

Previous literature shows that a large percentage of Medicaid expenditures might be attributable to a relatively small percentage of Medicaid enrollees. Lee & Morehead (1984) reported that two-thirds of the costs associated with ambulatory Medicaid claims in the South Bronx, NY were generated by one-fourth of the Medicaid enrollees. There were on average 11.2 visits per year for patients living in the South Bronx compared to 9.8 visits per year for the general Bronx Medicaid population, based on 1979-1980 ambulatory claims data.

Kuhlthau et al. (1998) found that in four states (California, Georgia, Michigan, and Tennessee) costs for high-cost children on Medicaid (those for whom service costs were greater than \$10,000 annually) were 2.9-9.4 times higher than for other Medicaid children. Children with high expenditures were likely to have chronic diseases and use hospitals or long-term care. This study indicated that 10% of children with SSI enrollment and high costs accounted for 70% of the SSI Medicaid resources.

Mehl-Madrona (1998) reviewed medical charts of patients with frequent rural primary care visits in comparison to other randomly selected patients. Frequent users of rural primary care were more likely to come from younger or older age groups. They were insured by either Medicaid or Medicare. Those patients had

more mental health diagnoses and more emergency room visits than the comparison patients.

Despite these findings, high-cost users of Medicaid services have not been adequately characterized. The present study provides insight into the characteristics and utilization patterns of Medicaid patients with high health care costs using the Andersen-Newman model of health care utilization and data elements available within the Medicaid databases (Andersen, Newman, 1973; Andersen, 1995). The Andersen-Newman theoretical framework for health services utilization emphasizes the importance of the following aspects:

- 1) characteristics of the health services delivery system, i.e., Medicaid aid programs and community characteristic variables that make health service resources more readily available;
- 2) changes in medical technology and social norms relating to the definition and treatment of illness, i.e., disease diagnoses, complexity of care, and clinical variables that characterize the patient's illness or need for services; and
- 3) individual determinants of utilization, i.e., demographic variables and social structure factors that may predispose a patient towards high use of services.

## Objectives

The primary objectives of this study are:

- 1) to describe the characteristics and utilization patterns of Medicaid patients with high health care costs; and
  
- 2) to assess the risk factors associated with those high-cost recipients, including health care and social demographic factors.

This study provides descriptive information about patients with high health care costs, the high-cost services they use, and the clinical and social demographic factors associated with high cost utilization. Health care decision makers can use this information to plan more effective demand management strategies or interventions for managing future health care costs and utilization and ensuring appropriate utilization of limited Medicaid resources.

# METHODS

## Theoretical Framework

Based on the Andersen and Newman (1973) theoretical framework for health services utilization, high cost utilization is hypothetically a function of:

- 1) predisposing variables, such as patient demographic characteristics (age, sex, race, location);
- 2) enabling variables, such as Medicaid program enrollment (ADB, AFDC, CHIP, months of enrollment); and
- 3) need/clinical factors (death, number of comorbidities).

Analyses were conducted for two dependent variables using the following two models:

- Risk of being a high-cost utilizer (yes/no) as a function of patient demographics, Medicaid program enrollment, and clinical factors (Equation 1).
- Total cost of health care utilization (total dollar amount) as a function of patient demographics, Medicaid program enrollment, and clinical factors (Equation 2). The total cost is the sum of costs for hospitalization, physician visits, ER visits, outpatient medical care, prescription drugs, and others.

**Equation 1**

$$\begin{aligned} \text{HIGHCOST}_i &= \beta_1 \text{AGE} + \beta_2 \text{SEX} + \beta_3 \text{RACE} + \beta_4 \text{URBAN} + \beta_5 \text{AFDC} \\ &+ \beta_6 \text{ADB} + \beta_7 \text{CHIP} + \beta_8 \text{DEATH} + \beta_9 \text{ADGNUM} + \epsilon \end{aligned}$$

**Equation 2**

$$\begin{aligned} \text{TOTALCOST}_i &= \Sigma(\text{Hospital}, \text{Physician}, \text{ERVisit}, \text{Outpatient}, \text{Drug}, \text{Others}) \\ &= \beta_1 \text{AGE} + \beta_2 \text{SEX} + \beta_3 \text{RACE} + \beta_4 \text{URBAN} + \beta_5 \text{AFDC} \\ &+ \beta_6 \text{ADB} + \beta_7 \text{CHIP} + \beta_8 \text{DEATH} + \beta_9 \text{ADGNUM} + \epsilon \end{aligned}$$

## **Research Design**

The study design is a retrospective cross-sectional data analysis of the Ohio Medicaid medical, institutional, and pharmacy claims. The study period is from January 1, 1999 to December 31, 2000.

## Target Population and Samples

Approximately 1.3 million fee-for-service recipients had claims during the study period and served as the target population. Because of their inherent differences, the population of recipients was divided by living arrangement into two categories for analysis:

- 1) non-nursing home recipients; and
- 2) nursing home recipients.

To eliminate the confounding factors between the long-term care and non-nursing home settings, 38,174 recipients who had both nursing home claims and non-nursing home claims during the study period were excluded from the study.

A total of 38,386 recipients were selected for study. Figure 1 illustrates how these recipients were selected from the target population:

### *Non-Nursing Home Recipients:*

A total of 1,232,278 persons were identified as non-nursing home recipients during the study period. Of these, high-cost recipients were defined as those at the 90th percentile or higher in Medicaid monthly expenditures. An individual's *average monthly expense* is the sum of all Medicaid expenses for the recipient divided by total months of enrollment during the study period.

Ten percent of these high-cost recipients (12,323) were randomly selected as the initial study group. An equal number of recipients with Medicaid monthly expenses between the 5th percentile and the 90th percentile were randomly selected as a comparison group. After excluding recipients with missing data, age over 100, or age less than 0 (indicating anomalies in the data records), 12,222 recipients remained in the non-nursing home high-cost group, and 11,743 recipients remained in the comparison group. Recipients whose monthly expense was below the 5th percentile (due to incomplete claims or unusual utilization patterns) were excluded from the analyses.

*Nursing home recipients:*

A total of 73,258 recipients resided in a nursing home institution for their entire Medicaid enrollment during the study period. As in the non-nursing home group, high-cost recipients were defined as those who had Medicaid monthly expenses at the 90th percentile or higher. Thus, initially there were 7,326 recipients in the high-cost group. An equal number of recipients with Medicaid monthly expenses between the 5th percentile and the 90th percentile were randomly selected as a comparison group. After excluding recipients with missing data, age over 100, or age less than 0, 7,293 recipients remained in the high-cost nursing home group. All of these recipients were included in the study group without any further sampling or

exclusions. After exclusions, 7,128 recipients remained in the comparison group.

In the selection process, no attempt was made to match comparison recipients to specific high-cost recipients based on, for example, age, race or gender. Instead, the variability due to such factors was accounted for in the statistical models used for analysis. In addition, no adjustments were made in the cost across the two years for inflation or other factors that might result in cost differentials by year. Preliminary analyses indicated non-significant difference in cost by year.

## **Definitions for Dependent and Independent Variables**

The descriptive and inferential analyses were conducted using two dependent variables (high-cost recipient, total Medicaid expenditure) and several independent variables classified into the following categories:

- Demographic characteristics (age, gender, race, urban/rural location);
- Medicaid enrollment (Children Health Insurance Plan, Aid for Disabled and Blind, Aid for Family and Dependent Children, months of enrollment);
- Clinical factors (number of comorbidities, mortality status);
- Utilization patterns, expressed in terms of either service utilization (number of physician encounters, number of laboratory claims, length of hospital stay, number of emergency room visits, number of mental health care visits,

number of prescription drugs) or cost utilization (physician encounters, laboratory tests, hospitalization, emergency room visits, long-term care, mental health care, prescription drugs).

The operational definitions of each of these variables is as follows (listed in order as stated above):

*High-Cost Recipients (HIGHCOST):* A dichotomous dependent variable indicating whether or not a recipient was a high-cost utilizer (1 = high-cost group, 0 = comparison group).

*Total Medicaid Expenses (TOTALCOST):* A continuous dependent variable defined as the sum, over the two-year period, of charges in US dollars for a recipient's hospitalizations, emergency room visits, physician encounters, prescription drugs, laboratory tests, and other medical claims. These data were obtained from the Medicaid claims database.

*Age (AGE):* Recipient's age as of the last day of the study period, calculated as: (December 31, 2000 – date of birth) / 365.25. Data were extracted from the Medicaid eligibility file.

*Gender (SEX):* Gender was defined as male = 1 and female = 0. Data were extracted from the Medicaid eligibility file.

*Race (RACE):* Race was defined as African American = 1, white and other races = 0. Data were extracted from the Medicaid eligibility file.

*Urban and Rural (URBAN):* A dichotomous variable indicating whether a recipient resided in an urban county or a non-urban (rural) county during the study period. A county code for a recipient's residency was extracted from the Medicaid monthly eligibility file. Of the 88 counties in Ohio, the following 38 counties were categorized as urban counties: Allen, Athens, Auglaize, Belmont, Butler, Carroll, Clark, Clermont, Cuyahoga, Delaware, Fairfield, Franklin, Fulton, Geauga, Greene, Hamilton, Jefferson, Lake, Lawrence, Licking, Lorain, Lucas, Madison, Mahoning, Medina, Miami, Montgomery, Pickaway, Portage, Richland, Stark, Summit, Trumbull, Tuscarawas, Union, Warren, Washington, and Wood.

*Aid to Family and Dependent Children (AFDC):* A continuous variable indicating the percentage of months that a recipient was enrolled in Medicaid under aid to families with children under age 18 during the study period. Data were extracted from the Medicaid monthly eligibility file with aid category code = 4 (regular aid to dependent children) or 5 (aid to dependent children, unemployed parent).

*Children's Health Insurance Plan (CHIP):* A continuous variable indicating the percentage of months a recipient was enrolled in the CHIP or Ohio Healthy Start program during the study period. Data were extracted from the Medicaid monthly

eligibility file with recipient case type code = I (Healthy Start, children  $\geq$  ages 6-14 and up to 100% of poverty), J (Healthy start, children age  $<$ 19 and up to 150% of poverty), or K (CHIPS II, children with 150%-200% of poverty). Recipients must be 18 years old or younger to be eligible for the CHIP program.

*Aid for Disabled and Blind (ADB):* A continuous variable indicating the percentage of months a recipient was enrolled in Medicaid as a disabled or blinded person during the study period. Data were extracted from the Medicaid monthly eligibility file with aid category code = 2 (blind) or 3 (disabled).

*Months of Enrollment (MOSENROL):* The number of months that a recipient was enrolled in the Medicaid program during the study period. This is a discrete variable between 0 and 24. Enrollment data were extracted from the Medicaid monthly eligibility files.

*Number of Comorbidities (COMORB):* The number of Aggregated Diagnosis Groups (ADGs) based on groups of International Classification of Disease 9<sup>th</sup> revision (ICD9). All ICD9 disease codes were categorized into 32 ADGs. It is assumed that the more ADGs for a recipient, the more comorbidities the recipient has. The ADGs were defined by the Johns Hopkins University Bloomberg School of Public Health (Weiner, 2001: ACG software). (A description of this software appears later in this report.)

*Mortality Status (DEATH):* A dichotomous indicator (1=died, 0=did not die) to identify whether or not a recipient died during the study period. Dates of death were extracted from the Medicaid eligibility file.

*Number of Physician Encounters (PHYSVISITS):* The number of physician visits a recipient had during the study period. Data were extracted from medical claims with provider category code = 43 (physician).

*Number of Laboratory Claims (LABTESTS):* The number of claims for laboratory tests or services a recipient had during the study period. Data were extracted from medical claims with provider category code = 22 (physiological lab) and 23 (independent lab). These are outpatient tests only. Claims will not appear under provider categories 22 or 23 if tests were done as part of an inpatient hospitalization.

*Length of Hospital Stay (LOS):* The number of days that a recipient stayed in the hospital for inpatient medical treatment during the study period. Data were extracted only from institutional claims.

*Number of Emergency Room Visits (ERVISITS):* The number of emergency room visits a recipient had during the study period. These ER visits might have or might not have led to inpatient hospitalization. Data were extracted from both institutional and medical claims.

*Number of Prescription Drugs (RXNUM):* The number of prescriptions that were dispensed for a recipient during the study period. These prescriptions can be original or refills. Data were extracted from pharmacy claims.

*Number of Mental Health Care Visits (MENTALVISITS):* The count of mental health services, mental retardation services, and mental health support services for a recipient during the study period. Data were extracted from the medical file with provider category = 03 (mental inpatient hospital), 41 (mental health services), 42 (mental retardation services), 59 (mental health support services), and 60 (mental retardation support services).

*Cost of Physician Encounters (PHYS):* The total dollar amount that Medicaid paid for physician diagnosis or consultation fees in either a hospital or a private office for a recipient during the study period. Data were extracted from medical claims with provider category code = 43 (physician).

*Cost of Laboratory Tests (LAB):* The total dollar amount that Medicaid paid for medical laboratory test services, diagnosis agents, and equipment fees for a recipient during the study period. Data were extracted from medical claims with provider category code = 22 (physiological lab) and 23 (independent lab).

*Cost of Hospitalization (HOSP):* The total dollar amount that Medicaid paid for hospital accommodation, medical therapy services, physician encounters, and radiology diagnosis fees for a recipient's periods of hospitalization during the study period. Data were extracted from both the institutional and medical files.

*Cost of Emergency Room Visits (ER):* The total dollar amount that Medicaid paid for emergency room services, medical treatment, physician encounters, and radiology for a recipient's ER visits during the study period. Data were extracted from both the institutional and medical files.

*Cost of Long-term Care (LONGTERM):* The total dollar amount that Medicaid paid to skilled nursing, intermediate-care, and public and private institutional mental retardation facilities for a recipient during the study period. Data were extracted from the institutional file with provider category = 11 (skilled nursing facility), 13 (public ICF & mental retardation), 16 (ICF), and 18 (private ICF & mental retardation).

*Cost of Mental Health Care (MENTAL):* The total dollar amount that Medicaid paid for mental inpatient, mental health services, mental retardation services, and mental health support services for a recipient during the study period. Data were extracted from the medical file with provider category = 03 (mental inpatient hospital), 41 (mental health services), 42 (mental retardation services), 59 (mental health support services), and 60 (mental retardation support services).

*Cost of Prescription Drugs (RX):* The total dollar amount that Medicaid paid for prescription drugs, and pharmacy dispensing fees for a recipient during the study period. Data were extracted from pharmacy claims file.

*Cost of Other Outpatient or Medical Services (Other):* The total dollar amount that Medicaid paid for other outpatient or medical services, including: optometric services, hearing aids, ophthalmological services, podiatrists, clinic audiology, physical therapy, occupational therapy, professional nursing, and radiological services per recipient during the study period. Data were extracted from the medical file with other provider category codes.

## **Statistical Analyses**

The analyses consisted of two phases. The first phase was a descriptive analysis of the characteristics and utilization patterns of high-cost recipients compared to recipients in the comparison group. The second phase included logistic regression analyses to assess the risk factors associated with being a high-cost utilizer based on Equation 1, and multiple regression analyses to estimate the relationships between Medicaid total expense and its associated economic determinants based on Equation 2.

All statistical analyses were performed using SAS for Windows, version 8.1 (SAS Institute Inc., SAS Campus Drive, Cary, NC). Separate analyses were conducted for the non-nursing home group and the nursing home group. The major assumptions for regression analyses include an uncorrelated relationship between independent variables, homoscedasticity of variance for each variable, and no autocorrelation between dependent variables and independent variables.

### **Adjusted Clinical Groups® (ACG): Analyses of Population-Based Clinical Characteristics**

The Adjusted Clinical Groups® (ACG, Version 5.0) computer software, from the Johns Hopkins University Bloomberg School of Public Health, was developed to provide an overview of population-based clinical characteristics (Weiner, 2001). In general, clinical risk assessment can be defined as the process by which individual patients are measured and categorized on the basis of their health status or expected risk for health care. ACG-based risk assessment involves grouping persons with similar health status characteristics together on the basis of diagnostic information assigned by their providers over a period of time. ACG risk assessment has been used for evaluating the Medicaid population, health insurance groups, and provider performance as well as determining payment strategies (premiums, capitation rates, withhold returns, and other forms of budgeted payment).

The ACG software requires the following three basics of types of data elements:

- 1) A unique identifier for every study subject during the study period;
- 2) The age and gender of each study subject; and
- 3) All relevant ICD9 diagnosis codes assigned by providers for all encounters during the study period.

Aggregated Diagnostic Groups (ADG):

All ICD9 disease codes are categorized into up to 32 Aggregated Diagnostic Groups (ADGs). Based on the ICD9 diagnosis codes shown on a recipient's claims, the ACG software determines whether or not the recipient falls into the various ADGs. Each ADG essentially represents a different comorbid condition.

Adjusted Clinical Groups (ACG):

Adjusted Clinical Groups (ACGs) are mutually exclusive morbidity categories that have both clinical and administrative meaning. The software considers the different ADGs a patient has and assigns a single ACG for that patient. Thus, a patient might have several ADGs but will have only one ACG code. Individuals assigned to the same ACG have similar patterns of morbidity and similar needs for health care resources.

# RESULTS

## Phase I. Descriptive Data Analyses

### Demographics

Table 1 lists the demographic characteristics of recipients in both the high-cost and comparison groups. Of the 12,222 non-nursing home recipients classified as high-cost utilizers, 61% were female, 27% were African American, the average age was 38.5 years, 53% were ADB, and 6% died during the study period. Of the 11,743 recipients in the comparison group, 59% were female, 27% were African American, the average age was 22.4 years, 12% were ADB, and fewer than 1% died.

Although most of these differences are statistically significant due to the large sample size, the high-cost non-nursing home recipients are substantially different from the comparison recipients only in terms of age, ADB status, and death rate. The high-cost recipients were more likely to be older, be ADB eligible, and be at risk for death than the comparison recipients.

Of the 7,293 high-cost nursing home recipients, 42% were female, 15% were African American, the average age was 45.8 years, 90% were ADB, and 9% died during the study period. Of the 7,128 recipients in the comparison group, 71%

were female, 12% were African American, the average age was 81.1 years, 17% were ADB, and 36% died. Thus, the high-cost nursing home recipients were more likely to be male, be younger, be ADB eligible, and have a lower death rate than the comparison recipients.

### **Costs by Group**

The major cost components were different between the non-nursing home and nursing home populations. Table 2 summarizes the major cost variables in both the study and comparison groups.

- For the sample of non-nursing home recipients, Ohio Medicaid spent a total of \$398.8 million on the high-cost utilizers (average of \$32,600 per recipient) versus \$29.7 million on the comparison group recipients (average of \$2,500 per recipient) during the two-year study period. A much greater percentage of the high-cost recipients' total cost went to purchase hospital services, compared to the comparison group, while a greater percentage of the comparison group's total cost, compared to the high-cost group, purchased prescription services (Figure 2). "Other" outpatient services had the second highest percentage of total cost for both groups, with the high-cost group's percentage being somewhat higher. For both groups, about 11% of expenditures were for mental health services.

- For the sample of nursing home recipients, Ohio Medicaid spent a total of \$1.23 billion for high-cost utilizers (average of \$168,600 per recipient) versus \$406 million for comparison group recipients (average of \$56,900 per recipient) during the two-year study period. As illustrated in Figure 3, the major cost component for both groups was long-term care (80% for high-cost utilizers, 88% for comparison group recipients). Also, 11% of the high-cost utilizer expenditures vs. less than 1% of comparison group expenditures went for mental health services.

### **Costs by Age Category**

Health utilization patterns were different among age groups. Table 3 and Figures 4 through 11 summarize the major cost variables by age category for recipients in the high-cost and comparison groups.

#### *Non-Nursing Home Recipients*

The major cost characteristics for non-nursing home recipients were:

- The total cost for the high-cost non-nursing home group was relatively low for children (ages 0-17), increased dramatically for adults 18-54 years of age, largely because this age group has more recipients, and then decreased for older adults (age 55+) as the number of recipients decreased (Figure 4). Most health care resources were allocated for non-nursing home high-cost recipients ages 18-64. For the comparison group, the total cost

was highest for the 18-34 age category and then decreased as age increased.

- As illustrated in Figure 5, hospitalization costs accounted for 87% of the total cost for infants (age <1), 55% for pre-school children (age 1-5), 16%-33% for young and middle age adults (ages 18-64), and 5% for the elderly (age 75+). This compares to 60%, 23%, 6%-24%, and 10%, respectively, for the comparison group recipients. The large proportion of total costs for hospitalization among infants may reflect a high prevalence of premature illness after birth.
- Prescription drug cost, as a proportion of total cost, increased with age, i.e., 1% for infants, 2% for pre-school children, 7%-8% for children under age 18, and 11%-21% for adults and elderly persons (Figure 6).
- Mental health cost, as a proportion of total cost, was very high (26%-34%) for school-age children (ages 6-17), followed by young adults (12%-13%), middle-age adults (10%-5%), preschool children (4%), and elderly persons (2%-5%) (Figure 7).
- Other outpatient care cost proportion also increased with age from 7% for infants, to 38% for young adults, to 71% for elderly persons.
- Other patterns of utilization, as measured by the proportion of total cost related to the various types of services, varied by age and differed between high-cost and comparison group recipients.
  - Although the majority of the total cost for high-cost preschoolers (age 1-5 years) was for hospitalization services, the proportion is

substantially less than that for infants (55% vs. 87%). High-cost preschool children used a greater proportion of their total cost for “other” services, as compared to high-cost infants (33% vs. 7%). Compared to high-cost preschoolers, preschool children in the comparison group used substantially less hospitalization services (23% vs. 55%) and used more physician services (15% vs. 5%) and “other” services (47% vs. 33%).

- Smaller proportions of the total cost for high-cost recipients (2%-5%) were used for physician services than for the comparison group (10%-17%).
- For both groups, but particularly for the comparison group, the proportion of total cost for prescription drugs increased with age (from 1% to 21% for the high-cost group and from 3% to 52% for the comparison group) under age 75, then decreased slightly.
- For both groups, the proportion of total cost for long-term care services was very small (0%-2%), as expected for these non-nursing home recipients.
- With the exception of a greater decrease for the 18-34 age category (monthly cost from \$2,952 to \$2,351) and a slight increase for the 55-64 age category (monthly cost from \$2,495 to \$2,779), the average monthly cost for the high-cost recipients consistently decreased with age. For the comparison group, the percentages for all age groups fell in the \$100 to \$300 range.

### Nursing Home Recipients

- Approximately 3% of the high-cost group was children (age 1-17).  
There were no children in the comparison group. It is uncertain as to whether this is a characteristic of the high-cost group or an anomaly of the study's sampling procedure.
- For both the high-cost and comparison groups, the greatest proportion of total cost (77%-90%) was for long-term care services, as expected.
- Figure 8 charts the total cost of nursing home patients by age category. For the high-cost nursing home group, total cost increased with age between ages 0 and 17 years, increased dramatically for adults ages 18-54 years, and then decreased with age greater than 54 years. There was a 944% increase in total cost, accompanied by a similar (896%) increase in the number of recipients, between the 12-17 and 18-34 age groups. For the comparison group, total cost increased consistently with age, with a 39% increase between the 65-74 and 75+ age groups.
- As illustrated in Figure 9, the percentage of total cost for hospitalization services for nursing home high-cost patients was

higher in each age category than their comparison patients.

Approximately 14% of the total cost for high-cost preschool children was for hospital services, which is a substantially higher percentage than for the other age groups.

- The percentage of total cost for prescription drugs for nursing home high-cost patients ages 18+ was less than for comparison patients (Figure 10). For high-cost nursing home recipients, about 2%-4% of total costs in each age category was for prescription drug. About 6%-9% of total costs were for prescription drugs in the comparison recipients over age 17.
- The percentage of total cost for mental health visits for nursing home high-cost patients was substantially higher in each age category than for comparison patients (Figure 11). The percentages of total cost for mental health visits in both groups were relatively higher among young adults and middle age patients (ages 18-64) than other age groups. For high-cost adults age 18-54, approximately 11%-12% of their total cost was for mental health services. This higher percentage was not found in the comparison group.

## Health Utilization Variables

Table 4 summarizes the major health utilization variables for recipients in the high-cost and comparison groups, including ER visits, length of hospital stays, physician encounters, prescription drugs, home services, dental care, laboratory tests, and other outpatient care. Data indicate that high-cost groups in both non-nursing home and nursing home populations had more ER visits, longer lengths of hospital stays, more mental health visits, and more prescription drugs compared to their comparison groups. Figures 12-15 compare the high-cost and comparison groups in term of units of service per recipient, and costs per unit of health care service.

### Non-Nursing Home Recipients

- As illustrated in Table 4 and Figure 12, the high-cost recipients consumed more units of service per recipient than the comparison group for all types of services. On average, the high-cost group had 2.7 times (3.5 vs 1.3) more ER visits, 15.3 times more hospital days of stay, 3.8 times more physician visits, 9.2 times more mental health visits, 4.9 times more prescriptions, 1.1 times more dental visits, and 4.3 times more laboratory tests than the comparison group.
- As illustrated in Table 4 and Figure 13, the cost per unit of service was substantially higher for the high-cost recipients than the comparison

recipient across all types of services except laboratory tests. On average, the high-cost group incurred \$79.99 more per ER visit, \$489.13 more per hospital day of stay, \$19.50 more per physician visit, \$50.41 more per mental health visit, \$17.28 more per prescription, \$16.52 more per dental visit, and \$4.57 less per lab test than the comparison group.

### Nursing Home Recipients

- For all types of services, the high-cost recipients consumed more units of service per recipient than their comparison persons (Table 4 and Figure 14). On average, the high-cost group had 2.0 times as many ER visits, 2.0 times as many hospital days of stay, 1.4 times as many physician visits, 19 times as many mental health visits, 1.1 times as many prescriptions, 1.7 times as many dental visits, and 3.2 times as many lab tests as the comparison group.
- With the exception of dental visits, the cost per visit of service was substantially higher for the high-cost recipients than the comparison recipients (Table 4 and Figure 15). On average, the high-cost group incurred \$139.14 more per ER visit, \$770.53 more per hospital day of stay, \$17.40 more per physician visits, \$228.88 more per mental health visit, \$10.04 more per prescription, \$5.08 more per lab test, and \$6.42 less per dental visit than the comparison group.

## **Description of Population-Based Clinical and Disease Risk Factors**

The Adjusted Clinical Groups (ACG, Version 5.0) software, developed by Johns Hopkins University, was applied to provide an overview of population-based clinical characteristics. Summaries of the Adjusted Clinical Group (ACG) distribution and summary of Aggregated Diagnostic Group (ADG) distributions follow:

### *Adjusted Clinical Group Distribution:*

Table 5 summarizes the Adjusted Clinical Groups (ACG) distribution for the high-cost and comparison groups. Approximately 45% of the high-cost recipients had 10 or more Aggregated Diagnostic Groups with ACG codes 5010-5070, compared to 10% of those in the comparison group. Similarly, 54% of the high-cost nursing home recipients had these codes compared to 35% of those in the comparison group. Figure 16 presents the percentage of recipients with ACG codes 5010-5070 for non-nursing home patients, and Figure 17 presents the percentage of recipients with ACG codes 5010-5070 for nursing home recipients. More specifically, these frequent Adjusted Clinical Groups are as follows:

- ACG 5070, the most frequent clinical group for the high-cost non-nursing home recipients and both nursing home recipients, is defined as adults age

18+ with more than 10 aggregated diagnosis groups (ADG comorbidities) and 4 or more major diagnoses. Under ACG 5070, there were:

- 24% of the high-cost non-nursing home recipients as compared to 2% of the comparison non-nursing home recipients; and
- 22% of the high-cost nursing home recipients and 21% of the comparison nursing home recipients.

- ACG 5060, the second most frequent clinical ACG for the high-cost non-nursing home and nursing home recipients, is defined as adults age 18+ with more than 10 aggregated diagnosis groups (ADG comorbidities) and 3 major diagnoses. Under ACG 5060, there were:

- 10% of the high-cost non-nursing home recipients as compared to 2% of the comparison non-nursing home recipients; and
- 13% of the high-cost nursing home recipients as compared to 9% of the comparison nursing home recipients.

- ACG 5050, the third most frequent clinical ACG for the high-cost non-nursing home recipients and the fourth most frequent ACG for the nursing home recipients, is defined as adults age 18+ with more than 10 aggregated diagnosis groups (ADG, comorbidities) and 2 major diagnoses. Under ACG 5050, there were:

- 6% of the high-cost non-nursing home recipients as compared to 2% of the comparison non-nursing home recipients; and

- 11% of the high-cost nursing home recipients as compared to 5% of the comparison nursing home recipients.

*Adjusted Diagnostic Group Distribution:*

Table 6 summarizes the Adjusted Diagnostic Group (ADG) distributions for the non-nursing home and nursing home populations. It should be noted that recipients can be in multiple ADG categories, and thus the sum of the percentages in a column will exceed 100%.

Figure 18 charts the percentage of recipients with the most frequent group diagnoses in non-nursing home recipients. The non-nursing home high-cost recipients had more severe diseases in the following categories relative to their comparison recipients.

- Chronic diseases (ADGs 10, 11) (Adult-onset Type 1 diabetes, hypertension, sickle-cell anemia, cystic fibrosis, etc): 64% and 59%, respectively, of high-cost recipients versus 24% and 15%, respectively, of comparison group recipients;
- Major Infections (ADGs 3, 4) (impaction of intestine, hepatitis, arthritis, etc.): 45% and 30%, respectively, of the high-cost group versus 8% and 9%, respectively, of the comparison group;

- Mental health or psycho-social illness (ADGs 23, 24, 25): 31%, 40%, and 30%, respectively, of high-cost recipients versus 10%, 17%, and 6%, respectively, of comparison group recipients;
- Chronic eye disease (ADG 14): 30% of the high-cost group versus 21% of the comparison group;
- Progressive diseases (ADG 9) (Adult onset Type II diabetes, etc.): 26% of the high-cost group versus 4% of the comparison group;
- Asthma (ADG 6): 17% of the high-cost group versus 8% of the comparison group;
- Chronic orthopedic disease (ADG 12): 11% of the high-cost group versus 3% of the comparison group;
- Chronic ear, nose, throat diseases (ADG 13): 4% of the high-cost group versus 2% of the comparison group; and
- Malignancy/Cancer (ADG 32): 10% of the high-cost group versus 2% of the comparison group.

Figure 19 charts the percentage of recipients with the most frequent diseases in nursing home recipients. The nursing home high-cost group also had more severe diseases in the following categories relative to the comparison group:

- Chronic diseases (ADGs 10, 11) (Adult-onset Type 1 diabetes, hypertension, sickle-cell anemia, cystic fibrosis, etc): 74% and 51%, respectively, of high-cost recipients versus 55% and 65%, respectively, of comparison group recipients;

- Chronic eye disease (ADG 14): 59% of the high-cost group versus 38% of the comparison group;
- Mental health or psycho-social illness (ADGs 23, 24, 25): 8%, 65%, and 54%, respectively, of high-cost group versus 4%, 25%, and 42%, respectively, of the comparison group;
- Progressive diseases (ADG 9) (Adult onset Type II diabetes, etc.): 35% of the high-cost group versus 22% of the comparison group;
- Dental care (ADG 34): 21% of the high-cost group versus 3% of the comparison group;
- Allergies (ADG 5): 7% of the high-cost group versus 1% of the comparison group; and
- Asthma (ADG 6): 5% of the high-cost group versus 2% of the comparison group.

*The Most Frequent Diseases or Clinical Conditions for Recipients among the Two Most Frequent Adjusted Clinical Groups (ACG 5070 and ACG 5060):*

Recipients within the two most frequent Adjusted Clinical Groups (ACG codes 5070 and 5060) accounted for over one third of the high-cost utilizers among either non-nursing home or nursing home recipients.

Table 7 and Figure 20 summarize the 10 most frequently occurring 3-digit ICD9 diagnostic codes within ACG 5070 for non-nursing home recipients. The most commonly diagnosed diseases or conditions were:

- Respiratory system illness (64% of the high-cost group vs. 4% of the comparison group);
- Diabetes mellitus (45% of the high-cost group vs. 2% of the comparison group);
- Coma and other conscious symptoms (40% of the high-cost group vs. 2% of the comparison group);
- Abdominal pain (37% of the high-cost group vs. 2% of the comparison group); and
- Hypertension (24% of the high-cost group vs. 2% of the comparison group).

As illustrated in Table 7 and Figure 21, the most commonly diagnosed diseases or conditions for nursing home recipients with ACG 5070 were:

- Coma and other conscious symptoms (53% of the high-cost group vs. 34% of the comparison group);
- Respiratory system illness (48% of the high-cost group vs. 40% of the comparison group);
- Lung diseases (23% of the high-cost group vs. 12% of the comparison group);
- GI system illness (21% of the high-cost group vs. 15% of the comparison group); and

- Diabetes mellitus (19% of the high-cost group vs. 18% of the comparison group).

Table 8 and Figure 22 summarize the most frequent 10 diseases or conditions for recipients within ACG 5060 for non-nursing home recipients. The most commonly diagnosed diseases or conditions were:

- Respiratory system illness (18% of the high-cost group vs. 3% of the comparison group);
- Coma and other conscious symptoms (12% of the high-cost group vs. 2% of the comparison group);
- Diabetes mellitus (11% of the high-cost group vs. 2% of the comparison group);
- Abdomen pain (10% of the high-cost group vs. 2% of the comparison group); and
- Hypertension (8% of the high-cost group vs. 2% of the comparison group).

As illustrated in Table 7 and Figure 23, the most commonly diagnosed diseases or conditions for nursing home recipients with ACG 5060 were:

- Coma and other conscious symptoms (18% of the high-cost group vs. 9% of the comparison group);
- Mycobacterial pulmonary (11% of the high-cost group vs. less than 1% of the comparison group);

- Other specified mental retardation and unspecified mental retardation (11% and 9.47%, respectively, of the high-cost group vs. 0.29% and 0.43%, respectively, of the comparison group);
- Respiratory system illness (10% of the high-cost group vs. 11% of the comparison group);
- Dermatophytosis (8% of the high-cost group vs. 7% of the comparison group); and
- Epilepsy (6% of the high-cost group vs. less than 1% of the comparison group).

## **Phase II. Inferential Statistical Analyses for High-Cost Risk Factors**

Based on the theoretical framework developed for health services utilization, the risk factors for being a high-cost utilizer and for total Medicaid expense (total cost) are considered to be a function of patients' demographic variables (age, sex, race, location), Medicaid program enrollment (ADB, AFDC, CHIP, months of enrollment), and clinical factors (number of comorbidities, death). Description of these dependent and independent variables and the inferential statistical analyses are presented as follows:

## Description of Dependent and Independent Variables

### Variables for Non-Nursing Home Recipients:

Table 9 presents the descriptive data for each of the dependent and independent variables for the non-nursing home recipients. Because Medicaid recipients age 65 or older might be dual-eligible for both Medicaid and Medicare coverage under Title XX of the Social Security Act, the non-nursing home recipients are divided into two groups:

- 1) those age 64 or younger, and
- 2) those age 65 or older.

A greater percentage of the recipients age 64 or were ADB eligible (38% vs. 13%). Also, 27% of the <=64 age group were CHIP enrollees and 63% were Aid for Family with Dependent Children (AFDC) eligible. It is noted that both CHIP and AFDC cover children. The recipients <=64 were more likely to be male and to have fewer ADGs comorbidities (7.5 vs. 10), on average, than their age 65+ counterparts.

### Variables for Nursing Home Recipients:

Table 10 presents the descriptive data for each of the dependent and independent variables for the nursing home recipients.

The high-cost nursing home recipients had an average age of 46 years, with 12% elderly persons (age 65+), while recipients in the comparison group had an average age of 81 years, with 91% elderly persons. Of the high-cost nursing home recipients, 90% were ADB eligible, with an average of 11 ADG comorbidities. On the other hand, only 12% of the nursing home comparison group were ADB eligible, with an average of 8 ADG comorbidities.

### **Logistic Regression Analyses**

To assess the risk factors associated with high-cost utilizers, several logistic regression analyses were conducted based on the model expressed in Equation 1 (in the Methods section). Because both AFDC and CHIP cover children's enrollment, AFDC variable was dropped from the final regression model in the consideration of minimizing the multicollinearity problem. Table 11 summarizes the results from the logistic regression analyses for both the non-nursing home and nursing home recipients. Some of the major findings are:

- Aid for Disabled and Blind (ADB): Recipients eligible for ADB had a very high risk for being a high-cost utilizer. Compared to non-ADB eligible recipients, an ADB enrolled Medicaid recipient had a higher risk for being a high-cost utilizer for each of the following groups:
  - 1) 6.7-fold higher risk for non-nursing home recipients age 64 or younger;

2) 5.9-fold higher risk for non-nursing home recipients age 65 or older;  
and

3) 1.9-fold higher risk for nursing home recipients.

This is not surprising given that disabled and blind recipients require more health services and additional care.

- Death status (DEATH): Non-nursing home recipients who died during the study period had a higher risk for being a high-cost utilizer than recipients who did not die. On average, a recipient who died had a higher risk for being high-cost utilizer as follows:

1) 4.6-fold higher risk for non-nursing home recipients age 64 or younger; and

2) 2.0-fold higher risk for non-nursing home recipients age 65 or older.

This suggests that premature deaths may very likely involve severe disease conditions and require additional medical care. By contrast, a nursing home recipient who died during the study period had a lower risk (1.2 times less likely) for being a high-cost utilizer.

- Comorbid Conditions (ADGNUM): Recipients with more comorbidities were at higher risk for being a high-cost utilizer. For each additional comorbidity that a recipient had, the risk of being a high-cost utilizer increased by:

1) 38% for non-nursing home recipients age 64 or younger;

2) 20% for non-nursing home recipients age 65 or older; and

3) 8% for nursing home recipients.

This is not surprising given that recipients with more comorbid conditions require more health services and medical care.

- Urban residents (URBAN): Non-nursing home recipients age 64 or younger who lived in urban areas were at a higher risk for being a high-cost utilizer than those who lived in rural areas. Compared to non-urban residents, a non-nursing home urban recipient age 64 or younger had, on average, an 80% higher risk of being a high-cost utilizer. By contrast, a nursing home recipient who lived in an urban area had a 19% lower risk for having high-costs, while urban and rural non-nursing home recipients age 65+ were at equal risk of being a high-cost utilizer.
- Male (SEX): Both non-nursing home male recipients age 64 or younger and nursing home male recipients had a higher risk for being a high-cost utilizer than their female counterparts. Compared to female recipients, a male non-nursing home recipient age 64 or younger had, on average, a 35% greater risk of being a high-cost utilizer, and a male nursing home recipient had a 51% greater risk. The risk for high cost was no different between male and female non-nursing home elderly (age 65+) recipients.
- Age (AGE): Age had a mixed relationship with high cost utilization. For each additional year of age, the risk of being a high-cost utilizer:

- increased by 4% for non-nursing home elderly recipients;
- decreased by 10% for nursing home recipients;<sup>2</sup> and
- did not change for non-nursing home recipients age 64 or younger.

This suggests that older recipients among the non-nursing home elderly group had a higher risk for high cost utilization than their younger counterparts. By contrast, younger nursing home recipients had a higher risk for high cost utilization than their older counterparts. This may be because many younger nursing home recipients have a disability (ADB eligible).

- Children’s Health Insurance Plan (CHIP): The CHIP program applies only for children age 18 or younger. Less than 1% of nursing home recipients had partial enrollment in CHIP. Hence, the CHIP variable was included in the analysis only for non-nursing home recipients age 64 or younger. Medicaid recipients enrolled in the CHIP program had a 25% lower risk of being a high-cost utilizer.<sup>3</sup> This suggests that children enrolled in CHIP may have relatively good health status relative to non-CHIP enrolled children and adults under age 65.
- Months of Enrollment (MOSENROL): Months of Medicaid enrollment for non-nursing home recipients was directly associated with a lower risk of

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<sup>2</sup> Risk reduction was calculated as  $(1 - OR) = 1 - 0.90 = 10\%$ .

<sup>3</sup> Risk reduction was calculated as  $(1 - OR) = 1 - 0.75 = 25\%$ .

being a high-cost utilizer. On average, each additional month of enrollment in Medicaid lowered the risk of being a high-cost utilizer by:

- 1) 14% for non-nursing home recipients age 64 or younger; and
- 2) 6% for non-nursing home recipient age 65 or older.

The risk for high cost utilization did not change by months of enrollment for nursing home recipients.

- African-American Medicaid Recipients (RACE): African-American recipients in nursing homes had a 23% lower risk of being a high-cost utilizer than recipients with other racial categories. The risk for high cost utilization did not vary by race for non-nursing home recipients.

### **Multiple Regression Analyses**

Several multiple regression analyses were conducted to identify the determinants of total cost (Medicaid expenses). Because both AFDC and CHIP cover children's enrollment, AFDC variable was dropped from the final regression model in the consideration of minimizing the multicollinearity problem. Table 12 summarizes the results from the multiple regression analyses for both non-nursing home and nursing home recipients. The regression analyses were conducted separately for the high-cost group and the comparison group. This resulted in risk six regression models being tested:

- 1) high-cost non-nursing home recipients age 64 and younger;
- 2) comparison group non-nursing home recipient age 64 and younger;

- 3) high-cost non-nursing home recipients age 65+;
- 4) comparison group non-nursing home recipients age 65+;
- 5) high-cost nursing home recipients; and
- 6) comparison group nursing home residents.

The overall regression for each model is significant ( $p < 0.0001$ ). The models explain the variation of total Medicaid expenses to various degrees, as indicated by the R square values (the goodness of fit):

- Non-nursing home high-cost recipients age 64 or younger: 23.2%;
- Non-nursing home comparison recipients age 64 or younger: 47.7%;
- Non-nursing home high-cost recipients age 65 or older: 37.7%;
- Non-nursing home comparison recipients age 65 or older: 40.9%;
- Nursing home high-cost recipients: 69.8%; and
- Nursing home comparison recipients: 83.4%.

The results reconfirm some of the findings of the logistic regression analyses above. Note that the cost figures given below are for the period 1999-2000. They have not been adjusted to current (2003) dollars. The major findings are as follows:

- Aid for Disabled and Blind (ADB): Recipients eligible for ADB had much higher Medicaid expenses (total cost) than non-ADB recipients. Compared

to non-ADB eligible recipients, a ADB enrolled Medicaid recipient had the following higher total cost, on average, than a non-ADB enrolled recipient:

- 1) \$15,929 for non-nursing home high-cost recipients age 64 or younger;
- 2) \$1,528 for non-nursing home comparison recipients age 64 or younger;
- 3) \$27,329 for non-nursing home high-cost elderly recipients (age 65+);
- 4) \$1,488 for non-nursing home comparison elderly recipients;
- 5) No significant difference for nursing home high-cost recipients; and
- 6) \$7,031 for nursing home comparison recipients.

- Death (DEATH): Death has a mixed relationship with the total cost.
  - 1) Non-nursing home high-cost recipients age 64 or younger who died during the study period had \$13,968 higher cost than that those who did not die;
  - 2) Non-nursing home comparison recipients age 64 or younger who died during the study period had \$1,402 less cost than that those who did not die;
  - 3) Non-nursing home high-cost elderly recipients age 65+ who died during the study period had \$3,344 higher cost than that ones who did not die;
  - 4) There was no significant difference for non-nursing home comparison elderly recipients age 65+;

- 5) Nursing home high-cost recipients who died during the study period had \$4,032 higher cost than that ones who did not die;
  - 6) Nursing home comparison recipients who died during the study period had \$2,835 less cost than that ones who did not die.
- Comorbid Conditions (ADGNUM): Recipients with more comorbidities have higher total cost than recipients with fewer comorbid conditions. For each additional comorbidity, the total cost increased by:
    - 1) \$1,012 for non-nursing home high-cost recipients age 64 or younger;
    - 2) \$469 for non-nursing home comparison recipients age 64 or younger;
    - 3) \$380 for non-nursing home high-cost elderly recipients (age 65+);
    - 4) \$513 for non-nursing home comparison elderly recipients (age 65+);
    - 5) \$188 for nursing home high-cost recipients; and
    - 6) \$654 for nursing home comparison recipients.
  - Urban residents (URBAN): Both nursing home and non-nursing home urban recipients age 64 or younger had higher total cost than their non-urban counterparts.
    - 1) The total cost increased by \$4,686 for non-nursing home high-cost recipients age 64 or younger;
    - 2) The total cost increased by \$362 for non-nursing home comparison recipients age 64 or younger;

- 3) There was no significant difference between urban and non-urban high-cost non-nursing home elderly recipients;
  - 4) There was no significant difference between urban and non-urban comparison non-nursing home elderly recipients;
  - 5) The total cost increased by \$5,088 for nursing home high-cost recipients; and
  - 6) The total cost increased by \$4,977 for nursing home comparison recipients.
- Male (SEX): Gender had a mixed relationship with total cost.
    - 1) Non-nursing home high-cost male recipients with age 64 or younger had \$4,173 higher cost than their female counterparts;
    - 2) Non-nursing home comparison male recipients with age 64 or younger had \$161 less cost than their female counterparts;
    - 3) Non-nursing home high-cost male elderly recipients age 65+ had \$2,828 higher cost than their female counterparts;
    - 4) There was no significant difference in cost between non-nursing home comparison male elderly recipients and their female counterparts;
    - 5) There was no significant difference in cost between nursing home high-cost male recipients and their female counterparts;
    - 6) Nursing home comparison male recipients had \$1,164 less cost than their female counterparts.

- Age for Recipients (AGE): Age had a mixed relationship with total cost. For each additional year of age,
  - 1) Total cost decreased by \$398 for non-nursing home high-cost recipients age 64 or younger;
  - 2) Total cost increased by \$18 for non-nursing home comparison recipients age 64 or younger;
  - 3) There was no significant difference in cost for non-nursing home high-cost recipients age 65+;
  - 4) Total cost increased by \$63 for non-nursing home comparison recipients age 65+;
  - 5) Total cost decreased by \$350 for nursing home high-cost recipients; and
  - 6) Total cost decreases by \$248 for nursing home comparison recipients.
  
- Children's Health Insurance Plan (CHIP): Due to nature of the CHIP program, the CHIP variable was included only for non-nursing home recipients.
  - 1) There was no difference between CHIP and non-CHIP enrollees among high-cost recipients; and
  - 2) Non-nursing home comparison recipients enrolled in the CHIP program had \$2 lower total cost than non-CHIP recipients.

- Months of Enrollment (MOSENROL): More months of enrollment resulted in high total costs. On average, for each additional month of enrollment, the total cost increased by:
  - 1) \$1,478 for non-nursing home high-cost recipients age 64 or younger;
  - 2) \$20 for non-nursing home comparison recipients age 64 or younger;
  - 3) \$1,446 for non-nursing home high-cost elderly recipients;
  - 4) \$103 for non-nursing home comparison recipients;
  - 5) \$7,236 for nursing home high-cost recipients; and
  - 6) \$3,207 for nursing home comparison recipients.
  
- African-American Recipients (RACE): Race had a mixed relationship with total cost.
  - 1) Race had no significant relationship with total cost for non-nursing home high-cost recipients age 64 or younger;
  - 2) Race had no significant relationship with total cost for non-nursing home comparison recipients age 64 or younger;
  - 3) Race had no significant relationship with total cost for non-nursing home high-cost recipients age 65+;
  - 4) Non-nursing home African-American comparison recipients age 65+ had \$671 less cost than other racial backgrounds;
  - 5) Nursing home African-American high-cost recipients had \$6,245 higher cost than other racial backgrounds; and

- 6) Nursing home African-American comparison recipients had \$2,267 higher cost than other racial backgrounds.

## DISCUSSION

Based on results of the data analyses, there are some important findings, limitations, and policy implications.

### **Non-Nursing Home Recipients**

Differences were seen in the demographic characteristics between the high-cost recipients and their comparison counterparts. The high-cost recipients, i.e., recipients whose total average monthly Medicaid cost was at or above the 90<sup>th</sup> percentile, tended to be older (38.5 years vs. 22.4 years) and were more likely to be ADB enrollees (53% vs. 17%) than the comparison recipients. In addition, the high-cost recipients had a higher rate of death (6.5% vs. 0.7%). On the other hand, the high-cost recipients were roughly comparable to their comparison counterparts in terms of gender and race. These results suggest that high-cost recipients may have a greater predisposition towards poorer health status than their comparison counterparts due to their age and disability status, resulting in greater utilization of health services and the associated cost of that utilization.

The Ohio Medicaid program spent a total of \$398.8 million for the high-cost utilizers in the sample (\$32,627 per recipient) versus \$29.7 million for the non-high-cost recipients in the sample (\$2,527 per recipient). The higher total cost for the high-cost recipients was a result of not only a greater consumption of services but also a

greater average cost for units of service. This suggests that high-cost recipients not only require more services to manage their problems but also tend to receive more complex, extensive, and costly services. This substantial difference in cost warrants further examination of the underlying utilization patterns of high-cost utilizers and the predisposing, enabling, and need-related factors that may be determinants of high cost utilization of Medicaid services.

The adult population (recipients 18-64 years of age) comprised 65% of the high-cost utilizers and accounted for 68% of the total cost associated with high-cost utilizers. The average cost per adult recipient over the two-year period was \$34,041 as compared to \$3,606 per adult recipient in the comparison group. Three major cost components accounted for approximately 93%-95% of the total cost of the high-cost utilizers: hospital (27%-33%), prescriptions (12% -21%), and other outpatient services (35%-38%), depending on the age category of these adults. This broad and extensive use of services is understandable given the clinical nature of these high-cost adults. Approximately 42% of the high-cost utilizers were adults age 18+ with 10 or more comorbid conditions. Over 57% of these adults had 4 or more major ADGs (Aggregated Diagnostic Groups). This compares to only 9% and 24%, respectively, for the non-high-cost recipients.

Children (ages 0 –17) comprised 22% of the high-cost recipients and accounted for 21% of the total cost associated with high-cost utilizers. These children spent on average \$31,124 per person as compared to \$1,507 per person for their non-high-

cost counterparts. The utilization patterns of these children varied greatly by age level. For high-cost children less than 1 year of age, 87% of their total cost was used for hospital services and 7% for other outpatient services. This may be related to the higher prevalence of premature births among the Medicaid population. Approximately 18% of the high-cost infants had 6 or more ADGs as compared to only 4% of the non-high-cost infants. For high-cost preschool children (ages 1-5), 55% of the total cost was for hospital services and 33% for other services. This compares to 23% and 47%, respectively, for non-high-cost preschool children. Mental health services emerged as a major cost component for both the high-cost and non-high-cost school age children (ages 6-11) and adolescents (age 12-17), accounting for roughly 30% of the total cost for both the high-cost and non-high-cost groups. However, the high-cost children were heavier users of hospital services, which account for 19% of their total cost as compared to 8% of the total cost of their comparison counterparts.

Elderly adults (age 65+) comprised 13% of the high-cost utilizers and accounted for 12% of the associated costs of that group. The high-cost utilizers had an average total cost per recipient of \$28,243 as compared to \$4,781 for their non-high-cost counterparts. The utilization patterns of the high-cost elderly varied by age category. The younger elderly (age 65 –74) spent 21% of their total cost on hospital services, 20% on prescriptions, and 47% on other outpatient services as compared to 5%, 17%, and 71%, respectively, for the older elderly (age 74+). Even though the death rates for these two age categories are not substantially

different (18% vs. 22%), the older elderly may actually be using more non-hospital services in their final days. In addition, there may be a reluctance on the part of physicians to aggressively treat the older elderly through hospital-based services as compared to the younger elderly.

Similarly, the average monthly cost was higher for high-cost infants and preschool children, probably due not only to limited enrollment time but also to higher intensity services for more acute conditions. The average monthly cost was fairly consistent for other high-cost recipients (ages 6-75+), with costs being slightly less for the 65-74 and 75+ age groups. The average monthly cost was also fairly consistent for the comparison group with a slight upward trend with age.

### **Risk Factors for Being High-Cost Utilizers**

Based on the results of the logistic regression analyses, the major risk factors for being a non-nursing home high-cost utilizer can be summarized as follows:

- The greatest risk factor for being a high-cost utilizer was enrollment in Medicaid through the Aid for Disabled and Blind (ADB) eligibility category. Given the nature of ADB population, it is not unexpected that these enrollees would be at high risk for high costs. The study findings show that the likelihood of being a high-cost utilizer was substantially greater for recipients age 64 and younger than for age 65+ year old recipients (6.7 times vs. 5.9 times). This suggests that younger ADB enrollees require more extensive and more costly services than their non-ADB counterparts.

On the other hand, enrollment in CHIP reduced the risk of being a high-cost utilizer. Since CHIP is available only for children under age 19, this finding reflects the fact that children are usually healthier than their adult counterparts and thus require fewer and less costly Medicaid services.

- Irrespective of the type of enrollment program, the length of enrollment in Medicaid was a significant risk factor for high cost utilization. It is interesting that longer the period of enrollment, the lower the risk of being a high-cost utilizer. One possible explanation might be that recipients may enter Medicaid with a progressive disease state that requires acute care services, which by nature may be more extensive and costly, and then transition into a state where the need is for more preventive, maintenance, and/or chronic care services that may be less costly. An alternative explanation is that this finding may be an artifact of the definition of high-cost utilizer applied in this study. For the purposes of this study, a high-cost utilizer is a recipient whose average monthly expenses are above the 90 percentile. Thus, the longer enrollment period, the more likely that the average monthly expenses are lower, and thus, the less likely of being defined as a high-cost utilizer.
- The two variables included in the analysis as proxy indicators of the recipient's need for care (death, number of comorbid conditions) suggest that severity of illness is an important determinant of high-cost utilization. Death is the second greatest risk factor for being high-cost utilizer, which

reflects not only the severity of a recipient's medical condition but also the level of medical services extensively provided to prevent death. The death rate for the high-cost utilizer group was 6.5% as compared to 0.7% for the comparison group. The fact that the likelihood of death was substantially higher for the age <65 recipients than for the age 65+ recipients (4.6 times vs. 2.0 times) may suggest severe medical conditions resulting in premature deaths and/or more aggressive medical treatment in an attempt to avoid premature death among the younger enrollees. As expected, the number of comorbid conditions, which reflects greater severity of illness, was a significant risk factor for high-cost utilization. In general, the risk of being a high-cost utilizer increased with each additional comorbidity by 38% for the age <65 population and by 20% for the 65+ year old recipients. This differential likelihood of being a high-cost utilizer may be an indication of more severe and/or acute comorbidities among the younger recipients.

- Urban residency was a risk factor for high-cost utilization for recipients less than 65 years of age but not for recipients 65 years of age and older. The finding of this risk factor for the younger age group may reflect the cost differential between services provided in urban versus non-urban areas and/or the greater access to services and the broader range of services available in urban areas. There is no apparent explanation for the lack of significance of this risk factor for the 65+ age group.

- Two of the demographic variables included in the analysis were significant risk factors for high-cost utilization. For recipients younger than 65 years of age, males were at a 35% higher risk than females of being high-cost utilizers, which suggests that while females possibly tend to be higher utilizers of the health care system, males have a greater predisposition towards more severe health conditions. Since males and females 65 years of age and older were at equal risk of being high-cost utilizers, this notion of differential use and need may be conditioned on age. In fact, for recipients age 65+, age is a significant risk factor for being high-cost utilizers. Each additional year of age over age 65 increased the risk of being a high-cost utilizer by 4%. This is not surprising, since the older the age, the greater the need for Medicaid services. Race was not a significant risk factor for high cost utilization, indicating that African-American recipients are as likely as recipients of other racial backgrounds to be high-cost utilizers.

### **Determinants of Medicaid Expenses (Total Cost)**

The results from the multiple regression analyses suggest the following regarding determinants of total Medicaid costs for non-nursing home recipients. Note that all cost figures represent the two-year period (calendar years 1999-2000):

- An ADB eligible recipient was likely to have \$16,000-\$27,000 more expenses than a non-ADB eligible recipient among high-cost recipients, and about \$1,500 more expense than a non-ADB eligible recipient among

comparison recipients. These findings are expected given that disabled and blind recipients require more health services and medical care, and thus have higher Medicaid expenditures. On the other hand, for all practical purposes there is no difference in cost between CHIP and non-CHIP enrollees among high-cost and comparison group recipients after controlling for the other possible determinants.

- In addition, length of enrollment in Medicaid was a significant risk factor for higher Medicaid costs. For each additional month of enrollment, the total cost for a high-cost recipient increased by about \$1,450-\$1,480, and about \$20-\$100 for comparison recipients during the two-year period. It is expected that the longer a period is enrolled in Medicaid, the more likely that they will utilize health services, and thus accumulate the costs of those services.
- The two proxy indicators of severity of illness included in the analysis (number of comorbid conditions, death) were significant determinants of total Medicaid costs. For each additional comorbid condition, the total cost per recipient increased by about \$380-\$1,010 for high-cost recipients, and about \$470-\$510 for comparison recipients. This is not surprising because recipients with more comorbid conditions require more health services and medical care and thus would be expected to have higher costs. In addition, a high-cost recipient who died during the two-year period was likely to have

about \$3,300-\$13,900 higher cost than one who did not die. However, a non-high-cost recipient who died during this same time period had \$1,400 less cost than one who did not die. One possible explanation for these findings is that high-cost recipients tend to be younger and have severe chronic diseases. It is possible that their premature deaths may be costly due to severe disease conditions and additional medical care. By contrast, non-high-cost recipients who died were more likely to be elderly persons and not have as many severe chronic diseases. Therefore, their deaths led to less health care cost compared to recipients who did not die.

- Medicaid enrollees under age 65 who resided in urban areas were more likely to experience higher Medicaid costs than their non-urban counterparts. An urban recipient age 64 or younger had about \$4,680 more cost than a non-urban recipient among high-cost recipients age 64 or younger and \$360 more than a non-urban recipient among comparison recipients. However, there is no difference in cost for high-cost and comparison recipients by urban/non-urban location. While it is expected that recipients in urban areas may have access to more health services with high prices than rural recipients, there is no apparent explanation for the lack of significant difference for the older recipients.
- There was no consistent relationship between the demographics characteristics of the enrolled population (gender, age, race) and Medicaid

costs. High-cost male recipients had about \$2,800-\$4,100 more in total cost than their female counterparts. However, non-high-cost male recipients had \$160 less cost than their female counterparts. This suggests that high-cost males had a greater predisposition for more extensive, and more expensive, health services than females. On the other hand, for persons with more routine care needs, females had a slightly greater predisposition towards either more services, more costly services, or both. In addition, age was a mixed determinant for Medicaid expenses. For each additional year of age, the total cost decreased by \$400 among high-cost recipients age 64 or younger, and increased by \$18 for comparison recipients age 64 or younger and \$63 for recipients age 65 or older. This finding reflects the fact that most of the high-cost recipients were persons with severe diseases at younger ages. For comparison recipients, the total cost per recipient slightly increased with age. Racial background did not have a significant difference effect on Medicaid costs among high-cost recipients and comparison recipients age 64 or younger. However, an African-American comparison elderly recipient had about \$670 less cost than recipients with other racial backgrounds.

In general, these results are consistent with the notion that high cost utilization is directly associated with high need for services. The unanswered question is whether all of the services provided are in fact necessary and appropriate for the

underlying Medicaid conditions and health status of the population. This study is unable to address this critical issue.

## **Nursing Home Recipients**

High-cost nursing home recipients were more likely than non-high-cost counterparts to be male (58% vs. 28%), younger (average age 46 years vs. 81 years), and ABD enrollees (90% vs. 12%). In addition, high-cost recipients had a lower death rate than the comparison group (9% vs. 36%). One possible explanation for these demographic differences is that high-cost recipients enter nursing homes due to mental or physical disabling conditions, which require extensive services utilization, whereas non-high-cost recipients tend to be elderly persons that require lower level intermediate care services.

For nursing home recipients, the Ohio Medicaid program spent on average \$168,696 per high-cost utilizer and \$56,984 per person in the comparison group. For both groups, the average monthly cost per person generally decreased by age. In the high-cost group, the average monthly expenditure ranged from \$10,663 for preschoolers to \$7,613 for the most elderly. In the comparison group, the average monthly expenditure ranged from \$4,728 in young adults to \$3,122 in the most elderly. Since the decrease by age was seen in both groups, the dynamics influencing these decreases may be the same for both groups.

There were no high-cost infants, but children age 1-17 comprised 38% of the recipients and 3% of the total cost. On average, these high-cost children spent \$172,584 per recipient. For preschool children (ages 1-5), 77% of this total cost was for long-term care services and 14% was for hospital services. For the older children (age 6-17), approximately 84% of their total cost was for long-term care services and 3% -5% for hospital services. Approximately 6% of the total cost of adolescents (ages 12-17) was for mental health services.

The adult population age 18 –54 years comprised 72% of the high-cost recipients and 75% (\$921.8 million) of the total cost of high-cost recipients. This adult population comprised only 6% of the comparison group recipients and 9% of their total comparison group cost. Approximately 80% of the total cost of the adult high-cost recipients was for long-term care services, 12% for mental health services, and 2% for hospital services. This compares to 82%, 7%, and 1%, respectively, for non-high-cost adult recipients. Over 21% of the high-cost recipients were classified with the mental ADG category as compared to only 3% of the non-high-cost recipients. In addition, mental retardation was a frequent ICD9 diagnosis within the most frequently occurring ACG categories for the high-cost utilizers but not for recipients in the comparison group. Thus, the high-cost adult population appears to have consisted of persons with mental health problems that required extensive mental health services.

The 55+ age group comprised 25% of the high-cost utilizers and 22% (\$266.8 million) of their total cost. On average, this group spent \$145,244 per recipient as compared to \$54,993 per recipient for the comparison group. This age group comprised 95% of the comparison group recipients and 91% of the comparison group costs, although the 75+ age group by itself accounted for 77% of the comparison group recipients and 70% of the total comparison group costs. Approximately 79%-84% of the total cost of high-cost recipients was for long-term care services, with 5%-9% for mental health services and 4% for prescription drugs. This compares to 83%-90%, less than 3%, and 7%-9%, respectively for the non-high-cost comparison group. For the 75+ age members of the comparison group, 90% of their total cost was for long-term care services and 7% was for prescription drugs. Whereas the non-high-cost comparison group appears to have consisted of a substantial percentage of elderly persons requiring intermediate/skilled long-term care services, the high-cost group consisted of younger adults with a greater need for mental health services.

### **Risk Factors for Being High-Cost Utilizers**

Based on the results of logistic regression analyses, the major risk factors for being a high-cost utilizer can be summarized as follows:

- Nursing home recipients eligible for ADB were 1.9 times more likely than those not covered by the ADB program. This is expected given the health and medical need often associated with being disabled and/or blind. On the other hand, the length of enrollment in Medicaid was not a significant risk

factor for high cost utilization. This may be due to the fact that all of the recipients were enrolled in Medicaid for the purpose of receiving nursing home services, which was the major cost component of the total cost of these recipients.

- The two illness/need-related variables (number of comorbid conditions and death) had mixed effects on the likelihood of being a high-cost utilizer. For each additional comorbid condition, the chance of being a high-cost utilizer increased by 8%. On the other hand, a recipient who died was 1.2 times less likely to be a high-cost utilizer. The former result is consistent with the notion that more complex illness requires greater and typically more costly services, while the later finding is understandable given that the great majority of deaths occurred among 75+ year old non-high cost recipients, for whom costly Medicaid treatment may not have been aggressively pursued.
- Urban recipients were 1.2 times less likely than non-urban recipients to be high-cost utilizers. This is somewhat unexpected given that the cost of living in an urban area is generally higher than that in a non-urban area. Also, access to medical services is greater in urban than non-urban areas and the cost of urban services tend to be higher than the same services in non-urban areas.

- All three of the demographic characteristics (gender, age, and race) were significant risk factors for high-cost utilization. Male recipients were 1.5 times more likely than female recipients to be high-cost utilizers. African-American recipients were 1.3 times less likely than recipients of other racial backgrounds to be high-cost utilizers. For each addition year of age, the likelihood of being a high-cost utilizer decreased by 10%. Although the first two findings are expected, the latter result is due to the findings presented earlier pertaining to the cost of nursing home recipients. For both the high-cost and non-high-cost group, the total cost per recipient decreased as age increases, with the differences between the two average costs decreasing with age until age 75.

### **Determinants of Medicaid Expenses (Total Cost)**

The results of the multiple regression analyses suggest that following regarding the determinants of total Medicaid expenses for nursing home recipients:

- An ADB eligible recipient was likely to have \$7,000 higher costs than a non-ADB eligible recipient in the comparison group during the two-year period. This is expected given that disabled and blind recipients require more health services and medical care. However, there was no statistical significant difference in total cost between ADB eligible and non-ADB eligible high-cost recipients. One reason for this is that over 90% of high-cost nursing home recipients were ADB enrollees.

- Length of enrollment in Medicaid was a significant determinant of total cost for nursing home recipients. For each additional month of enrollment, the total cost for a recipient increased by \$3,200 for comparison recipients and \$7,200 for high-cost recipients in the two-year period. Over 80% of total cost for nursing home recipients were accounted for long-term care. Thus, each month in the nursing home contributed to the total cost of care for these recipients.
- The need/illness indicators (number of comorbid conditions, death) which are proxy indicators of severity of illness, had significant relationships with total costs. For each additional comorbid condition, the total cost for a recipient increased by \$180 for high-cost recipients and \$650 for comparison recipients in a two-year period. This is expected given that recipients with more comorbid conditions may require more and possibly more costly health services and medical care. Similarly, a high-cost recipient who died had about \$4,000 higher cost than that one who did not die. However, a non-high-cost recipient who died had \$2,800 less cost than that one who did not. One explanation is that 90% of the high-cost nursing home recipients were ADB eligible with an average age 46 years and with a substantial number of severe chronic conditions. Most nursing home recipients in the comparison group were elderly. It is possible that the high-cost recipients had more premature deaths and require more health

services. Consequently, the high-cost recipients who died had high total costs. For the nursing home comparison group, most of the non-high-cost nursing home recipients who died were elderly persons (over age 75) and may not have had a premature death or were not treated aggressively to prevent death. Hence, their total costs would be less than other recipients who did not die.

## **Limitations**

This study was limited to the Ohio Medicaid fee-for-service recipients. It may not be generalized to other populations because the Medicaid recipients are low-income people.

The number and type of variables within the Medicaid data files limited the application of the Andersen-Newman model for explaining the variation in health service utilization and costs within and between the high-cost and non-high-cost recipients of Medicaid services. Despite these limitations, the models analyzed in this study performed quite well as risk factors in predictor models; in some cases explaining over 83% of the variation.

## Conclusions

### Non-Nursing Home Recipients

- The Ohio Medicaid program spent an average 13 times more in cost per recipient on persons in the upper 10 percent of the average monthly cost distribution (high-cost utilizers) than on persons in the 5 percent to 90 percent of the distribution (comparison group).
- There were differences between the high-cost utilizers and the comparison group in terms of demographic characteristics, clinical characteristics, and health services utilization.
- Costs of care and service utilization varied substantially by age among the high-cost utilization population.
- Adults age 18-64 years were the major consumers of health care services among the high-cost utilizers, accounting for 65 percent of the high-cost population and 68% of the costs incurred by this population. These adults tended to be clinically complex persons with large number of comorbid conditions.
- High-cost utilizers required not only more services to manage their Medicaid conditions but also different types of services as reflected by both a greater consumption of services per recipient and a higher cost per unit of service.
- In comparison to the non-high-cost recipients, greater percentage of the total cost associated with the high-cost recipients was utilized for hospital services and other outpatient services and lesser percentages were used for prescription services.

- The high-cost utilizers were a clinically complex population with nearly half of this population having 10 or more comorbid conditions. Relative to the non-high-cost recipients, high-cost utilizers were significantly more likely to have chronic disorders (stable or unstable), major infections, and recurrent or persistent psychosocial problems.
- The major risk factor for being a high-cost utilizer was being blind or disabled, followed by being at risk for death, having more comorbid conditions, and being enrolled in Medicaid for a shorter period of time. ADB recipients were 6-7 times more likely than non-ADB recipients to incur high costs.
- For the high-cost utilizer population under age 65, the major determinants of cost were: being disabled or blind, being at risk for death, living in an-urban location, being male, being enrolled in Medicaid for longer periods of time, having a larger number of comorbid conditions, and being younger in age. With the exception of urban location and age, these same factors are the major determinants of cost the age 65+ high-cost population. Race was not significant in determining cost.

### **Nursing Home Recipients**

- The Ohio Medicaid program spent on average 3 times more in cost per recipient on persons in the upper 10 percent of the average monthly cost distribution (high-cost utilizers) than on persons in the 5 percent to 90

percent of the cost distribution (comparison group). This cost difference was substantially less than for non-nursing home recipients.

- There were differences between the high-cost utilizers and the comparison group in terms of demographic characteristics, clinical characteristics, and health services utilization.
- Costs of care and services utilization varied substantially by age among the high-cost utilization population. Adults age 18-54 years were the major consumer of health care resources among the high-cost utilizers, accounting for 72% of the costs. These adults appeared to have significant mental health problems that required extensive mental health services.
- In comparison to the non-high-cost recipients, a greater percentage of the total cost associated the high-cost recipients was utilized for mental health services, regardless of age. High-cost utilizers consumed 19 times more mental health visits at almost twice the per-unit cost than non-high-cost utilizers.
- High-cost utilizers were more clinically complex than their non-high-cost counterparts, but the differences were not as great for the non-nursing home population. Slightly under half of the high-cost utilizers had 10 or more comorbid conditions as compared to only 10% of the non-high-cost utilizers. Compared to the non-high-cost recipients, the high-cost utilizers were more likely to have stable, recurrent, or persistent psychosocial problems, preventive/administrative conditions, minor time limited infections, stable chronic conditions, discretionary conditions, and dental problems.

- The major risk factors for being a high-cost utilizer were: being disabled or blind, being male, not being black, living in a non-urban area, not being at risk for death, being younger, and having more comorbid conditions. In general, the effects of these risk factors for being a high-cost nursing home resident were less than for being a high-cost non-nursing home recipient. For example, ABD nursing home residents were only 1.89 times more likely than non-ABD residents to be a high-cost utilizer, while the odds ratio for non-nursing home residents was 6.72.
- The major determinants of total cost among the high-cost nursing home population were length of enrollment in Medicaid, black race, urban location, risk of death, younger age, and the number of comorbid conditions. ABD enrollment and gender had no effect on total cost within this population group.

## **Policy Implications**

High-cost utilizers do appear to be a clinically complex group of Medicaid recipients who utilize more, and more costly, health care services. On the other hand, these recipients appear to have diagnostic conditions similar to the non-high-cost recipients. Thus, without further analysis it is not possible to determine whether the levels of utilization and cost associated with the high-cost utilizers is in fact appropriate for their level of complexity. This implies the need to have further investigation on specific disease entities, such as diabetes, and to examine the service utilization and cost differences between high-cost and non-high-cost

recipients within those diseases. The challenge is to identify from administrative data the primary diagnosis, particularly for the high-cost utilizers.

There appears to be substantial differences in the nature of high-cost utilization between the nursing home and non-nursing home populations so as to warrant further investigation separately in both of these areas. While the cost differentials between high-cost and non-high-cost recipients are greater for the non-nursing population than for the nursing home population, the level of Medicaid expenditures and volume of services provided to nursing home residents justifies a focus on both areas.

For nursing home residents, a major factor should be on the utilization of mental health services. It is unclear from the analyses presented here whether high-cost utilizers have different mental health conditions (such as mental retardation versus dementia), from non-high-cost utilizers or whether they utilize different and/or more costly services for the same mental health conditions as non-high-cost recipients.

Since being disabled or blind is a major risk factor for high-cost utilization, particularly among the non-nursing home population, further investigation is warranted to give a better understanding of the types of services required to meet those needs. A particular area of focus should be on the adult population, who comprise the greater population of high-cost utilizers and who account for the greater percentage of cost.

Since death is also a major risk factor for high-cost utilization in non-nursing home recipients, further understanding of the issues regarding service utilization for dying patients is needed, particularly for patients under 65 years of age, regarding whether younger enrollees are at risk for premature death and regarding the extent to which aggressive medical treatment is being provided in an attempt to avoid premature death among younger enrollees.

This study is an improvement on the existing literature in many ways, and it provides useful information regarding major risk factors for high-cost utilizers of Medicaid. This study suggests at least four policy issues:

- 1) Preventing comorbidities for recipients with progressive chronic diseases (e.g., adult onset diabetes mellitus, hypertension, respiratory illness, mental health, etc.) can help control increased future health care costs.
- 2) It is important to conduct evaluation programs (such as drug utilization review or disease management) for high-risk recipients with severe chronic diseases and many comorbidities, being disabled/blind eligible, being male, and living in urban areas.
- 3) Due to high-cost utilization of mental health services among school-aged children and adolescents (ages 6-17), it is important for the Ohio Medicaid Program to cooperate with some School-Based Health Centers in order to prevent or control the mental health illness among these high-risk children and adolescents.

- 4) Because hospitalization accounted for a very high percentage of health care cost among infants and preschool-age children (age 1-5), it is necessary to promote educational programs for pregnancy women for preventing premature births, and enhance health services for these high-risk infants or preschool-age children aiming at preventing costly hospitalizations.

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**Table 1. Demographics and Medicaid Enrollments for Recipients in Study and Comparison Groups**

	Non-Nursing Home Recipients		Nursing Home Recipients	
	High Cost Group	Comparison Group	High Cost Group	Comparison Group
<b>Number of Recipients</b>	12,222	11,743	7,293	7,128
<b>Demographics</b>				
Gender				
female	61.34%	58.94%	41.94%	71.11%
male	38.66%	41.06%	58.06%	27.89%
Average Age	38.5 (0 - 99.8)	22.4 (0 - 97)	45.8 (1 - 98)	81.1 (19 - 99.9)
Race				
White	69.89%	69.13%	83.18%	86.98%
Black	26.54%	26.53%	15.38%	12.07%
Hispanic	2.00%	2.57%	0.64%	0.32%
Asian	0.36%	0.44%	0.14%	0.06%
Natives	0.11%	0.07%	0.08%	0.03%
Other	1.10%	1.25%	0.58%	0.55%
Urban location	80.31%	73.19%	74.94%	75.41%
Deaths	6.48%	0.66%	8.69%	36.24%
<b>Medicaid Enrollments</b>				
Average Months Enrolled	14.9 (1 - 24)	14.4 (1 - 24)	22.1 (1 - 24)	16.7 (1 - 24)
Children Health Insurance Plan (CHIP) or Healthy Start Program	11.95%	37.61%	~0%	0%
Aid to Disable/Blind (ADB)	53.12%	17.23%	90.39%	11.99%
Aid for Family Dependent Children (AFDC)	38%	73.16%	~0%	~0%

**Table 2. Description of Cost Variables for Recipients in Study and Comparison Groups**

Group	Num of Recipients	Total Cost\$	Average MosCost	Sum of Hospital\$	Sum of ER\$	Sum of Physician\$	Sum of Mental\$	Sum of Home Serv\$	Sum of Rx\$	Sum of Dental\$	Sum of Longterm\$	Sum of Labtest\$	Sum of Outpat.Others
<b><u>Non-Nursing Home Population</u></b>													
HighCost Study	12,222	398,770,000	2,679	122,780,000	9,528,395	20,023,570	44,408,571	7,913,034	59,665,818	1,288,113	1,017,362	469,095	131,673,499
%Cost		100%		30.79	2.39	5.02	11.14	1.98	14.96	0.32	0.26	0.12	33.02
Comparison	11,743	29,675,245	185	4,570,752	2,134,965	3,620,556	3,316,621	130,373	7,893,454	920,061	34,583	103,493	6,950,388
%Cost		100%		15.40	7.19	12.20	11.18	0.44	26.60	3.10	0.12	0.35	23.42
<b><u>Nursing Home Population</u></b>													
HighCost Study	7,293	1,230,300,000	7,863	33,737,619	5,432,183	5,317,422	130,570,000	9,777	44,288,058	866,625	990,360,000	902,798	18,859,167
%Cost		100%		2.74	0.44	0.43	10.61	0.00	3.60	0.07	80.50	0.07	1.53
Comparison	7,128	406,180,000	3,259	3,682,431	1,664,855	1,975,022	3,370,744	903	29,590,353	567,192	358,600,000	226,659	6,500,060
%Cost		100%		0.91	0.41	0.49	0.83	0.00	7.29	0.14	88.29	0.06	1.60

**Table 3. Description of Costs by Age Category for both Study and Comparison Groups**

Group	Age Group	Average MosCost	Enroll months	Deaths	Num of Recips	Total\$	Hosp\$	%hosp	Phys\$	%phys	Rx\$	%Rx	Long term\$	%long term	Mental\$	%mental	%Outpat. Others
<b>Non-Nursing Home Recipients</b>																	
Highcost group	<1	5,082	3	18	773	13,654,922	11,834,653	86.67%	728,796	5.34%	133,079	0.97%	0	0.00%	9,005	0.07%	6.95%
	1-5	3,858	11	27	781	28,160,431	15,553,532	55.23%	1,338,109	4.75%	652,563	2.32%	0	0.00%	1,250,504	4.44%	33.26%
	6-11	2,910	16	6	481	19,539,057	3,147,210	16.11%	429,493	2.20%	1,496,595	7.66%	156,576	0.80%	5,273,193	26.99%	46.25%
	12-17	2,592	15	7	628	21,527,666	4,685,929	21.77%	557,148	2.59%	1,732,758	8.05%	27,100	0.13%	7,389,492	34.33%	33.14%
	18-34	2,351	12	37	2,639	69,499,361	23,100,490	33.24%	3,486,141	5.02%	7,964,210	11.46%	37,239	0.05%	8,670,541	12.48%	37.76%
	35-44	2,519	17	88	1,922	70,368,609	19,081,658	27.12%	3,758,370	5.34%	13,175,554	18.72%	33,797	0.05%	9,149,243	13.00%	35.77%
	45-54	2,495	18	132	1,884	73,629,109	20,265,032	27.52%	4,174,318	5.67%	15,307,744	20.79%	65,011	0.09%	7,873,974	10.69%	35.23%
	55-64	2,779	18	150	1,474	56,069,780	18,783,051	33.50%	3,850,801	6.87%	10,628,361	18.96%	121,720	0.22%	2,901,849	5.18%	35.28%
	65-74	2,082	17	139	774	23,685,745	5,087,903	21.48%	1,173,460	4.95%	4,729,042	19.97%	208,506	0.88%	1,324,737	5.59%	47.13%
	75+	1,525	18	188	866	22,632,150	1,242,426	5.49%	526,935	2.33%	3,845,912	16.99%	367,414	1.62%	566,034	2.50%	71.06%
Compsm Group	<1	264	6	1	435	620,170	372,718	60.10%	104,485	16.85%	16,888	2.72%	0	0.00%	966	0.16%	20.17%
	1-5	130	14	2	2,259	3,326,263	758,711	22.81%	504,049	15.15%	229,087	6.89%	0	0.00%	262,132	7.88%	47.27%
	6-11	109	15	0	2,138	2,994,655	187,395	6.26%	294,555	9.84%	389,377	13.00%	0	0.00%	948,551	31.67%	39.23%
	12-17	129	15	1	1,597	2,749,708	255,020	9.27%	272,005	9.89%	393,324	14.30%	0	0.00%	721,007	26.22%	40.31%
	18-34	239	12	2	2,589	7,495,901	1,827,139	24.38%	1,162,872	15.51%	1,144,857	15.27%	0	0.00%	569,032	7.59%	37.25%
	35-44	234	15	1	996	3,697,098	394,597	10.67%	391,620	10.59%	1,437,828	38.89%	0	0.00%	433,150	11.72%	28.13%
	45-54	265	17	2	604	2,924,951	247,057	8.45%	352,540	12.05%	1,368,016	46.77%	3,374	0.12%	209,899	7.18%	25.44%
	55-64	296	19	11	427	2,529,530	232,749	9.20%	268,498	10.61%	1,292,787	51.11%	7,584	0.30%	111,980	4.43%	24.35%
	65-74	239	20	19	362	1,688,195	136,001	8.06%	157,868	9.35%	879,424	52.09%	9,138	0.54%	46,936	2.78%	27.18%
	75+	288	18	38	336	1,648,775	159,366	9.67%	112,064	6.80%	741,864	44.99%	14,487	0.88%	12,969	0.79%	36.88%
<b>Nursing Home Recipients</b>																	
Highcost group	1-5	10,663	18	3	19	3,190,419	442,719	13.88%	33,574	1.05%	80,983	2.54%	2,462,189	77.17%	27,422	0.86%	4.50%
	6-11	8,433	21	9	72	12,149,548	664,885	5.47%	84,511	0.70%	391,878	3.23%	10,198,431	83.94%	475,997	3.92%	2.75%
	12-17	7,813	22	6	151	26,425,664	762,626	2.89%	126,261	0.48%	834,494	3.16%	22,441,358	84.92%	1,552,318	5.87%	2.68%
	18-34	8,137	23	58	1,504	275,880,000	6,829,166	2.48%	1,129,431	0.41%	10,661,843	3.86%	220,310,000	79.86%	31,694,566	11.49%	1.91%
	35-44	7,851	23	67	1,905	340,740,000	5,039,380	1.48%	1,067,027	0.31%	11,281,450	3.31%	276,030,000	81.01%	41,883,228	12.29%	1.60%
	45-54	7,745	23	119	1,805	305,130,000	7,338,229	2.40%	1,169,316	0.38%	10,400,833	3.41%	246,070,000	80.64%	34,567,550	11.33%	1.83%
	55-64	7,789	21	141	988	151,350,000	7,407,627	4.89%	983,813	0.65%	6,048,050	4.00%	119,470,000	78.93%	13,345,259	8.82%	2.71%
	65-74	7,659	20	130	532	76,505,895	3,900,628	5.10%	544,072	0.71%	3,105,243	4.06%	60,756,912	79.41%	5,211,532	6.81%	3.90%
	75+	7,613	17	101	317	38,957,041	1,352,359	3.47%	179,417	0.46%	1,483,285	3.81%	32,624,628	83.75%	1,813,358	4.65%	3.86%
Compsm Group	18-34	4,768	21	4	41	4,160,998	71,692	1.72%	26,458	0.64%	251,427	6.04%	3,379,320	81.21%	283,019	6.80%	3.58%
	35-44	4,268	22	9	114	10,985,508	113,694	1.03%	57,468	0.52%	679,413	6.18%	9,016,370	82.08%	784,033	7.14%	3.05%
	45-54	4,117	21	18	236	20,543,866	272,403	1.33%	125,600	0.61%	1,710,612	8.33%	16,878,308	82.16%	961,153	4.68%	2.90%
	55-64	3,896	20	57	351	27,984,579	722,854	2.58%	247,750	0.89%	2,365,130	8.45%	23,144,752	82.71%	603,908	2.16%	3.22%
	65-74	3,425	18	228	895	57,714,819	667,822	1.16%	373,289	0.65%	5,198,030	9.01%	49,467,350	85.71%	455,208	0.79%	2.69%
	75+	3,122	16	2,267	5,491	284,790,000	1,833,965	0.64%	1,144,458	0.40%	19,385,741	6.81%	256,720,000	90.14%	283,424	0.10%	1.91%

**Table 4. Health Utilization Variables for Recipients in Study and Comparison Groups**

Group	Num of Recipients	Sum of MonthEnroll	Sum of ER visits	Sum of Length of Stays (days)	Sum of Physician Visits	Sum of MentalHth Visits	Sum of Home Services	Sum of Drug Rx	Sum of Dental Visits	Sum of Lab Tests
<b>Non-Nursing Home Recipients</b>										
<u>HighCost Study Group</u>	12,222	182,109	42,510	112,553	302,856	236,779	30,075	1,119,546	10,872	15,481
unit of service per recip			3.50	9.20	24.80	19.40	2.46	91.60	0.90	1.30
cost\$ per unit of service			\$224.14	\$1,090.86	\$66.12	\$187.55	\$263.11	\$53.29	\$119.48	\$30.30
<u>Comparison Group</u>	11,743	168,823	14,811	7,596	77,665	24,185	706	219,187	9,024	2,968
unit of service per recip			1.30	0.60	6.60	2.10	0.06	18.70	0.80	0.30
cost\$ per unit of service			\$144.15	\$601.73	\$46.62	\$137.14	\$184.66	\$36.01	\$101.96	\$34.87
<b>Nursing Home Recipients</b>										
<u>HighCost Study Group</u>	7,293	160,994	14,324	34,231	145,720	277,329	39	1,144,969	14,893	34,744
unit of service per recip			2.00	4.70	20.00	38.00	0.01	157.00	2.00	4.80
cost\$ per unit of service			\$379.24	\$985.59	\$36.49	\$470.81	\$250.69	\$38.68	\$58.19	\$25.98
<u>Comparison Group</u>	7,128	119,393	6,934	17,123	103,448	13,933	6	1,033,279	8,779	10,843
unit of service per recip			1.00	2.40	14.50	2.00	0.00	145.00	1.20	1.50
cost\$ per unit of service			\$240.10	\$215.06	\$19.09	\$241.93	\$150.50	\$28.64	\$64.61	\$20.90

**Table 5. Adjusted Clinical Groups (ACGs) Distribution among Study and Comparison Groups**

ACG code	Description	Highcost Non-NursingH		Comparison Non-NursingH		Highcost NursingH		Comparison NursingH	
		recips	percentage	recips	percentage	recips	percentage	recips	percentage
100	Acute Minor, Age 1	6	0.05%	52	0.44%		0.00%		0.00%
200	Acute Minor, Age 2-5	4	0.03%	231	1.97%		0.00%		0.00%
300	Acute Minor, Age 6+	8	0.07%	554	4.72%	10	0.14%	51	0.72%
400	Acute: Major	127	1.04%	246	2.09%	17	0.23%	153	2.15%
500	Likely To Recur, without Allergies	10	0.08%	235	2.00%	14	0.19%	33	0.46%
600	Likely To Recur, with Allergies		0.00%	30	0.26%		0.00%		0.00%
700	Asthma	2	0.02%	23	0.20%		0.00%		0.00%
800	Chronic Medical, Unstable	56	0.46%	38	0.32%	15	0.21%	140	1.96%
900	Chronic Medical, Stable	8	0.07%	54	0.46%	5	0.07%	30	0.42%
1000	Chronic Specialty	1	0.01%	1	0.01%		0.00%		0.00%
1100	Ophthalmological/Dental	14	0.11%	209	1.78%	30	0.41%	9	0.13%
1200	Chronic Specialty, Unstable	2	0.02%	5	0.04%	3	0.04%	65	0.91%
1300	Psychosocial, without Psychosocial Unstable	113	0.92%	187	1.59%	5	0.07%	2	0.03%
1400	Psychosocial, with Unstable, without Stable	58	0.47%	60	0.51%	7	0.10%	9	0.13%
1500	Psychosocial, with Unstable and Stable	49	0.40%	14	0.12%	10	0.14%	35	0.49%
1600	Preventive/Administrative	20	0.16%	389	3.31%	6	0.08%	5	0.07%
1710	Pregnancy: 0-1 ADGs		0.00%		0.00%		0.00%		0.00%
1711	..., Delivered	110	0.90%	34	0.29%		0.00%		0.00%
1712	...,Not Delivered	5	0.04%	69	0.59%		0.00%		0.00%
1720	Pregnancy: 2-3 ADGs, No Major ADGs		0.00%		0.00%		0.00%		0.00%
1721	...,Delivered	172	1.41%	86	0.73%		0.00%		0.00%
1722	...,Not Delivered	18	0.15%	100	0.85%		0.00%		0.00%
1730	Pregnancy: 2-3 ADGs, 1+ Major ADGs		0.00%		0.00%		0.00%		0.00%
1731	..., Delivered	120	0.98%	29	0.25%		0.00%		0.00%
1732	..., Not Delivered	7	0.06%	9	0.08%		0.00%		0.00%
1740	Pregnancy: 4-5 ADGs, No Major ADGs		0.00%		0.00%		0.00%		0.00%
1741	..., Delivered	95	0.78%	91	0.77%		0.00%		0.00%
1742	..., Not Delivered	18	0.15%	60	0.51%		0.00%		0.00%
1750	Pregnancy: 4-5 ADGs, 1+ Major ADGs		0.00%		0.00%		0.00%		0.00%
1751	..., Delivered	148	1.21%	54	0.46%		0.00%		0.00%
1752	..., Not Delivered	32	0.26%	21	0.18%		0.00%		0.00%
1760	Pregnancy: 6+ ADGs, No Major ADGs		0.00%		0.00%		0.00%		0.00%
1761	..., Delivered	69	0.56%	95	0.81%		0.00%		0.00%
1762	..., Not Delivered	11	0.09%	54	0.46%		0.00%		0.00%
<b>Table 5. (cont.)</b>									
1770	Pregnancy: 6+ ADGs, 1+ Major ADGs		0.00%		0.00%		0.00%		0.00%

1771 ..., Delivered	436	3.57%	216	1.84%	1	0.01%	15	0.21%
1772 ..., Not Delivered	205	1.68%	77	0.66%	21	0.29%	2	0.03%
1800 Acute Minor and Acute Major	140	1.15%	421	3.59%	20	0.27%	62	0.87%
1900 Acute Minor and Likely To Recur, Age 1	2	0.02%	62	0.53%		0.00%		0.00%
2000 ..., Age 2-5	3	0.02%	314	2.67%		0.00%		0.00%
2100 ..., Age > 5,w/out Allergy	6	0.05%	288	2.45%	6	0.08%		0.00%
2200 ..., Age > 5,with Allergy		0.00%	51	0.43%		0.00%	13	0.18%
2300 Acute Minor and Chronic Medical: Stable	8	0.07%	35	0.30%	5	0.07%	8	0.11%
2400 Acute Minor and Eye/Dental	3	0.02%	127	1.08%	10	0.14%	13	0.18%
2500 Acute Minor, Psychosocial, Without Unstable	23	0.19%	89	0.76%	1	0.01%	3	0.04%
2600 ..., Unstable without Stable	9	0.07%	11	0.09%	3	0.04%	5	0.07%
2700 ..., with Unstable & Stable	24	0.20%	8	0.07%	4	0.05%		0.00%
2800 Acute Major And likely To Recur	27	0.22%	92	0.78%	13	0.18%	29	0.41%
2900 Acute Minor and Major/Likely to Recur, Age 1	41	0.34%	95	0.81%		0.00%		0.00%
3000 ..., Age 2-5	63	0.52%	254	2.16%		0.00%		0.00%
3100 ..., Age 6-11	9	0.07%	128	1.09%		0.00%		0.00%
3200 ..., Age > 12,w/out Allergies	29	0.24%	162	1.38%	25	0.34%	27	0.38%
3300 ..., Age > 12, with Allergies	1	0.01%	27	0.23%	1	0.01%		0.00%
3400 Acute Minor/Likely To Recur/Eye & Dental	6	0.05%	134	1.14%	20	0.27%		0.00%
3500 Acute Minor/Likely To Recur/Psychosocial	33	0.27%	92	0.78%	6	0.08%	11	0.15%
3600 Acute Minor/Maj/Likely to Recur/Chronic Med:Stable	83	0.68%	207	1.76%	47	0.64%	22	0.31%
3700 Acute Minor & Major/Likely to Recur/Psychosocial	127	1.04%	183	1.56%	57	0.78%	33	0.46%
3800 2-3 Other ADG Combinations, Age 1-17	122	1.00%	425	3.62%	5	0.07%		0.00%
3900 ..., Male, Age 18-34	42	0.34%	74	0.63%	24	0.33%	2	0.03%
4000 ...,Female, Age 18-34	36	0.29%	89	0.76%	14	0.19%		0.00%
4100 ..., Age >34	237	1.94%	256	2.18%	311	4.26%	691	9.69%
4210 4-5 Other ADG Combinations, Age 1-17, No Major A	75	0.61%	422	3.59%	5	0.07%		0.00%
4220 ..., Age 1-17, 1 + Major ADGs	120	0.98%	115	0.98%	9	0.12%		0.00%
4310 ..., Age 18-44, No Major ADGs	37	0.30%	135	1.15%	104	1.43%	2	0.03%
4320 ..., Age 18-44, 1 Major ADG	123	1.01%	107	0.91%	119	1.63%	3	0.04%
4330 ..., Age 18-44, 2 + Major ADGs	114	0.93%	34	0.29%	31	0.43%	1	0.01%
4410 ..., Age >44, No Major ADGs	39	0.32%	58	0.49%	118	1.62%	81	1.14%
4420 ..., Age >44, 1 Major ADGs	150	1.23%	98	0.83%	126	1.73%	321	4.50%
4430 ..., Age >44, 2+ Major ADGs	185	1.51%	67	0.57%	59	0.81%	403	5.65%
4510 6-9 Other ADG Combinations, Age 1-5, No Major AD	21	0.17%	146	1.24%		0.00%		0.00%
4520 ..., Age 1-5, 1+ Major ADGs	186	1.52%	121	1.03%		0.00%		0.00%
4610 ..., Age 6-17, No Major ADGs	57	0.47%	332	2.83%	10	0.14%		0.00%
4620 ..., Age 6-17, 1+ Major ADGs	189	1.55%	141	1.20%	45	0.62%		0.00%
<b>Table 5. (cont.)</b>								
4710 ..., Male, Age 18-34, No Major ADGs	17	0.14%	11	0.09%	49	0.67%	1	0.01%
4720 ..., Male, Age 18-34, 1 Major ADGs	64	0.52%	46	0.39%	115	1.58%	2	0.03%
4730 ..., Male, Age 18-34 2+ Major ADGs	130	1.06%	27	0.23%	104	1.43%	6	0.08%

4810 ..., Female, Age 18-34, No Major ADGs	21	0.17%	65	0.55%	23	0.32%	1	0.01%
4820 ..., Female, Age 18-34, 1 Major ADG	55	0.45%	85	0.72%	71	0.97%		0.00%
4830 ..., Female, Age 18-34, 2+ Major ADGs	54	0.44%	36	0.31%	54	0.74%	2	0.03%
4910 ..., Age >34, 0-1 Major ADGs	344	2.81%	359	3.06%	904	12.40%	411	5.77%
4920 ..., Age >34, 2 Major ADGs	411	3.36%	173	1.47%	413	5.66%	606	8.50%
4930 ..., Age >34, 3 Major ADGs	388	3.17%	74	0.63%	130	1.78%	467	6.55%
4940 ...! Age >34, 4+ Major ADGs	165	1.35%	20	0.17%	47	0.64%	165	2.31%
5010 10+ Other ADG Combinations, Age 1-17 No Major A	30	0.25%	92	0.78%	8	0.11%		0.00%
5020 ..., Age 1-17, 1 Major ADGs	132	1.08%	108	0.92%	17	0.23%		0.00%
5030 ..., Age 1-17, 2+ Major ADGs	451	3.69%	60	0.51%	114	1.56%		0.00%
5040 ..., Age 18+, 0-1 Major ADGs	230	1.88%	245	2.09%	511	7.01%	80	1.12%
5050 ..., Age 18+, 2 Major ADGs	761	6.23%	269	2.29%	788	10.80%	323	4.53%
5060 ..., Age 18+, 3 Major ADGs	1165	9.53%	250	2.13%	929	12.74%	652	9.15%
5070 ..., Age 18+, 4+ Major ADGs	2917	23.87%	241	2.05%	1630	22.35%	1464	20.54%
5100 No or Only Unclassified Diagnoses & Non-Users		0.00%		0.00%		0.00%		0.00%
5110 No or Only Unclassified Diagnoses (2 input files)	31	0.25%	115	0.98%	19	0.26%	9	0.13%
5200 Non-Users (2 input files)	18	0.15%	551	4.69%	25	0.34%	660	9.26%
5310 Infants: 0-5 ADGs, No Major ADGs	246	2.01%	153	1.30%				
5311 ..., Low Birth Weight		0.00%		0.00%				
5312 ..., Normal Birth Weight		0.00%		0.00%				
5320 Infants: 0-5 ADGs, 1 + Major ADGs	162	1.33%	24	0.20%				
5321 ..., Low Birth Weight		0.00%		0.00%				
5322 ..., Normal Birth Weight		0.00%		0.00%				
5330 Infants: 6+ ADGs, No Major	20	0.16%	11	0.09%				
5331 ..., Low Birth Weight		0.00%		0.00%				
5332 ..., Normal Birth Weight		0.00%		0.00%				
5340 Infants: 6+ ADGs, 1+ Major ADG	116	0.95%	5	0.04%				
5341 ..., Low Birth Weight		0.00%		0.00%				
5342 ..., Normal Birth Weight		0.00%		0.00%				
<b>Total Recipients</b>	<b>12222</b>		<b>11743</b>		<b>7293</b>		<b>7128</b>	

**Table 6. Adjusted Diagnostic Group (ADG) Distribution among Study and Comparison Groups**

ADG Group	Description	Non-Nursing Home Recipients		Nursing Home Recipients	
		High Cost %	Comparison %	High Cost %	Comparison %
adg1	Time Limited: Minor	39.90	26.71	45.08	21.21
adg2	Time Limited: Minor-Primary Infections	53.37	49.14	45.74	31.85
adg3	Time Limited: Major	45.41	8.50	29.54	28.04
adg4	Time Limited: Major-Primary Infections	30.00	9.44	25.34	17.80
adg5	Allergies	9.80	8.88	6.60	1.05
adg6	Asthma	16.76	8.16	4.76	2.47
adg7	Likely to Recur: Discrete	44.09	18.08	37.86	24.00
adg8	Likely to Recur: Discrete-Infections	37.50	33.35	34.75	21.53
adg9	Likely to Recur: Progressive	26.28	4.19	16.44	26.73
adg10	Chronic Medical: Stable	63.54	23.85	74.04	55.36
adg11	Chronic Medical: Unstable	58.63	14.67	51.47	64.72
adg12	Chronic Specialty: Stable-Orthopedic	11.38	3.07	8.90	4.43
adg13	Chronic Specialty: Stable-Ear,Nose,Throat	4.03	1.68	8.56	4.77
adg14	Chronic Specialty: Stable-Eye	30.06	21.32	59.08	37.79
adg15	No Longer in Use	0.00	0.00	0.00	0.00
adg16	Chronic Specialty: Unstable-Orthopedic	8.33	2.24	2.18	1.25
adg17	Chronic Specialty: Unstable-Ear,Nose,Throat	0.45	0.14	0.29	0.14
adg18	Chronic Specialty: Unstable-Eye	12.70	4.01	21.71	15.98
adg19	No Longer in Use	0.00	0.00	0.00	0.00
adg20	Dermatologic	21.32	10.87	58.12	45.83
adg21	Injuries/Adverse Effects: Minor	32.67	24.13	34.72	19.60
adg22	Injuries/Adverse Effects: Major	38.90	16.13	43.71	29.66
adg23	Psychosocial: Time Limited, Minor	30.49	10.24	7.86	4.24
adg24	Psychosocial:Recurrent or Persistent,Stable	40.09	17.16	65.05	24.71
adg25	Psychosocial:Recurrent or Persistent,Unstable	29.94	6.33	54.41	42.03
adg26	Signs/Symptoms: Minor	63.63	36.06	62.92	50.69
adg27	Signs/Symptoms: Uncertain	76.41	41.48	77.87	64.13
adg28	Signs/Symptoms: Major	66.99	25.22	66.98	54.67
adg29	Discretionary	30.67	11.10	38.53	20.97
adg30	See and Reassure	13.02	4.34	10.13	7.10
adg31	Prevention/Administrative	75.24	59.12	66.05	30.98
adg32	Malignancy	10.05	1.46	5.13	7.13
adg33	Pregnancy	11.86	8.42	0.30	0.17
adg34	Dental	8.58	8.29	21.46	3.16
<b>Total Recipients</b>		<b>12222.00</b>	<b>11743.00</b>	<b>7293.00</b>	<b>7128.00</b>

**Table 7. Most Frequent 10 Diseases or Clinical Conditions for Recipients with ACG 5070**

**Non-Nursing Home Recipients**

Ranking	High Cost Group				Comparison Group			
	ICD9	Count	%	Description	ICD9	Count	%	Description
1	786	7,764	63.52	RESP SYS/OTH CHEST SYMP*	786	452	3.85	RESP SYS/OTH CHEST SYMP*
2	250	5,450	44.59	DIABETES MELLITUS*	250	266	2.27	DIABETES MELLITUS*
3	780	4,831	39.53	GENERAL SYMPTOMS*	780	260	2.21	GENERAL SYMPTOMS*
4	789	4,576	37.44	OTH ABDOMEN/PELVIS SYMP*	789	254	2.16	OTH ABDOMEN/PELVIS SYMP*
5	401	2,891	23.65	ESSENTIAL HYPERTENSION*	401	210	1.79	ESSENTIAL HYPERTENSION*
6	V72	2,806	22.96	SPECIAL EXAMINATIONS*	724	186	1.58	BACK DISORDER NEC & NOS*
7	724	2,578	21.09	BACK DISORDER NEC & NOS*	V72	186	1.58	SPECIAL EXAMINATIONS*
8	787	2,548	20.85	GI SYSTEM SYMPTOMS*	719	159	1.35	JOINT DISORDER NEC & NOS*
9	719	2,433	19.91	JOINT DISORDER NEC & NOS*	729	129	1.10	OTHER SOFT TISSUE DIS*
10	729	2,426	19.85	OTHER SOFT TISSUE DIS*	787	116	0.99	GI SYSTEM SYMPTOMS*

**Nursing Home Recipients**

Ranking	High Cost Group				Comparison Group			
	ICD9	Count	%	Description	ICD9	Count	%	Description
1	780	3,882	53.23	GENERAL SYMPTOMS*	786	2,889	40.53	RESP SYS/OTH CHEST SYMP*
2	786	3,522	48.29	RESP SYS/OTH CHEST SYMP*	780	2,430	34.09	GENERAL SYMPTOMS*
3	518	1,668	22.87	OTHER LUNG DISEASES*	250	1,317	18.48	DIABETES MELLITUS*
4	787	1,496	20.51	GI SYSTEM SYMPTOMS*	110	1,090	15.29	DERMATOPHYTOSIS*
5	276	1,415	19.40	FLUID/ELECTROLYTE DIS*	787	1,078	15.12	GI SYSTEM SYMPTOMS*
6	V72	1,414	19.39	SPECIAL EXAMINATIONS*	401	1,008	14.14	ESSENTIAL HYPERTENSION*
7	250	1,400	19.20	DIABETES MELLITUS*	276	988	13.86	FLUID/ELECTROLYTE DIS*
8	789	1,338	18.35	OTH ABDOMEN/PELVIS SYMP*	719	973	13.65	JOINT DISORDER NEC & NOS*
9	318	1,133	15.54	OTHER MENTAL RETARDATION*	290	877	12.30	SENILE/PRESENILE PSYCHOS*
10	719	1,080	14.81	JOINT DISORDER NEC & NOS*	789	875	12.28	OTH ABDOMEN/PELVIS SYMP*

**Table 8. Most Frequent 10 Diseases or Clinical Conditions for Recipients with ACG 5060**

**Non-Nursing Home Recipients**

Ranking	High Cost Group				Comparison Group			
	ICD9	Count	%	Description	ICD9	Count	%	Description
1	786	2,177	17.81	RESP SYS/OTH CHEST SYMP*	786	338	2.88	RESP SYS/OTH CHEST SYMP*
2	780	1,430	11.70	GENERAL SYMPTOMS*	789	244	2.08	OTH ABDOMEN/PELVIS SYMP*
3	250	1,373	11.23	DIABETES MELLITUS*	250	214	1.82	DIABETES MELLITUS*
4	789	1,173	9.60	OTH ABDOMEN/PELVIS SYMP*	724	211	1.80	BACK DISORDER NEC & NOS*
5	V72	1,115	9.12	SPECIAL EXAMINATIONS*	780	211	1.80	GENERAL SYMPTOMS*
6	401	978	8.00	ESSENTIAL HYPERTENSION*	V72	208	1.77	SPECIAL EXAMINATIONS*
7	724	802	6.56	BACK DISORDER NEC & NOS*	401	187	1.59	ESSENTIAL HYPERTENSION*
8	719	728	5.96	JOINT DISORDER NEC & NOS*	719	159	1.35	JOINT DISORDER NEC & NOS*
9	729	725	5.93	OTHER SOFT TISSUE DIS*	367	144	1.23	DISORDERS OF REFRACTION*
10	787	705	5.77	GI SYSTEM SYMPTOMS*	729	144	1.23	OTHER SOFT TISSUE DIS*

**Nursing Home Recipients**

Ranking	High Cost Group				Comparison Group			
	ICD9	Count	%	Description	ICD9	Count	%	Description
1	780	1,310	17.96	GENERAL SYMPTOMS*	786	811	11.38	RESP SYS/OTH CHEST SYMP*
2	031	824	11.30	OTHER MYCOBACTERIAL DIS* (MYCOBACTERIAL PULMONARY)	780	667	9.36	GENERAL SYMPTOMS*
3	318	773	10.60	OTHER MENTAL RETARDATION*	110	507	7.11	DERMATOPHYTOSIS*
4	V72	758	10.39	SPECIAL EXAMINATIONS*	719	430	6.03	JOINT DISORDER NEC & NOS*
5	786	756	10.37	RESP SYS/OTH CHEST SYMP*	401	387	5.43	ESSENTIAL HYPERTENSION*
6	319	691	9.47	MENTAL RETARDATION NOS	787	345	4.84	GI SYSTEM SYMPTOMS*
7	110	601	8.24	DERMATOPHYTOSIS*	250	334	4.69	DIABETES MELLITUS*
8	367	580	7.95	DISORDERS OF REFRACTION*	366	311	4.36	CATARACT*
9	345	462	6.33	EPILEPSY*	367	306	4.29	DISORDERS OF REFRACTION*
10	719	454	6.23	JOINT DISORDER NEC & NOS*	729	298	4.18	OTHER SOFT TISSUE DIS*

**Table 9. Data Description of Study Variables for Non-Nursing Home Recipients**

**a) Recipients with Age 64 or Younger**

Variable	Overall Recipients (N=21,627)			Highcost Group (11,045)		Comparison Group (10582)	
	Mean	Std Dev	%	Mean	Std Dev	Mean	Std Dev
TOTALCOST	17515.00	32,986		33,306	41,521	2,385	3,321
SEX (male=1, female=0)	--	--	41% male	41%		42%	
AGE (years)	25.71	19.00		32.62	19.39	19.09	16.05
RACE (black=1, other=0)	--	--	27% black	27%		27%	
MOSENROL (months)	14.29	8.49		14.49	9.07	14.09	7.89
ADGNUM (comorbidities)	7.50	5.42		10.19	5.50	4.92	3.86
URBAN (urban=1, other=0)	--	--	77% urban	81%		73%	
Death (%)				4.4%		0.2%	
AFDC (%month)*	0.60	0.48	63% AFDC	0.40	0.48	0.79	0.40
CHIP (%month)*	0.20	0.37	27% CHIP	0.11	0.29	0.29	0.41
ADB (%month)*	0.35	0.46	38% ADB	0.54	0.48	0.16	0.35

**b) Recipients with Age 65 or Older**

Variable	Overall Recipients (N=2,338)			Highcost Group (1,640)		Comparison Group (698)	
	Mean (range)	Std Dev	%	Mean	Std Dev	Mean	Std Dev
TOTALCOST	21,238	23,473		28,243	24,746	4,781	4,563
SEX (male=1, female=0)	--	--	27% male	26%		28%	
AGE (years)	76.27	8.00		76.55	8.23	75.61	7.39
RACE (black=1, other=0)	--	--	25% black	25%		24%	
MOSENROL (months)	17.95	8.26		17.52	8.50	18.94	7.57
ADGNUM (comorbidities)	10.26	5.47		11.26	5.42	7.91	4.86
URBAN (urban=1, other=0)	--	--	76% urban	76%		75%	
Death (%)				20.0%		8.2%	
AFDC (%month)*	0.00	0.05	0%	0.00	0.05	0.00	0.03
ADB (%month)*	0.09	0.26	12.6% ADB	0.11	0.29	0.04	0.17

\* %month means that the percentage of months enrolled for CHIP or ADB or AFDC during the study period.

**Table 10. Data Description of Study Variables for Nursing Home Recipients**

Variable	Overall Recipients (N=14,421)			Highcost Group (7,293)		Comparison Group (7,128)	
	Mean	Std Dev	%	Mean	Std Dev	Mean	Std Dev
TOTALCOST	113,482.00	69,675		168,702	48,072	56,984	33,841
SEX (male=1, female=0)	--		43% male	58%		28%	
AGE (years)	63.26	22.75		45.79	15.74	81.14	12.70
American=1, other=0)	--		14% black	15%		12%	
MOSENROL (months)	19.44	7.55		22.08	5.47	16.75	8.38
ADGNUM (comorbidities)	9.14	5.26		10.64	4.74	7.61	5.32
URBAN (urban=1, other=0)	--	0.43	75% urban	75%		75%	
AFDC (%month)	0.00	0.02	0%	0.00	0.02	0.00	0.00
ADB (%month)	0.51	0.50	52%	0.90	0.30	0.11	0.31

\* %month means that the percentage of months enrolled for ADB or AFDC during the study period.

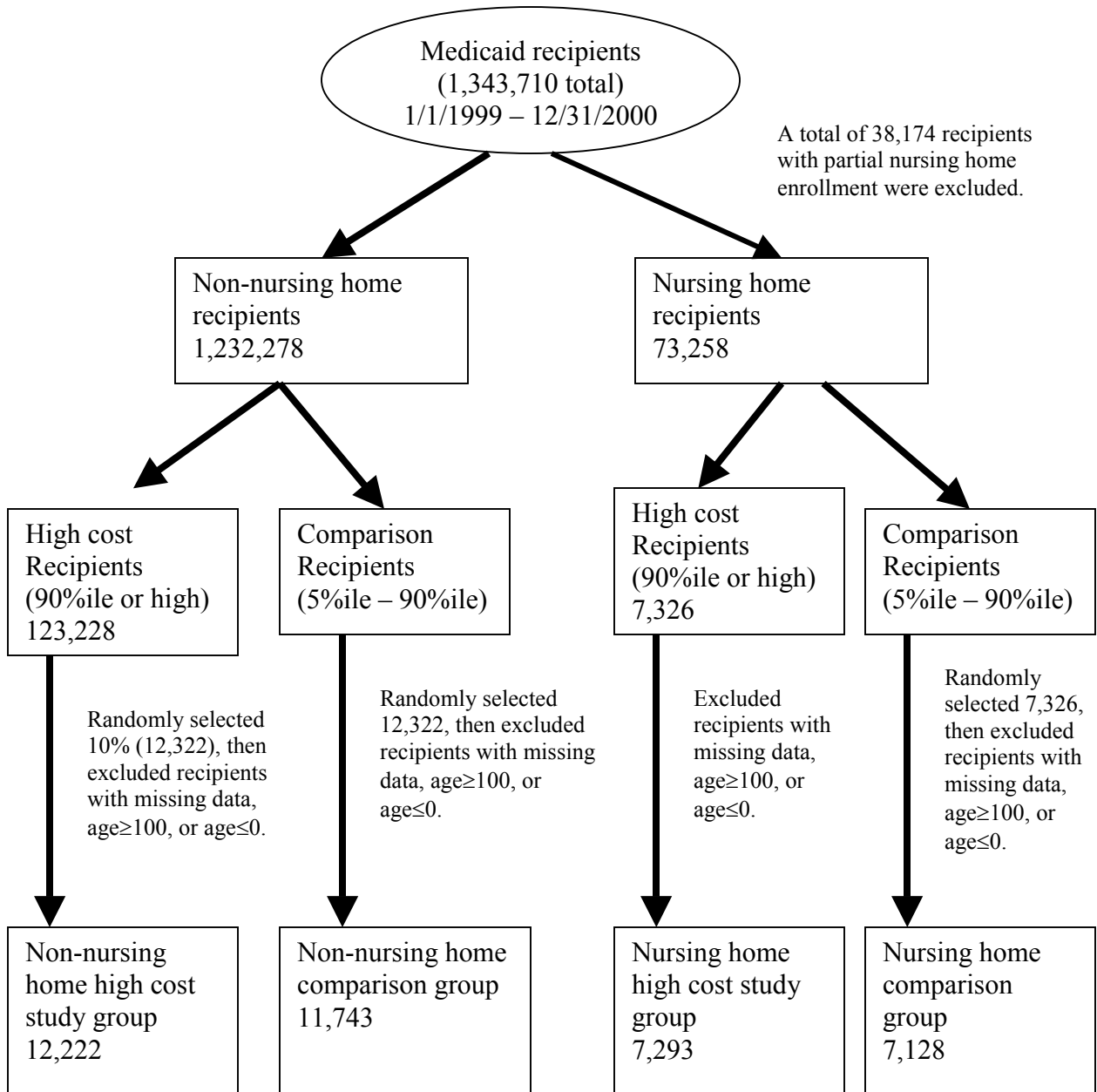
**Table 11. Odds Ratio of Likelihood for High Cost for both Non-Nursing Home Recipients and Nursing Home Recipients**

	Non-Nursing Home Recipients				Nursing Home Recipients	
	Recipients age 64 or younger		Recipients age 65 or older		Odds Ratio (95% CI)	p-value
	Odds Ratio (95% CI)	p-value	Odds Ratio (95% CI)	p-value		
SEX (male)	1.35 (1.26 – 1.46)	<0.0001	0.89 (0.71 – 1.11)	0.3035	1.51 (1.34 – 1.69)	<0.0001
RACE (black)	1.02 (0.94 – 1.10)	0.6705	1.05 (0.83 – 1.33)	0.6974	0.77 (0.66 – 0.91)	0.0019
ADB	6.72 (6.03 – 7.51)	<0.0001	5.89 (3.61 – 10.0)	<0.0001	1.89 (1.53 – 2.33)	<0.0001
CHIP	0.75 (0.67 – 0.84)	<0.0001	---	---	---	---
URBAN	1.8 (1.64 – 1.97)	<0.0001	1.04 (0.82 – 1.31)	0.7504	0.81 (0.71 – 0.93)	0.0017
AGE (years)	1 (1.00 – 1.00)	0.315	1.04 (1.03 – 1.06)	<0.0001	0.9 (0.89 – 0.90)	<0.0001
MOSENROL	0.86 (0.86 – 0.87)	<0.0001	0.94 (0.92 – 0.95)	<0.0001	1 (0.99 – 1.01)	0.7503
DEATH	4.64 (2.93 – 7.79)	<0.0001	1.96 (1.40 – 2.78)	0.0001	0.81 (0.67 – 0.97)	0.0264
ADGNUM	1.38 (1.36 – 1.39)	<0.0001	1.2 (1.17 – 1.22)	<0.0001	1.08 (1.07 – 1.09)	<0.0001

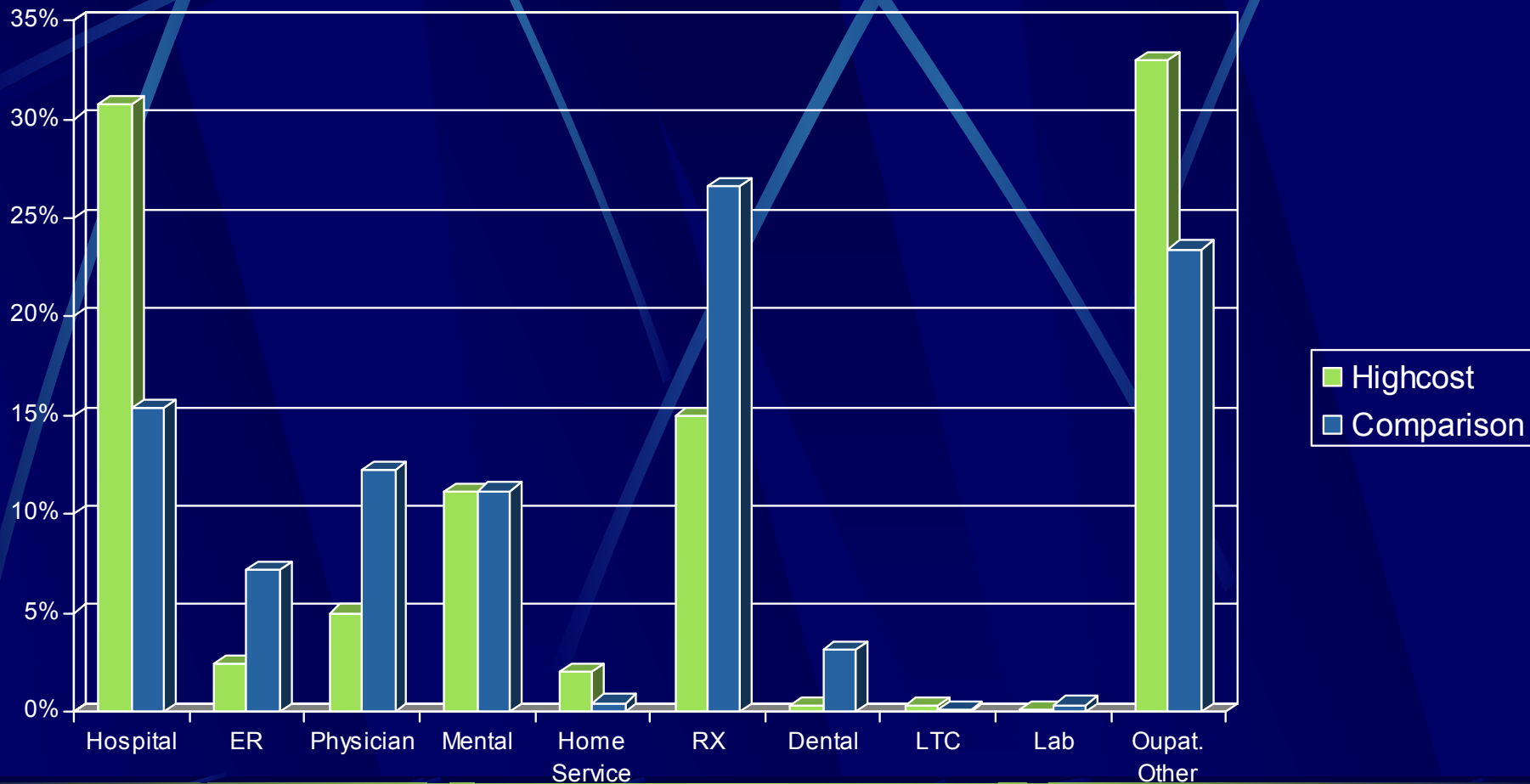
**Table 12. Coefficient Parameters of Multiple Regression Analysis for Total Medicaid Expenses**

	Non-Nursing Home Recipients(Age 64 or Younger)				Non-Nursing Home Recipients (Age 65 or Older)				Nursing Home Recipients			
	Highcost Recipients (N=10,582)		Comparison Recipients (N=11,045)		Highcost Recipients (N=1,640)		Comparison Recipients (N=698)		Highcost Recipients (N=7,293)		Comparison Recipients (N=7,128)	
	Coefficients (t-statistic)	p-value	Coefficients (t-statistic)	p-value	Coefficients (t-statistic)	p-value	Coefficients (t-statistic)	p-value	Coefficients (t-statistic)	p-value	Coefficients (t-statistic)	p-value
SEX (male)	4,172.87 (5.57)	<0.0001	-161.22 (-3.39)	0.0007	2,827.64 (2.51)	<0.0123	422.51 (1.41)	0.1597	564.97 (0.89)	0.3721	-1164.24 (-3.06)	0.0022
RACE (black)	54.95 (0.07)	0.9475	118.07 (2.14)	0.4129	-575.88 (-0.50)	0.6201	-670.89 (-2.04)	0.0412	6,245.06 (7.15)	<0.0001	2,267.36 (4.38)	<0.0001
ADB	15,929 (15.24)	<0.0001	1,527.91 (19.02)	<0.0001	27,329 (15.38)	<0.0001	1,487.54 (1.8)	0.0721	-2,197.61 (-1.62)	0.1051	7,031.11 (8.44)	<0.0001
CHIP	-8.81 (-0.63)	0.5302	-1.56 (-2.43)	0.0149	---	---	---	---	---	---	---	---
URBAN	4,685.61 (5.01)	<0.0001	361.97 (6.65)	<0.0001	-688.87 (-0.58)	0.5597	85.41 (0.26)	0.7916	5,087.64 (6.77)	<0.0001	4,976.76 (12.90)	<0.0001
AGE (years)	-397.82 (-15.94)	<0.0001	18.12 (9.78)	<0.0001	12.80 (0.20)	0.8440	63.29 (3.28)	0.0011	-349.84 (-13.39)	<0.0001	-248.45 (-11.53)	<0.0001
MOSENROL	1,477.54 (25.70)	<0.0001	20.34 (5.90)	<0.0001	1,446.48 (19.03)	<0.0001	102.94 (4.86)	<0.0001	7,236.06 (92.23)	<0.0001	3,207.05 (120.87)	<0.0001
DEATH	13,968 (7.74)	<0.0001	-1,401.62 (-2.60)	0.0094	3,343.61 (2.38)	0.0174	-451.33 (-0.84)	0.3998	4,031.73 (2.66)	0.0077	-2,835.02 (-6.67)	<0.0001
ADGNUM	1,012.26 (11.59)	<0.0001	468.93 (64.83)	<0.0001	380.15 (3.53)	0.0004	512.95 (16.68)	<0.0001	188.31 (2.73)	0.0064	653.58 (18.11)	<0.0001
Model Fit	R square=0.2316 F =354.14 p<0.0001		R square=0.4768 F =1,117.21 p<0.0001		R square=0.3772 F =123.5 p<0.0001		R square=0.4091 F =59.62 p<0.0001		R square=0.6976 F =2100 p<0.0001		R square=0.8340 F =4470 p<0.0001	

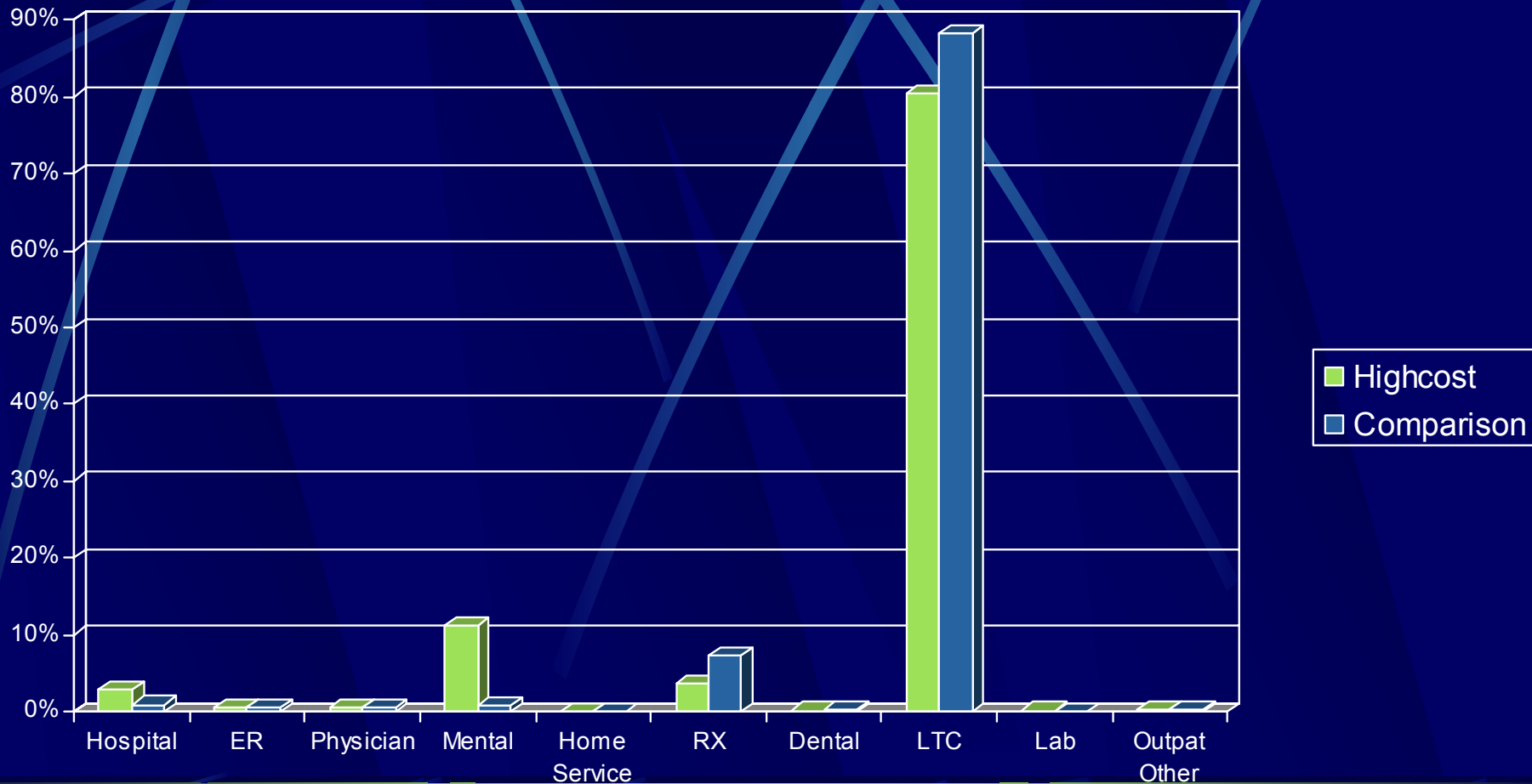
Figure 1. Flow of Sample Selection from Target Population



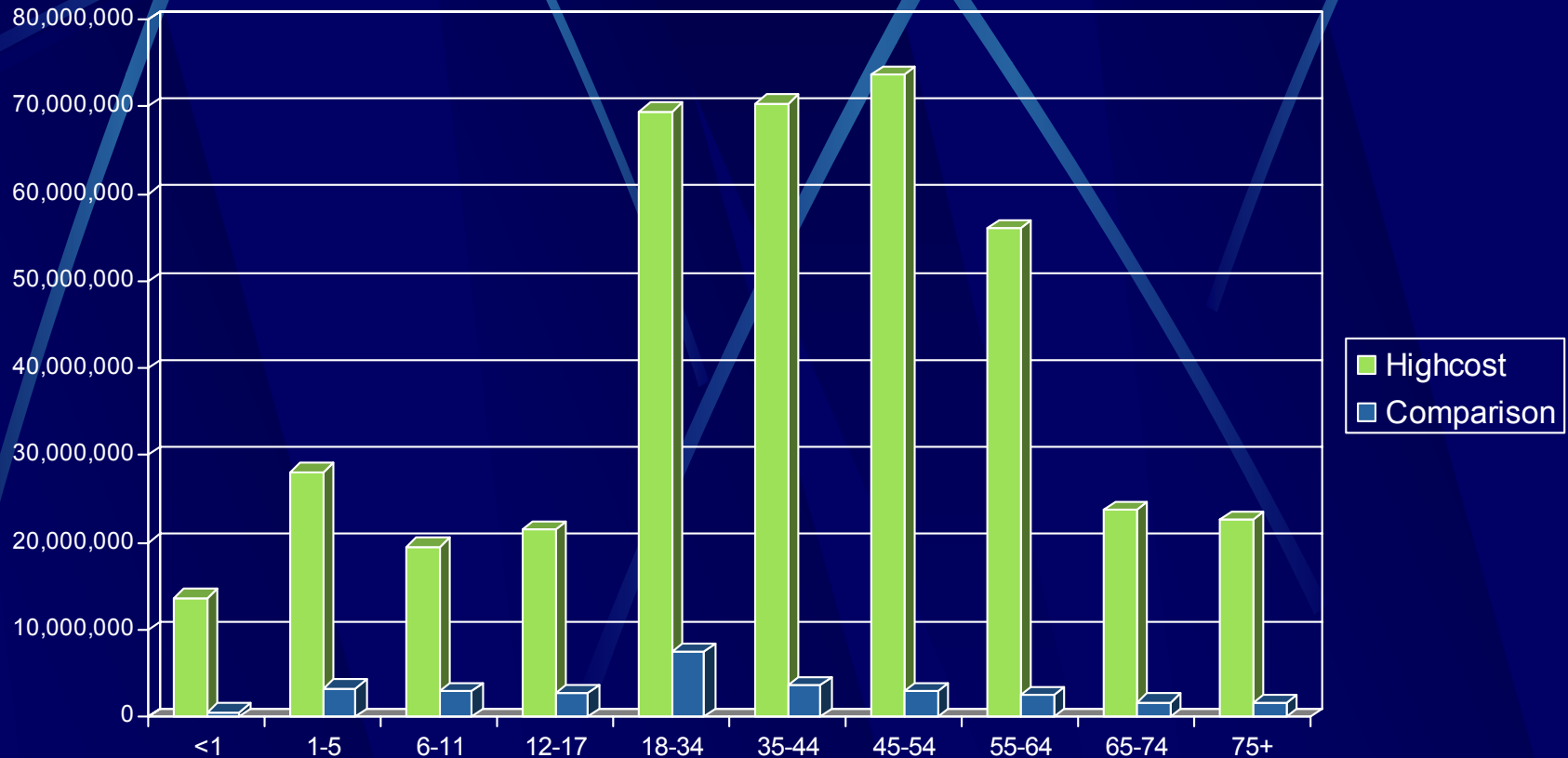
# Figure 2. Percentage of Total Costs by Service for Non-Nursing Home Patients



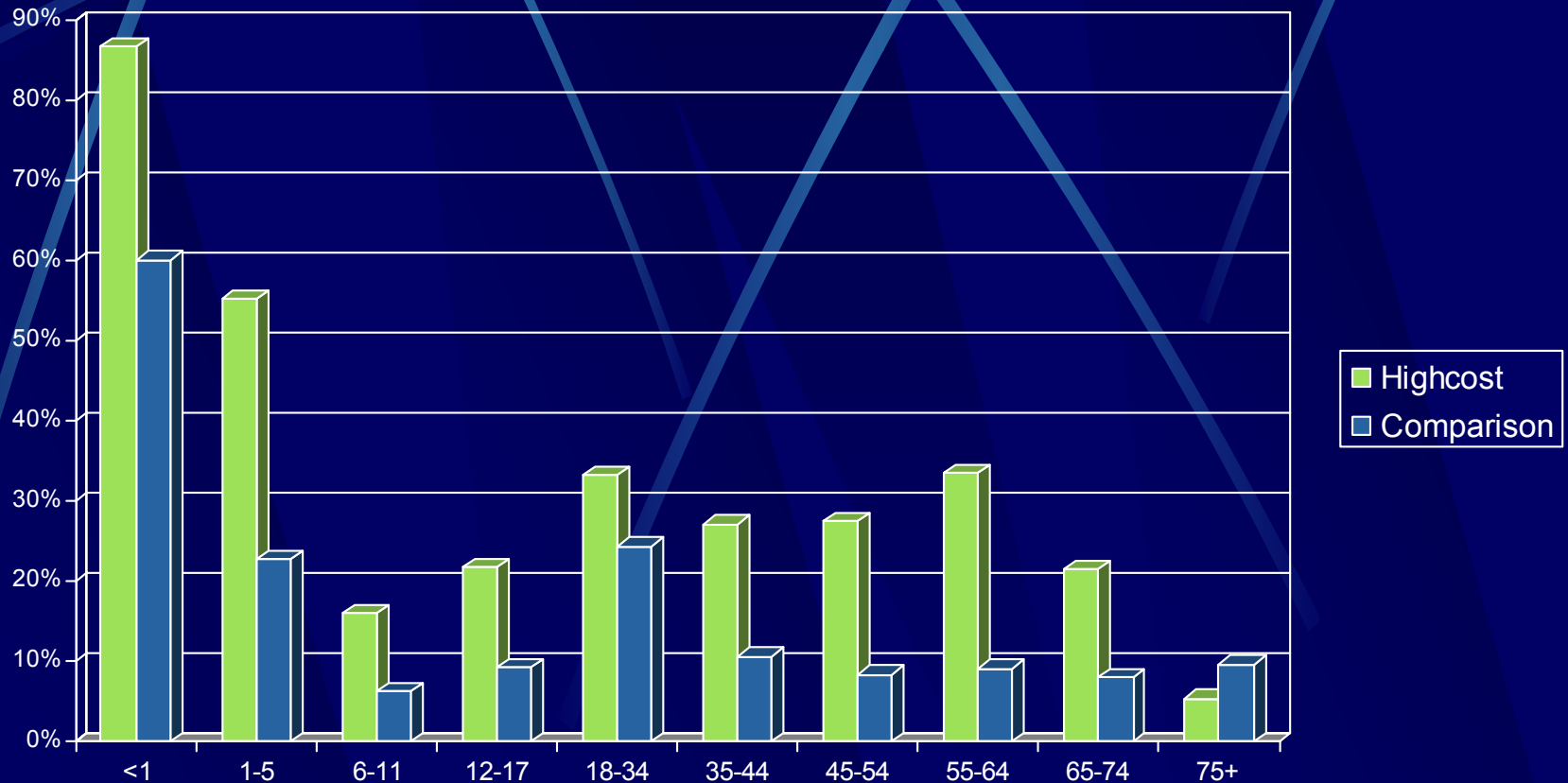
# Figure 3. Percentage of Total Costs by Service for Nursing Home Patients



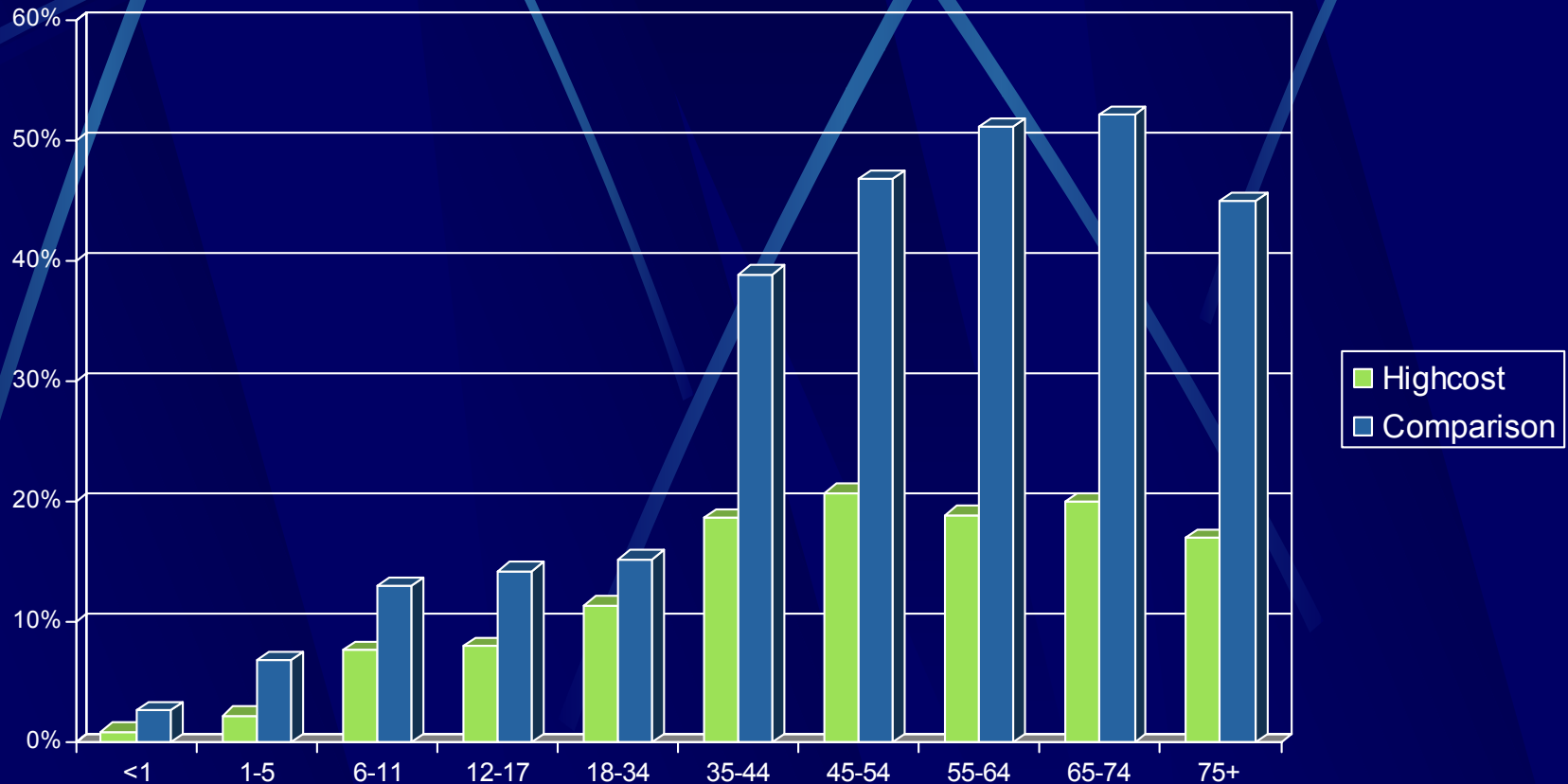
# Figure 4. Total Cost of Non-Nursing Home Patients by Age Category: High Cost vs. Comparison



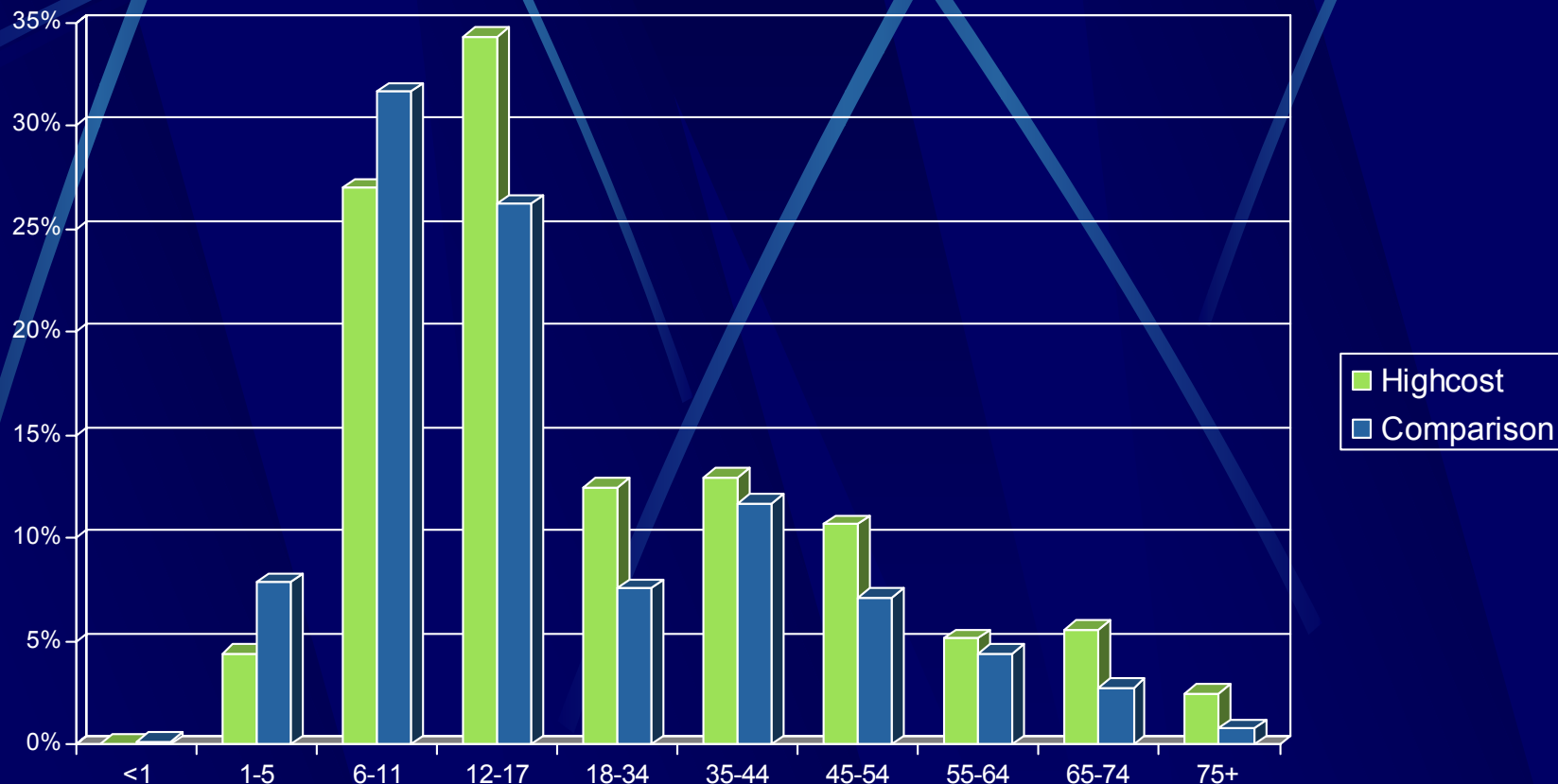
# Figure 5. Percentage of Total Cost Accounted for by Hospitalization Costs for Non-Nursing Home Patients by Age Category



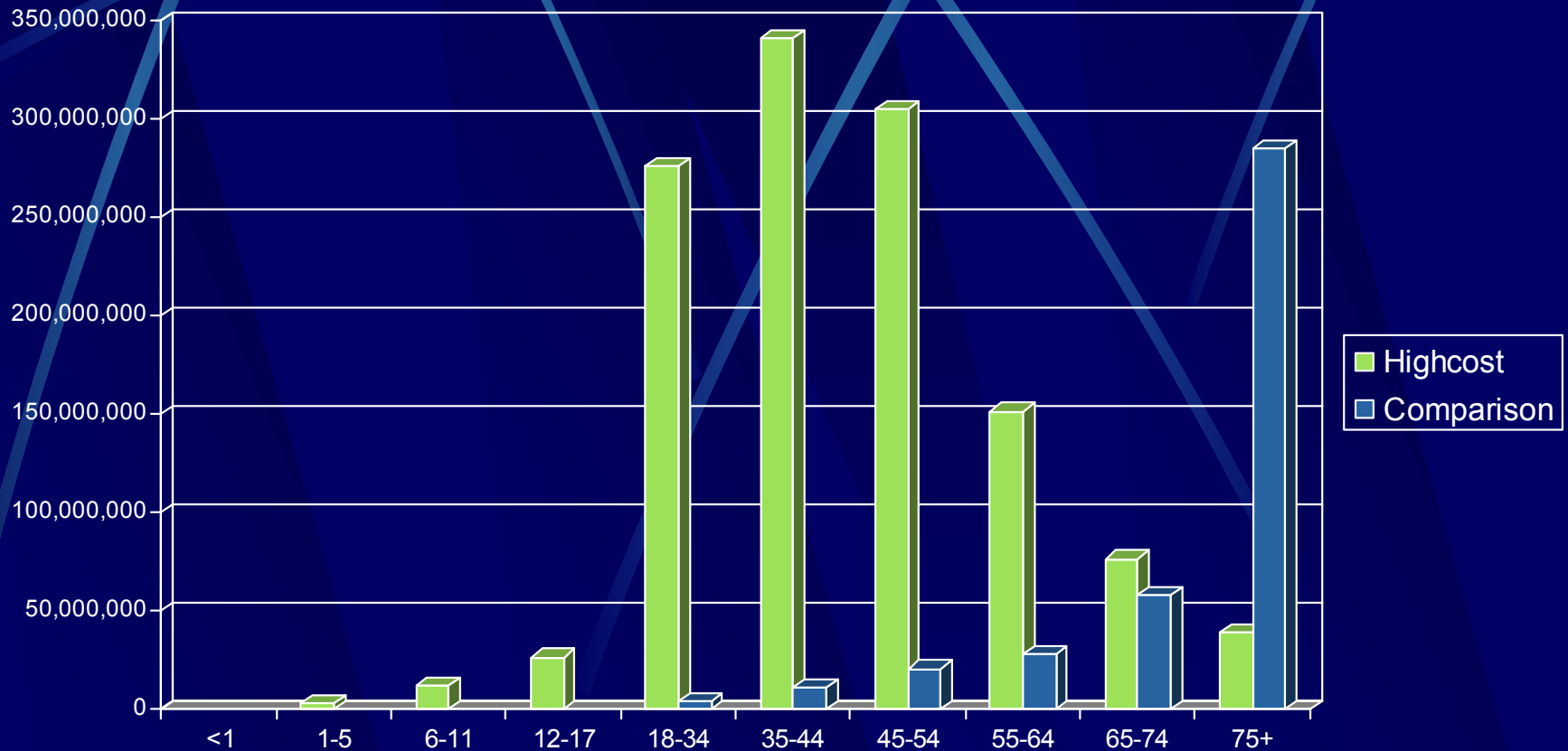
**Figure 6. Percentage of Total Cost Accounted for by Prescription Drug Costs for Non-Nursing Home Patients by Age Category.**



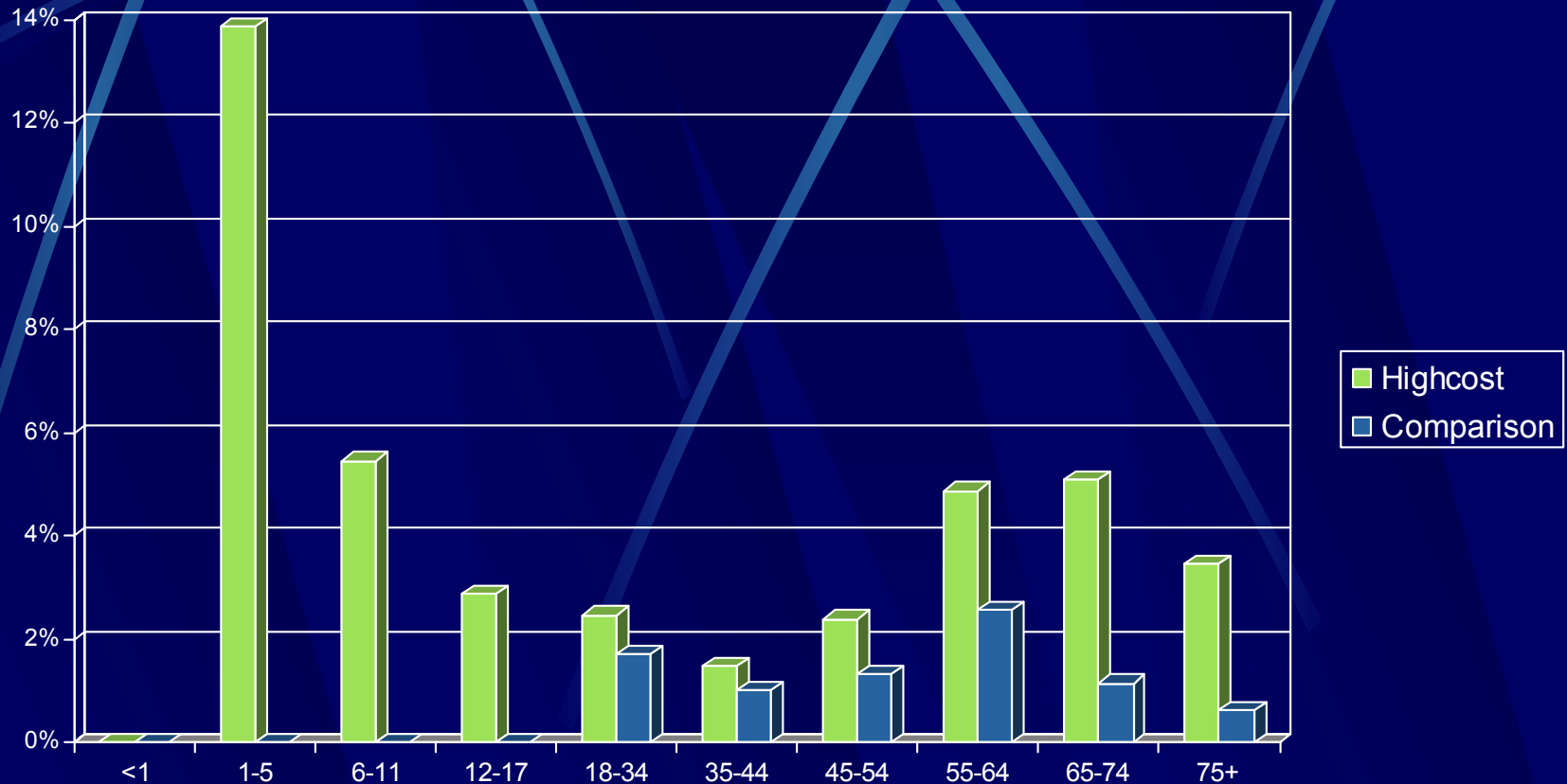
# Figure 7. Percentage of Total Costs Accounted for by Mental Health Costs for Non-Nursing Home Patients by Age Category



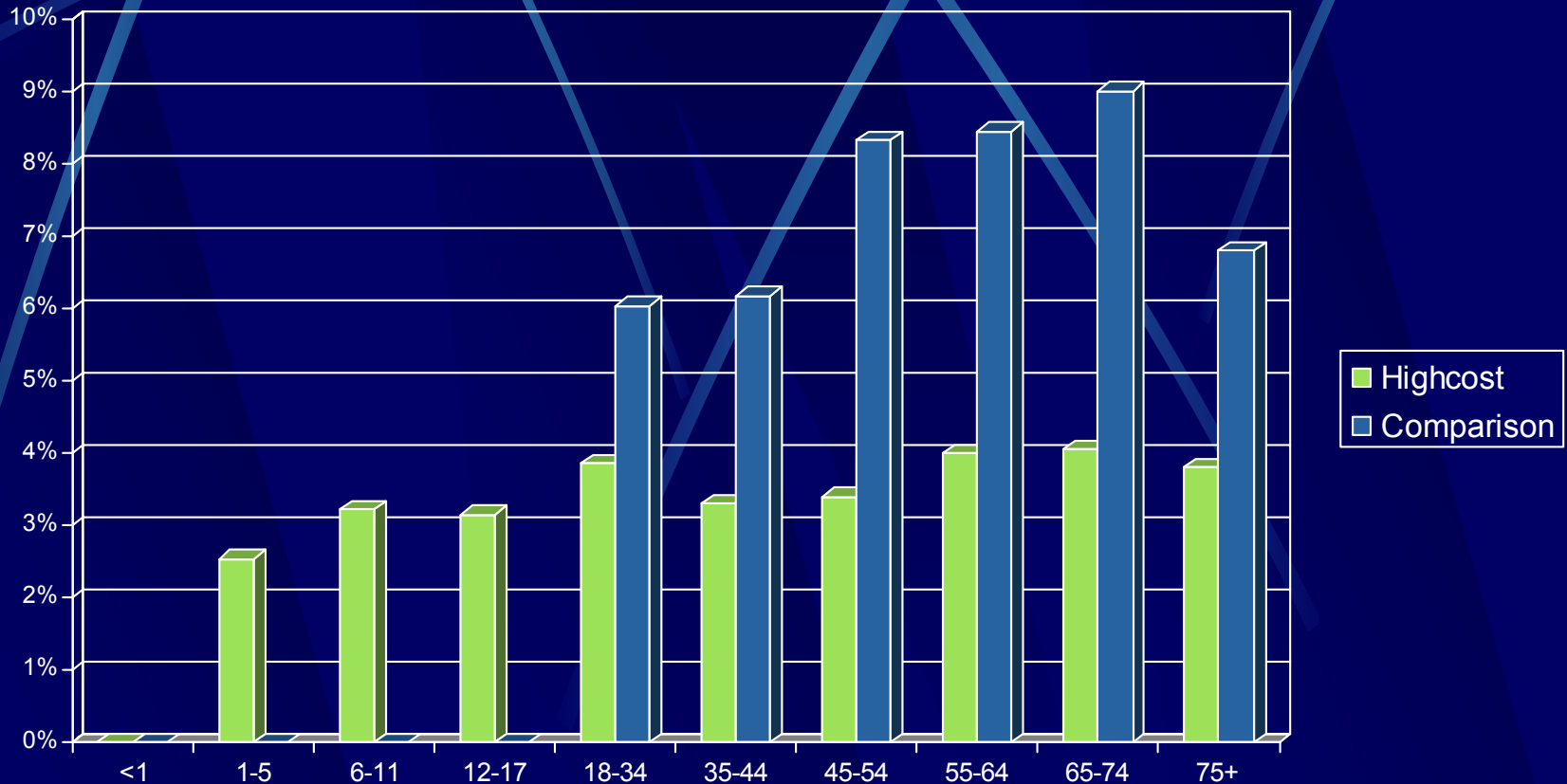
# Figure 8. Total Cost of Nursing Home Patients by Age Category: High Cost vs. Comparison



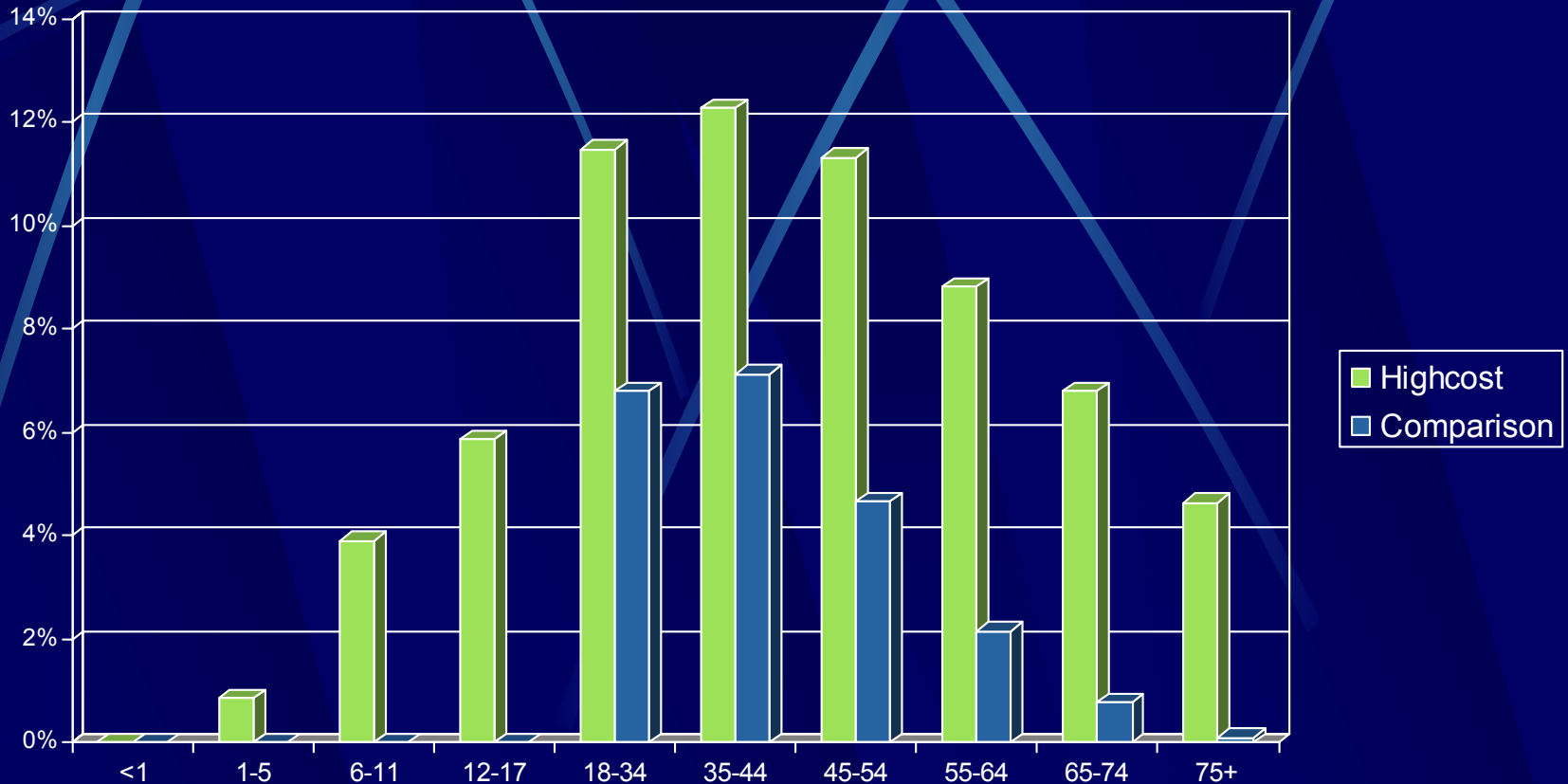
# Figure 9. Percentage of Total Cost Accounted for by Hospitalization Costs for Nursing Home Patients by Age Category



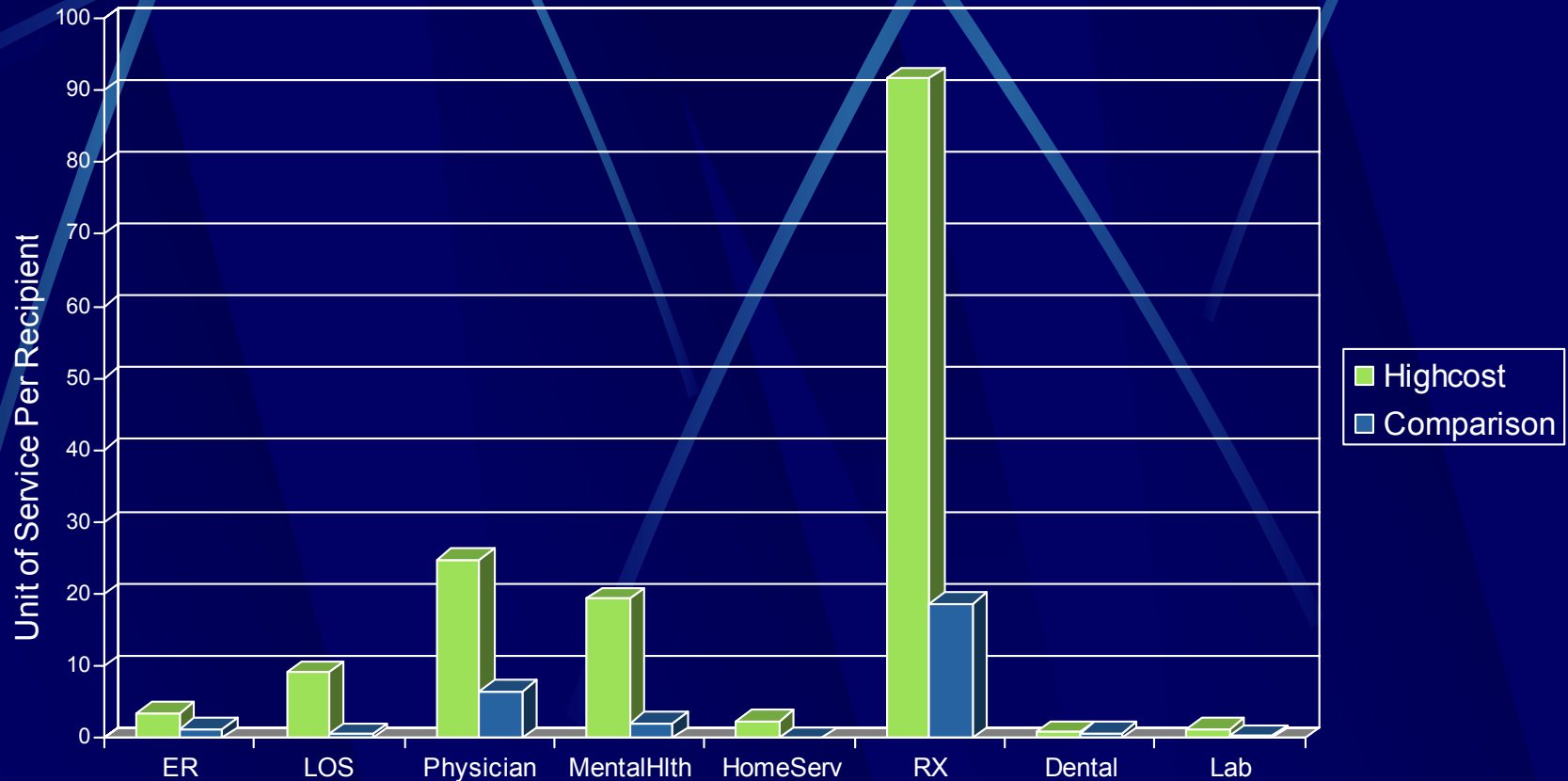
# Figure 10. Percentage of Total Cost Accounted for by Prescription Drug Costs for Nursing Home Patients by Age Category



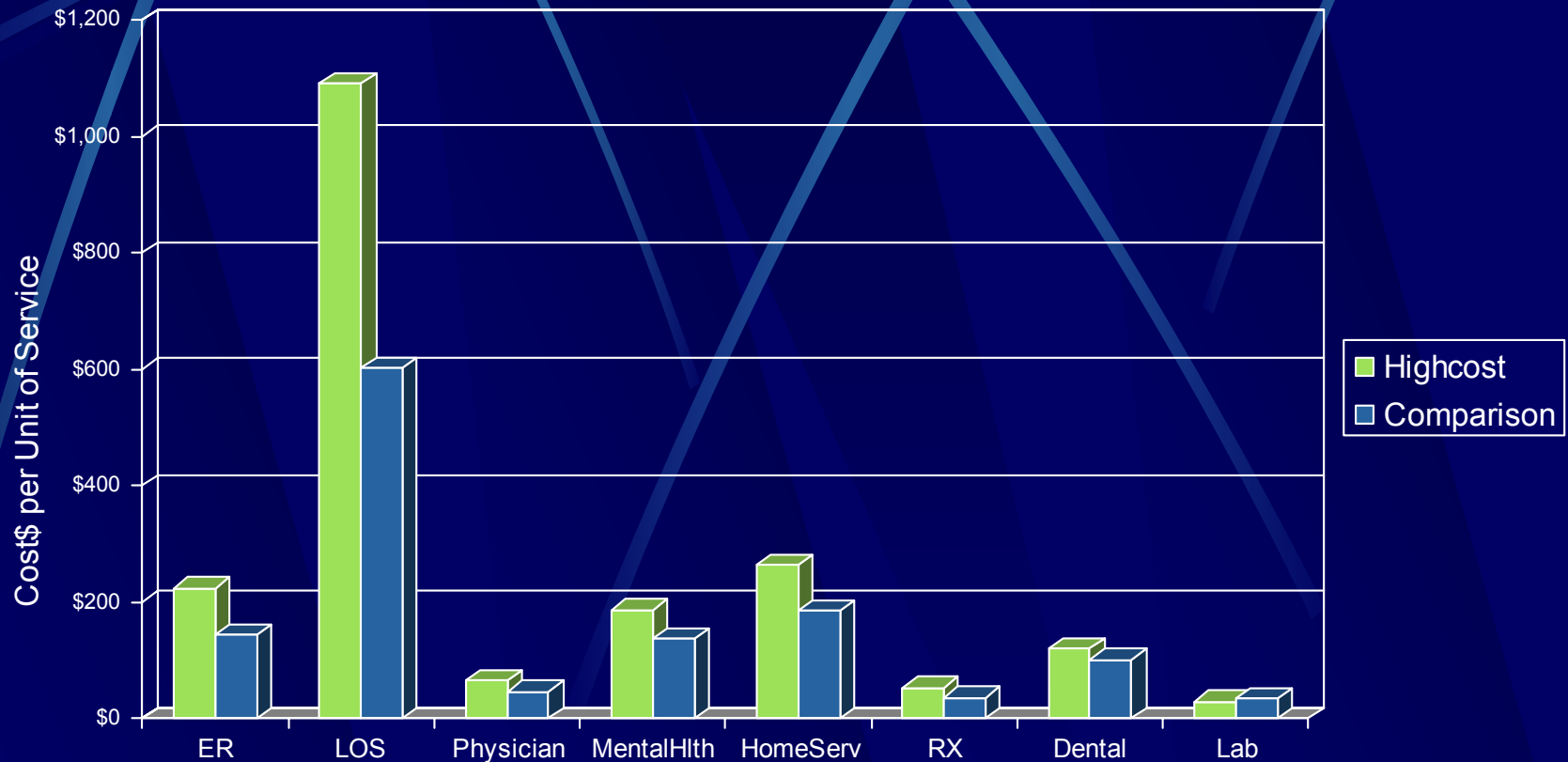
# Figure 11. Percentage of Total Cost Accounted for by Mental Health Costs for Nursing Home Patients by Age Category



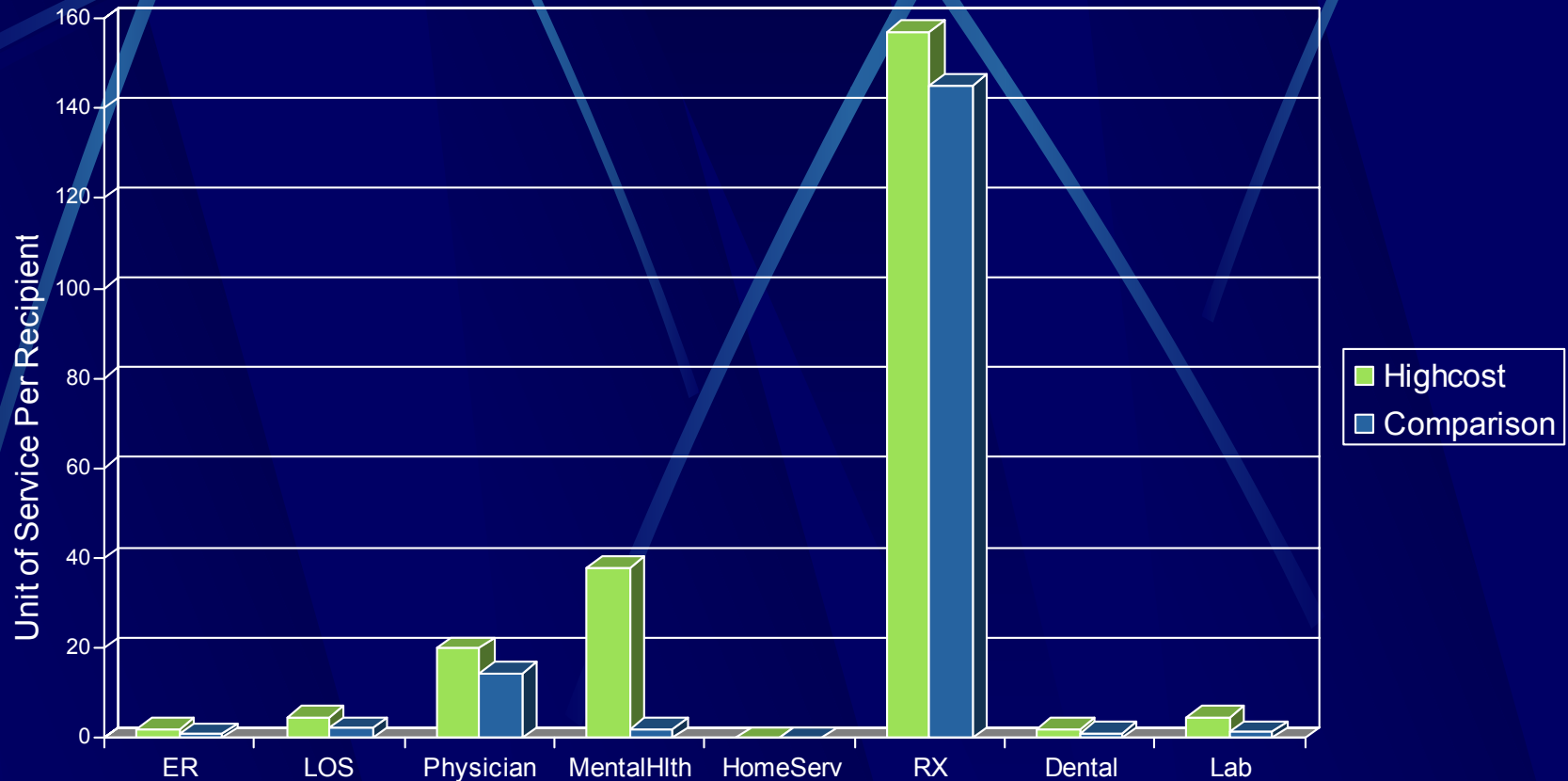
# Figure 12. Units of Service Per Recipient in Non-Nursing Home Patients: High Cost vs. Comparison



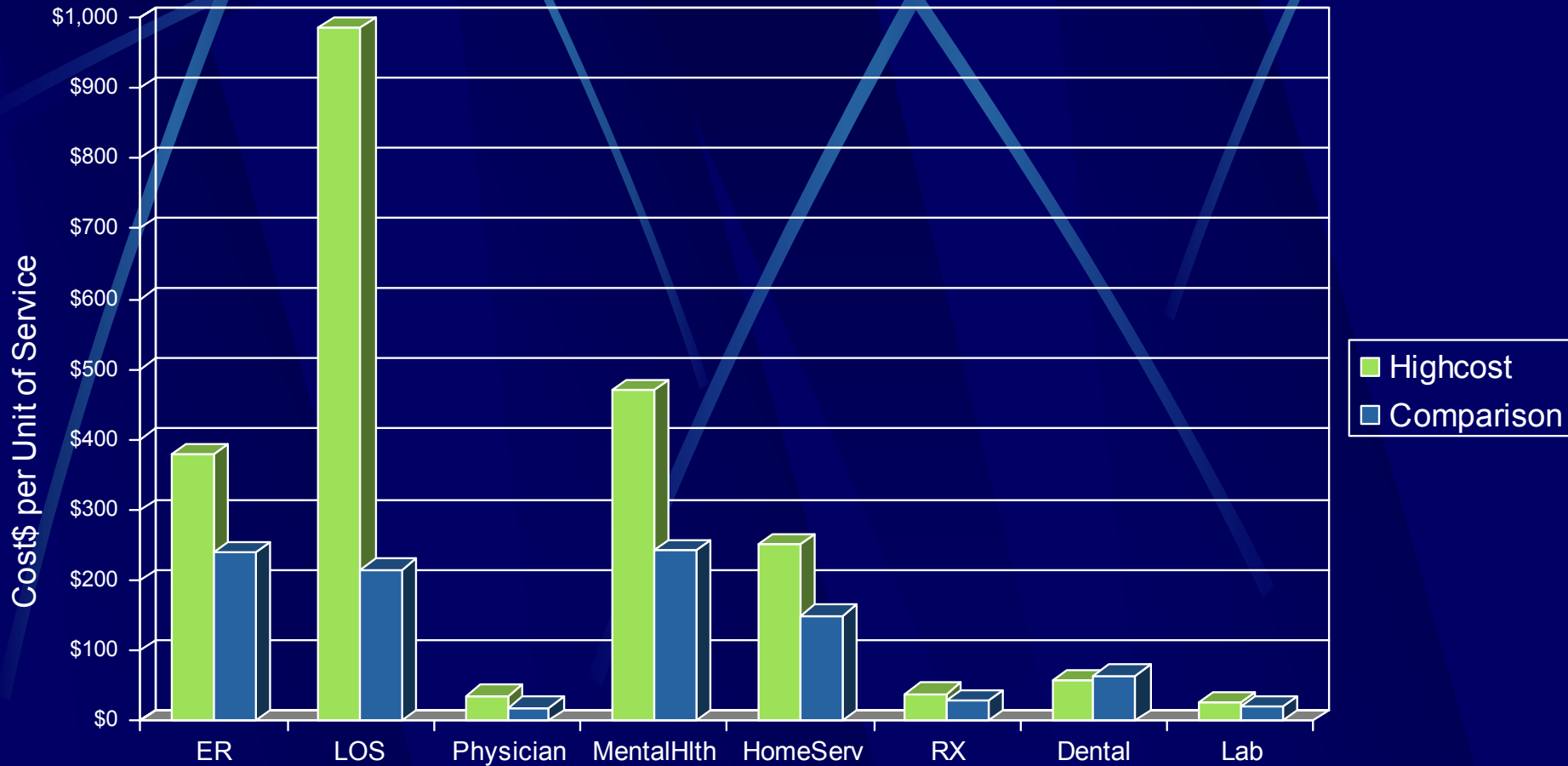
# Figure 13. Costs per Unit of Service in Non-Nursing Home Patients: High Cost vs. Comparison



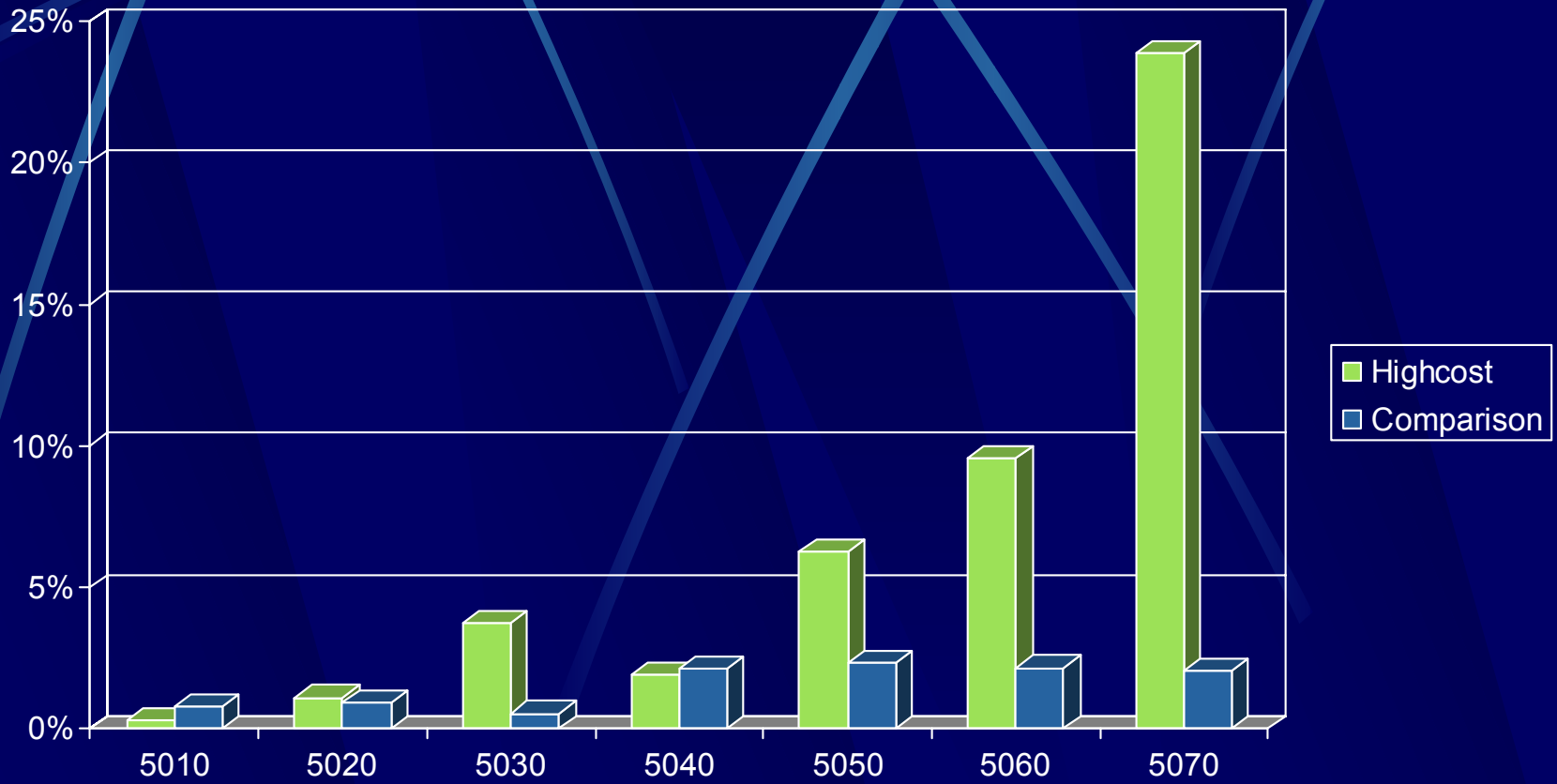
# Figure 14. Units of Service per Recipient in Nursing Home Patients: High Cost vs. Comparison



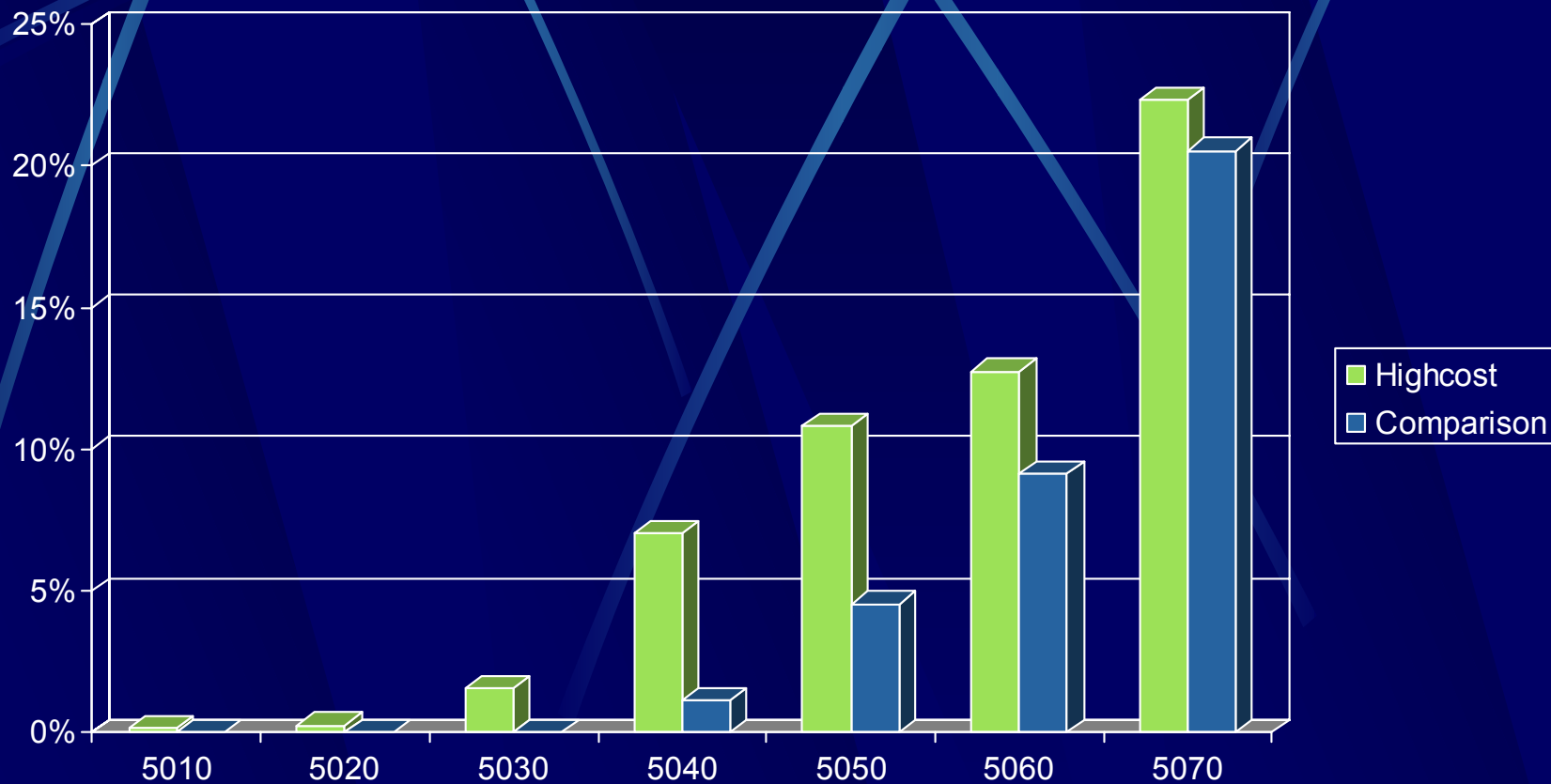
# Figure 15. Costs per Unit of Service in Nursing Home Patients: High Cost vs. Comparison



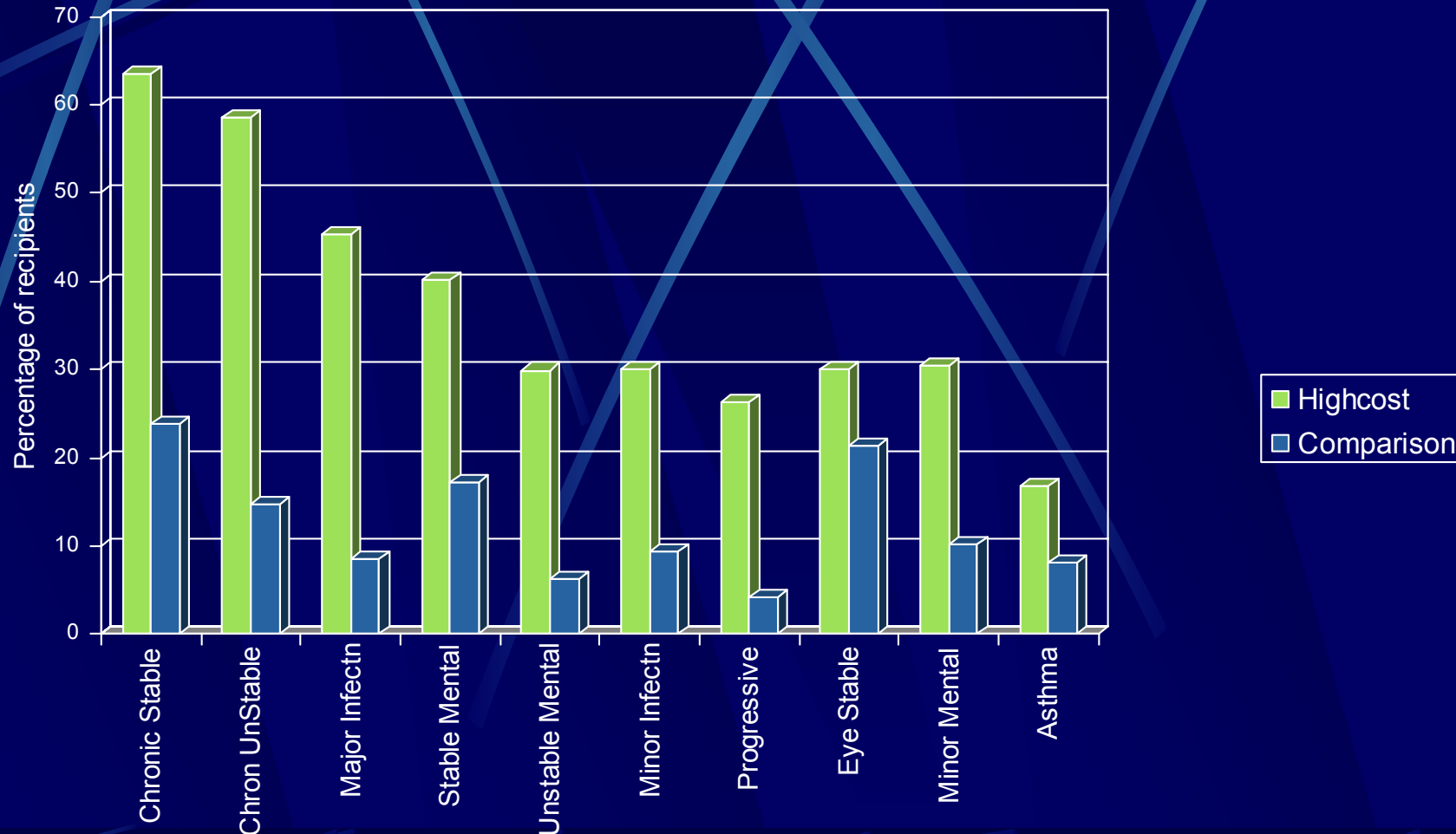
**Figure 16. Percentage of Non-Nursing Home Recipients with ACG Codes 50xx: High Cost vs. Comparison**



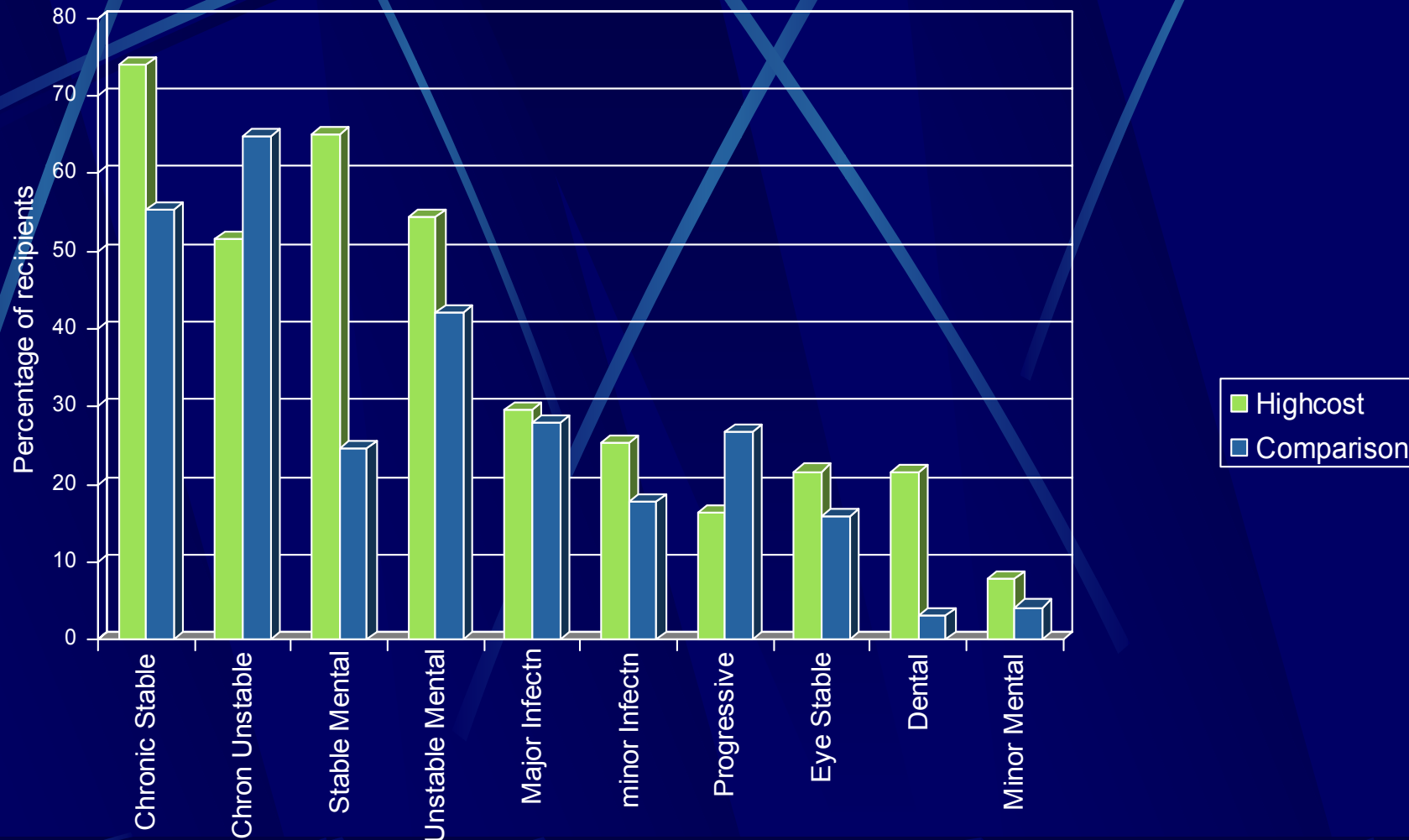
# Figure 17. Percentage of Nursing Home Recipients with ACG Codes 50xx: High Cost vs. Comparison



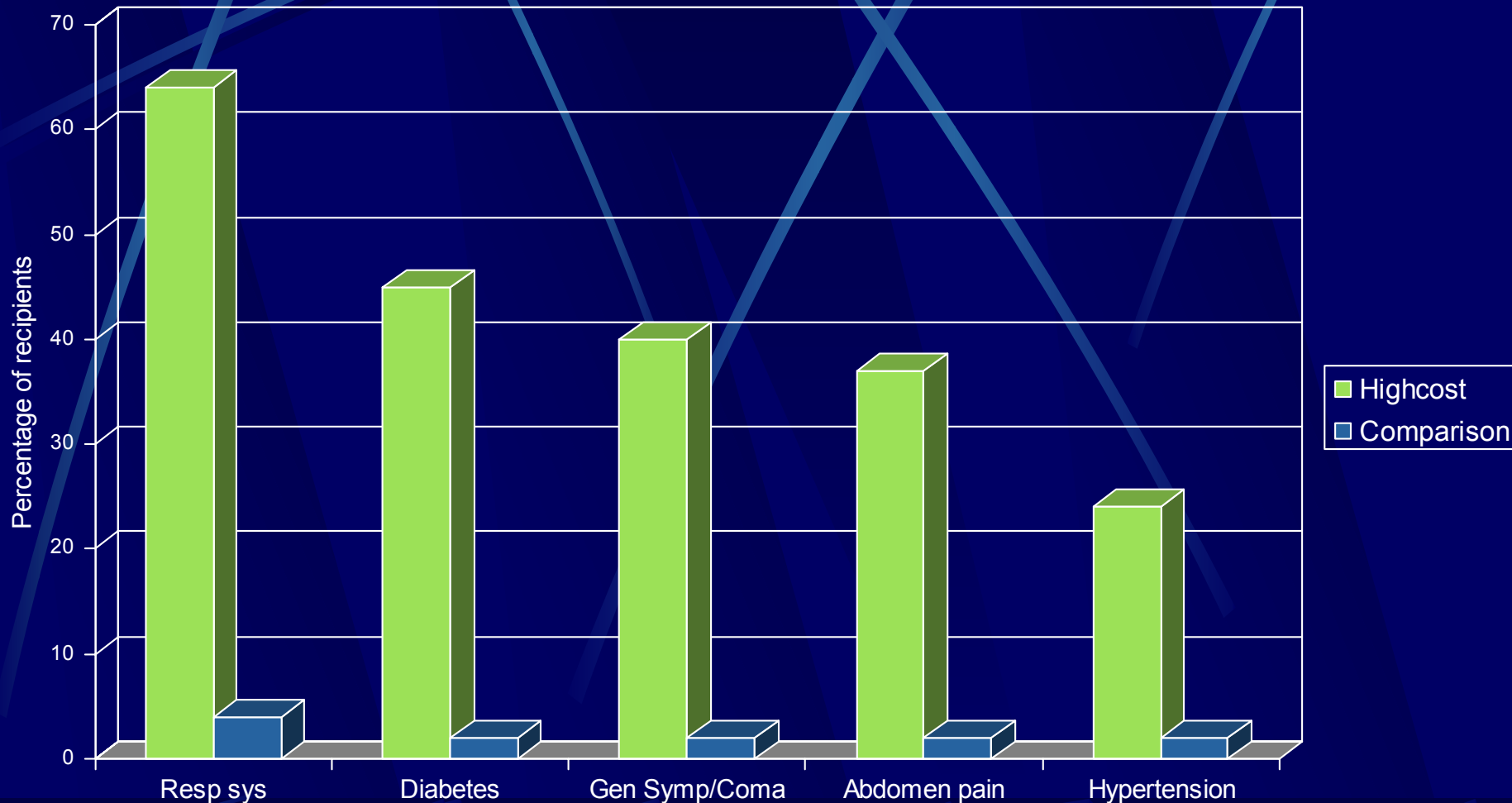
**Figure 18. Percentage of Recipients with Most Frequent Diseases (ADG Distribution) in Non-Nursing Home Patients**



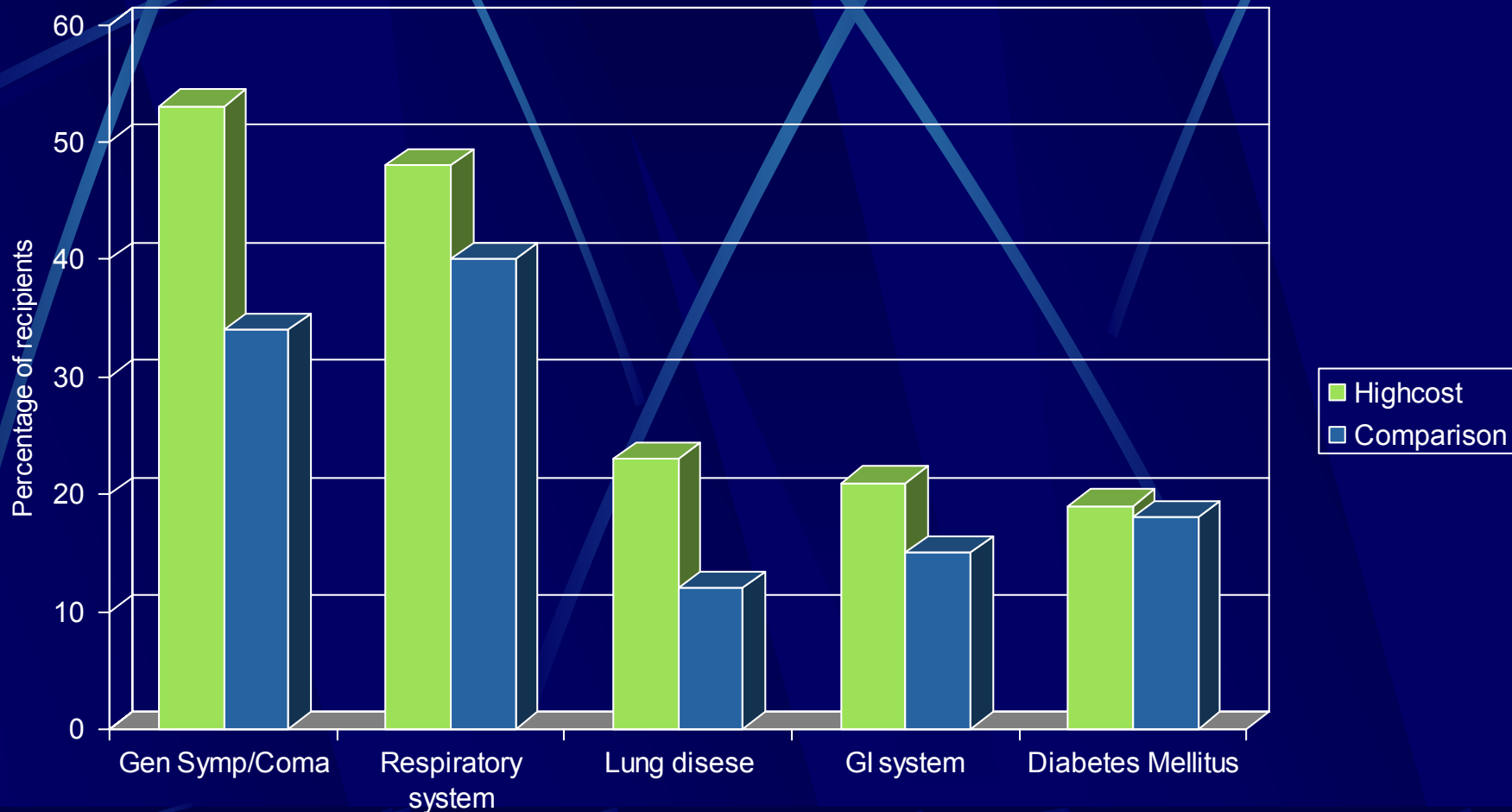
# Figure 19. Percentage of Recipients with Most Frequent Diseases (ADG Distribution) in Nursing Home Patients



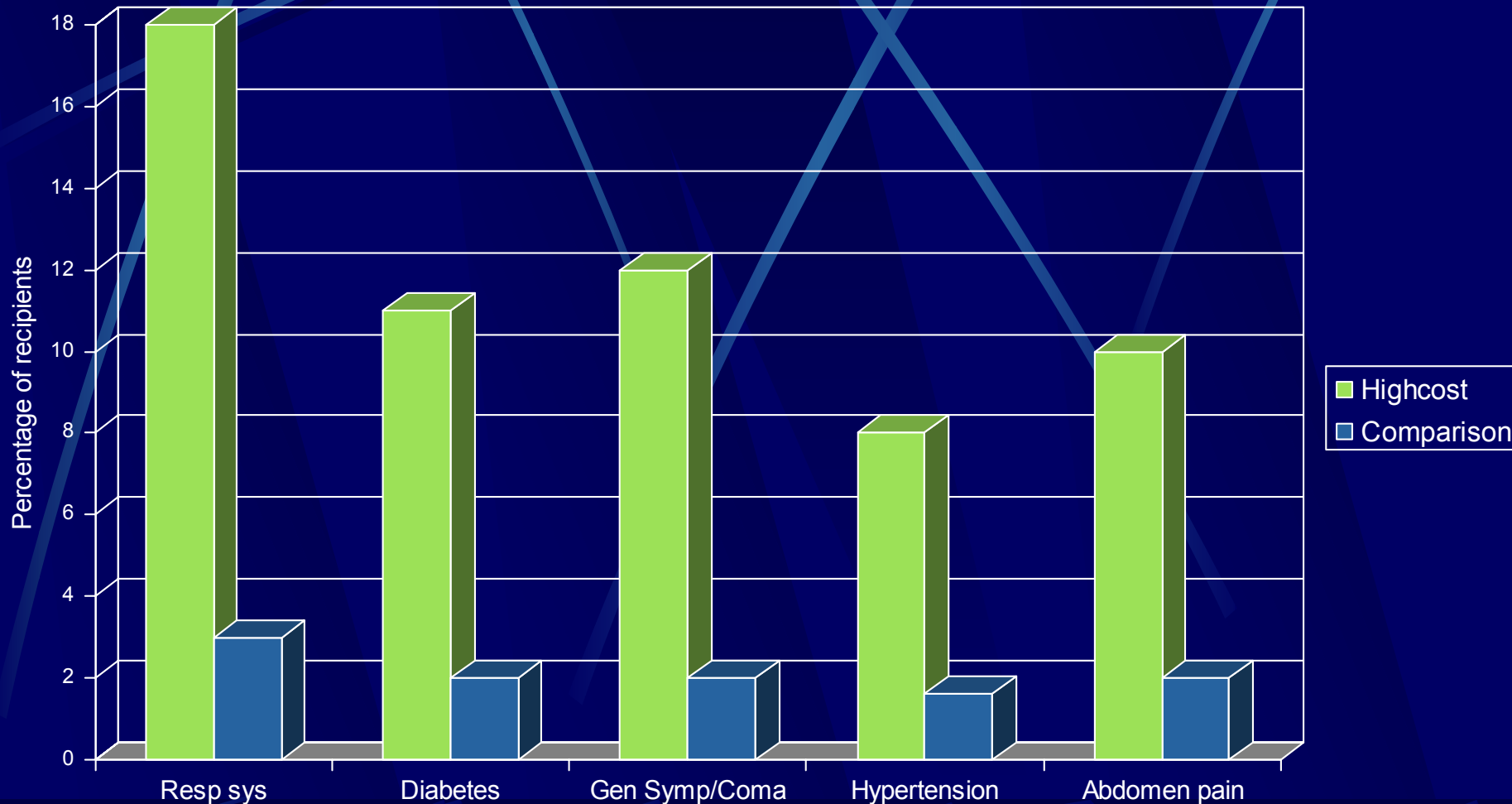
**Figure 20. Percentage of Non-Nursing Home Recipients within ACG 5070 with Most Frequent Diseases (ICD9 Codes)**



**Figure 21. Percentage of Nursing Home Recipients within ACG 5070 with Most Frequent Diseases (ICD9 Codes)**



**Figure 22. Percentage of Recipients with Most Frequent Diseases (ICD9 Codes) in Non-Nursing Home Patients with ACG 5060**



**Figure 23. Percentage of Nursing Home Recipients within ACG 5060 with the Most Frequent Diseases (ICD9 Codes)**

