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IDENTIFYING FUTURE HIGH-COST CASES AMONG MEDICAID RECIPIENTS WITH A SEVERE DISABILITY IN WASHINGTON STATE

Although persons with severe disabilities comprise about 15 percent of individuals receiving Medicaid services in Washington State,¹ they account for about 27 percent of all Medicaid expenditures.² This paper focuses on methods to identify the subset of Medicaid clients with a severe disability who are expected to have the highest future costs. Once identified, it is possible to provide medical management services to these individuals, with the goals of reducing Medicaid program costs and improving patient outcomes.

The Washington State Institute for Public Policy (Institute) was directed by the Legislature “to research and evaluate strategies for constraining the growth in state health expenditures.”³ After consulting with legislative fiscal committee staff, an analysis of future high-cost individuals who are eligible for Medicaid due to a severe disability was identified as a useful area of research.

Key Findings

Prior-year health costs are good predictors of future health care costs for persons enrolled in the Categorically Needy Blind and Disabled Medicaid program: 55 percent of clients in the top 5 percent of calendar year 2000 expenses are also among those with the highest 5 percent of calendar year 2001 health care costs, while only 19 percent of this group are in the bottom 80 percent of expenses in calendar year 2001.

A prediction method based on diagnostic information is less successful: only 34 percent of clients in the top 5 percent of estimated expenses based on diagnostic data are among the group with the highest 5 percent of actual 2001 health care costs.

Combining the two methods yields even better predictions: a total of 62 percent of highest-cost clients in 2001 were correctly identified by using the results from both the prior-year cost and diagnosis-based methods.

Once potential high-cost clients have been identified, the Medical Assistance Administration (MAA) could analyze clients’ diagnostic data and past patterns of service utilization to determine suitable interventions. Potential interventions may include encouraging enrollment in an existing disease management program, medical management programs to coordinate care, or the development of new disease management programs.

¹ Based on September 2002 caseload data reported on the Caseload Forecast Council website <<http://www.cfc.wa.gov>>, Accessed June 23, 2003.

² Based on 2001–03 biennial expenditures, all funds, reported on the DSHS budget website <<http://www1.dshs.wa.gov/budget/080main.shtml>>, Accessed June 23, 2003.

³ ESSB 6153, Section 608(8), Chapter 7, Laws of 2001.

Medical Management Approaches to Containing Costs

Given their relatively high medical costs, strategies to reduce expenses and improve care coordination among Medicaid recipients with severe disabilities are clearly important.

One approach to reducing health care expenses, currently underway as part of MAA's cost containment efforts, is to provide clients with specific disease-based education and assistance in coordinating care. The goals of this disease management effort, targeted to Medicaid recipients with diabetes, asthma, end stage renal disease or congestive heart failure, are improving self-care and reducing adverse outcomes, thereby reducing costs.

Another approach is to provide similar patient education and care coordination services but to patients identified on the basis of their expected medical costs rather than by a specific disease. Due to the volume of services they receive, high-cost patients are assumed to be more likely to have received unnecessary services and to benefit from coordination of care.

Although Medicaid recipients with severe disabilities are generally more expensive than other Medicaid groups, there is considerable variation in annual expenditures among these clients. In calendar year 2001, the 5 percent of disabled Medicaid recipients with the highest health care expenses were responsible for nearly 44 percent of disabled Medicaid recipients' expenditures.⁴ This concentration of costs among a relatively small number of recipients suggests that a targeted approach to cost containment efforts is likely to provide the largest potential for savings.

Targeting cost-saving efforts to those Medicaid recipients for whom cost savings seem most likely requires identifying "high-cost" clients in advance. Therefore, this analysis aims to identify future high-cost patients among Washington State Medicaid recipients with severe disabilities. Two techniques for identifying future high-cost recipients are investigated.

Data Sources and Client Characteristics

Washington State's Medicaid program that provides health care services to low-income persons with a severe disability is referred to as the Categorically Needy Blind and Disabled program. Medicaid eligibility based on disability requires that an individual meet the definition of disability under the federal Supplemental Security Income (SSI) program. To meet this definition, an individual must have a severe, medically determined physical or mental impairment. For adults, a second condition is added—the impairment must be

⁴ Defining high-cost clients as the most expensive 5 percent of recipients in 2003 is somewhat arbitrary. Other studies examining this issue have focused on groups ranging from the most expensive 0.5 percent to the most expensive 20 percent of a population. For example, see A. S. Ash et al., "Finding Future High-Cost Cases: Comparing Prior Cost Versus Diagnosis-Based Methods," *Health Services Research* 36, no. 6 (December 2001), Part II; M. L. Berk and A. C. Monheit, "The Concentration of Health Care Expenditures, Revisited," *Health Affairs* 20, no. 2 (2001); R. T. Meenan et al., "The Sensitivity and Specificity of Forecasting High-Cost Users of Medical Care," *Medical Care* 37, no. 8 (1999).

sufficiently severe that the individual is unable to engage in “substantial gainful activity” which would result in monthly earnings of \$800 or more.⁵

The data used in this analysis are health care billing records (generally referred to as claims) and eligibility information for all persons with at least one month of eligibility in the Categorically Needy Blind and Disabled program during calendar year 2001. To obtain an accurate measure of prior-year health care costs, the analysis sample is further limited in two ways:

- First, recipients must have had 12 months of Medicaid eligibility (although not necessarily in the Categorically Needy Blind and Disabled program) during calendar year 2000. This requirement avoids underestimating prior-year medical costs for individuals who may have had only part of their calendar year 2000 health care paid for by Medicaid.
- The second restriction is to exclude those persons who were simultaneously eligible for both Medicaid and Medicare. Because Medicare generally pays for a substantial share of hospital and physician costs for these “dually eligible” recipients, the Medicaid expenditures for such individuals may substantially understate their total prior-year health care costs.

Some individuals who met the above criteria were not enrolled in the Categorically Needy Blind and Disabled program for all calendar year 2000. For example, some persons who initially qualified for another Medicaid program may ultimately have been determined to have a severe disability and qualify for the Categorically Needy Blind and Disabled program.⁶ Presumably, we would only attempt to predict future high-cost Categorically Needy Blind and Disabled recipients from among individuals who were eligible for the Categorically Needy Blind and Disabled at the end of whatever data period is used for prediction purposes. Because we are using data from calendar year 2000, the analysis sample is further limited to those persons who were eligible for the Categorically Needy Blind and Disabled program in December 2000.

Exhibit 1 provides brief descriptive information about the analysis sample. Although 116,764 individuals had one or more months of eligibility in the Categorically Needy Blind and Disabled program during calendar year 2001, the restrictions placed on the analysis sample reduce the group to 78,353 clients. As the exhibit indicates, the sample consists primarily of female, English-speaking, non-Hispanic whites living in or near urban areas.

⁵ This is the definition of substantial gainful activity for 2003. The data used in this analysis are from 2001, when substantial gainful activity was defined as \$740 of earnings per month. Employed persons with severe disabilities and incomes under 220 percent of the federal poverty level may qualify for the Healthcare for Workers with Disabilities (HWD) program which enables individuals to obtain eligibility for the Categorically Needy Blind and Disabled program by paying premiums based on income.

⁶ See S. Lerch, *Medicaid Coverage for Persons With Severe Disabilities: Caseload Composition and Growth* (Olympia: Washington State Institute for Public Policy, March 2003), 37 for a brief discussion of why individuals might be shifted from other Medical Assistance programs to the Categorically Needy Blind and Disabled program.

Exhibit 1
Descriptive Statistics: Analysis Sample

| Characteristic | |
|-------------------------------------|---------|
| Sample size | 78,353 |
| Average age | 39.9 |
| Female | 54.5% |
| Primary language other than English | 7.2% |
| Racial/ethnic minority | 20.3% |
| Living in rural area | 4.3% |
| Average CY 2000 medical expenses | \$7,098 |
| Average CY 2001 medical expenses | \$7,427 |

Source: WSIPP analysis of MAA data

Using Prior-Year Costs to Identify Future High-Cost Clients

Individuals with high health care expenses in one year might reasonably be expected to continue to have high future costs. Health insurance actuaries frequently use prior costs as a way to predict future costs.⁷ This approach seems particularly feasible among individuals with disabilities who would be expected to have severe, ongoing health care problems.

To test this approach, we focus on the most expensive 5 percent of clients in calendar year 2000. These individuals have health care expenses of \$25,550 or more. If prior-year medical costs are a good predictor of future medical costs, we would expect most of these individuals also to be at the upper end of the calendar year 2001 distribution of health care expenses.

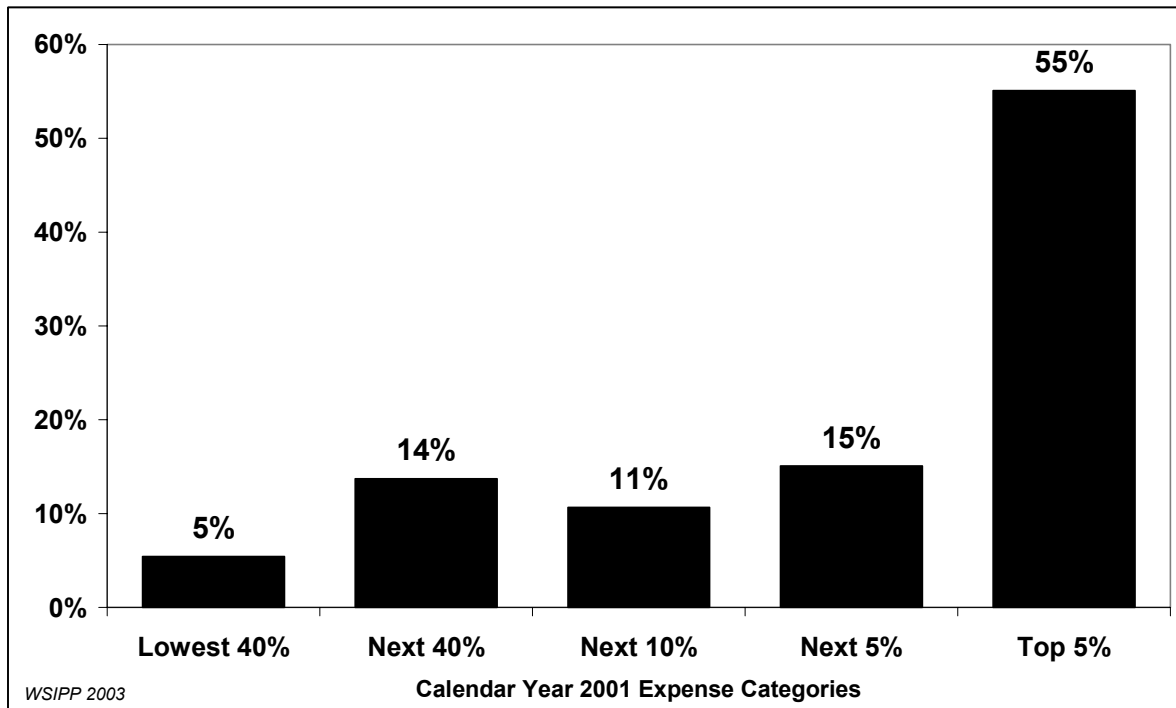
Exhibit 2 displays the distribution of calendar year 2001 medical expenses for clients in the top 5 percent of calendar year 2000 expenses. The exhibit indicates that 55 percent of clients in the top 5 percent of calendar year 2000 expenses are also among those with the highest 5 percent of calendar year 2001 health care costs. These individuals had average medical expenses of nearly \$70,000 in 2001.

Conversely, only 19 percent of the highest-cost clients from calendar year 2000 are in the bottom 80 percent of expenses in calendar year 2001. This suggests that prior-year health care costs are good identifiers of future high-cost clients among this group of Medicaid recipients.⁸

⁷ For example, see W. F. Bluhm and S. Koppel, "Individual Health Insurance Premiums" in *Individual Health Insurance*, ed. F. T. O'Grady (Schaumburg, IL: Society of Actuaries, 1988); J. P. Cookson, "Medical Claim Cost Trend Analysis" in *Group Insurance*, ed. W. F. Bluhm (Winsted, CT: ACTEX Publications, 1996).

⁸ The relationship between prior-year and future-year health care costs for individuals receiving employer-provided health insurance is not as strong as for the Medicaid Categorically Needy Blind and Disabled program. See R. Kronick, T. Dreyfus, L. Lee, and Z. Zhou, "Diagnostic Risk Adjustment for Medicaid: The Disability Payment System," *Health Care Financing Review* 17, no. 3 (Spring 1996); A. S. Ash et al., "Finding Future High Costs Cases."

Exhibit 2
Percentage of Clients in Top 5 Percent of Calendar Year 2000 Expenses
by Calendar Year 2001 Expense Categories



Using Diagnosis-Based Data to Identify Future High-Cost Clients

An alternative to using prior-year medical expenses to identify future high-cost patients is to make use of prior-year data on illnesses, accidents, and diseases. This information is available on most health care claims in the form of a “diagnosis code” that indicates the primary reason for receiving a particular medical service.⁹ In some cases, diagnosis codes are included for secondary diseases, which are not directly related to the service received but may have an impact on how a patient is treated.

In order to make the most effective use of diagnostic information, we have applied the Chronic Illness and Disability Payment System (CDPS) developed by researchers to predict health-based payments to managed care organizations for Medicaid recipients with severe disabilities.¹⁰ The CDPS groups diagnoses associated with elevated future medical costs into 20 major categories (such as cardiovascular, diabetes, psychiatric, and infectious disease), which are then further divided into subcategories based on the relationship between diagnoses and health care costs. For example, the psychiatric category is

⁹ The *International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM)* contains over 10,000 codes for disease, illness, and injury and is widely used by health care providers throughout the United States. It is a clinical modification of the World Health Organization’s *International Classification of Diseases, 9th Revision*.

¹⁰ See R. Kronick, T. Gilmer, T. Dreyfus, and L. Lee, “Improving Health-Based Payment for Medicaid Beneficiaries: CDPS,” *Health Care Financing Review* 21, no. 3 (Spring 2000). The CDPS classification system is an updated version of the DPS system described in Kronick et al. 1996.

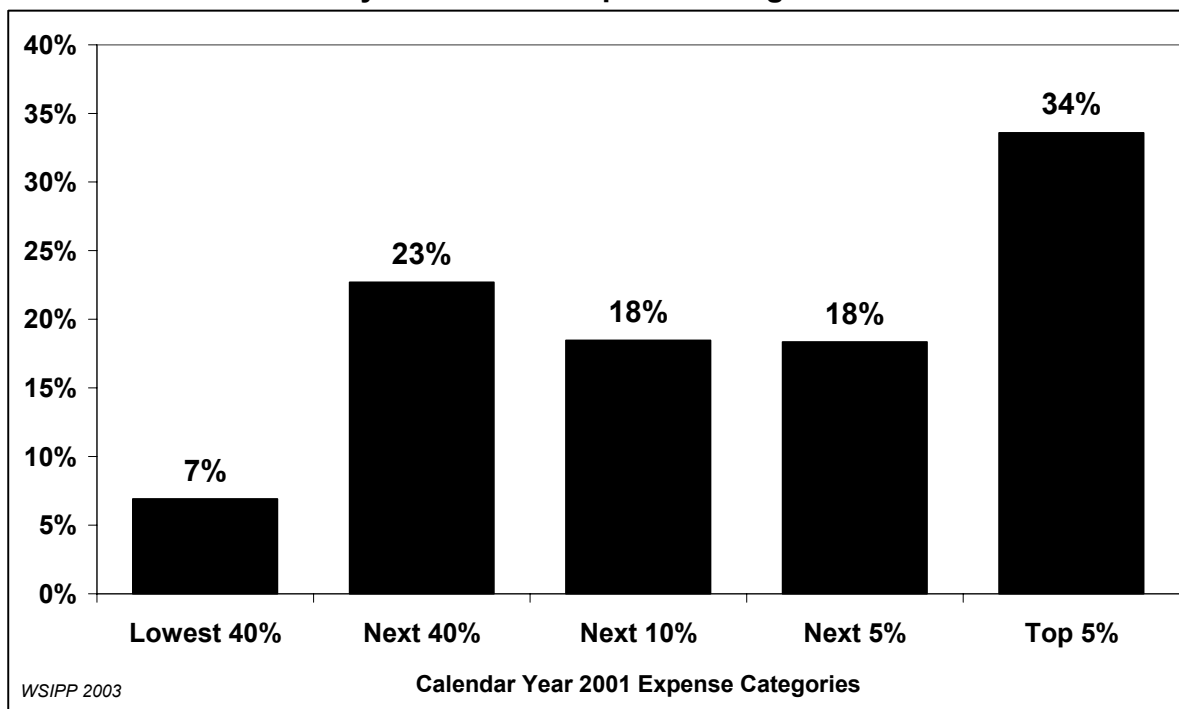
subdivided into three subcategories: high-cost (e.g., schizophrenia), medium-cost (e.g., bipolar affective disorder), and low-cost (e.g., panic disorder) conditions.

Using the diagnosis codes from the calendar year 2000 claims data, each individual in the analysis sample is assigned to the relevant CDPS categories and subcategories. Individuals with multiple diseases are included in multiple CDPS categories, while individuals who received no health care services in 2000 (and therefore had no claims) are not assigned to any CDPS categories.

To identify high-cost patients, regression analysis is used to estimate the relationship between calendar year 2001 health care expenditures and CDPS categories. Demographic information such as age, gender, primary language spoken, and race or ethnicity are used in the regression analysis to control for differences in health care expenditures associated with these factors. From the regression results, calendar year 2001 health care expenditures can be estimated for each person in the sample (see the appendix for regression results). We are then able to compare *estimated* calendar year 2001 costs to *actual* calendar year 2001 costs.

If the diagnosis-based CDPS categories are good predictors of future medical costs, we would expect most individuals with high estimated costs to also be at the upper end of the calendar year 2001 distribution of actual health care expenses. Exhibit 3 displays the distribution of *actual* calendar year 2001 medical expenses for clients in the top 5 percent of *estimated* calendar year 2001 expenses. The exhibit indicates 34 percent of clients in the top 5 percent of estimated expenses were also among those with the highest 5 percent of actual 2001 health care costs. These individuals had average medical expenses of over \$78,000 in 2001.

Exhibit 3
Percentage of Clients in Top 5 Percent of Estimated 2001 Expenses
by Actual 2001 Expense Categories



Of the two methods to identify future high-cost clients, the diagnosis-based method is not as successful as using prior-year costs. However, it does identify clients who, on average, have higher future health care costs. Therefore, combining the prior-year costs and the diagnosis-based methods may provide the most effective approach to identifying future high cost clients.

Exhibit 4 provides a brief description of the high cost clients in 2001 identified by either method. Line (c) shows that only 25 percent of high-cost clients in 2001 were identified by both the prior-year cost and the diagnosis-based methods. However, these clients have much higher 2001 medical costs, an average of over \$85,000, than high-cost clients identified by either method alone. Line (d) indicates the impact of combining the two methods. A total of 62 percent of high-cost clients in 2001, who account for 69 percent of expenditures among all high-cost clients, are identified.

Exhibit 4
Identifying Future High-Cost Clients

| | Clients | Percent of Clients | Expenditures (\$ Millions) | Percent of Expenditures | Average Expenditures |
|---|----------------|---------------------------|-----------------------------------|--------------------------------|-----------------------------|
| Top 5 Percent of 2001 Expenditures (All) | 3,918 | 100% | \$238.0 | 100% | \$60,744 |
| (a) In Top 5 Percent of 2000 Expenditures | 2,158 | 55% | \$150.7 | 63% | \$69,842 |
| (b) In Top 5 Percent of Predicted 2001 Expenditures | 1,255 | 32% | \$98.2 | 41% | \$78,262 |
| Diagnosis-Based Method | | | | | |
| (c) In Both (a) and (b) | 979 | 25% | \$83.6 | 35% | \$85,430 |
| (d) In Either (a) or (b) | 2,434 | 62% | \$165.3 | 69% | \$67,914 |

Comparison With Current Disease Management Approach

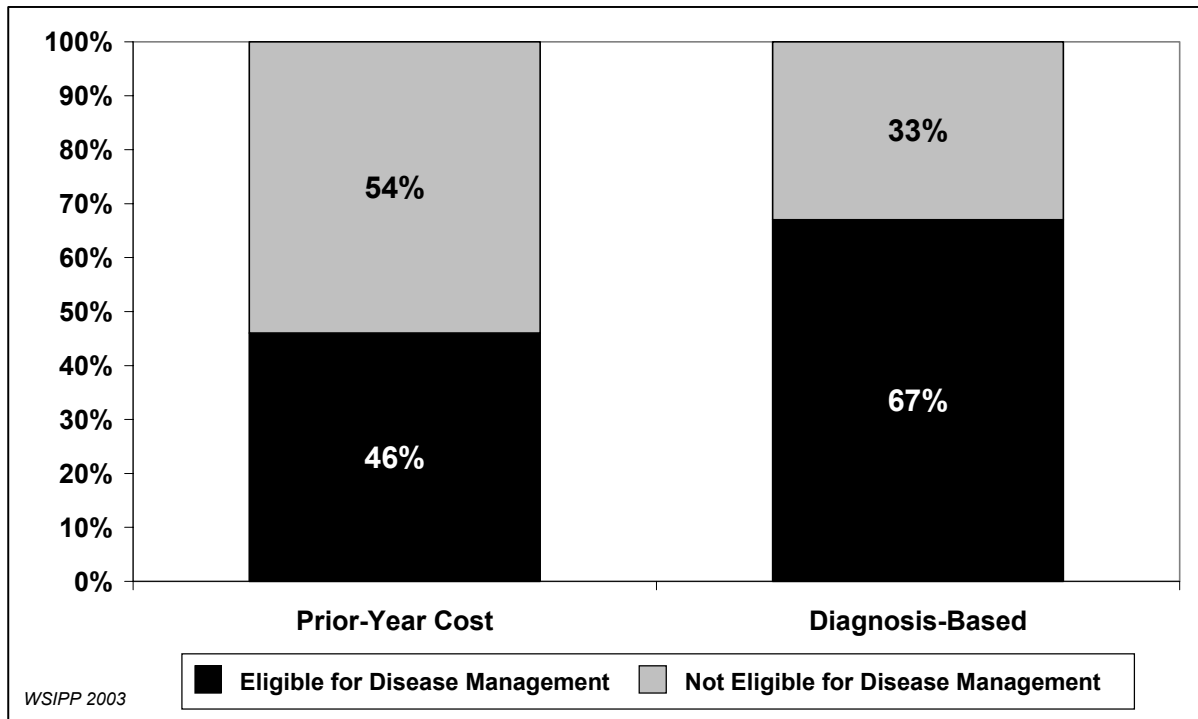
As noted earlier, Washington State’s MAA currently has a disease management program intended to target clients with diabetes, asthma, congestive heart failure, and end stage renal disease. To the extent that future high-cost clients have one or more of these diseases, the existing disease management program may already be identifying and treating a substantial number of high-cost clients.

To obtain an approximate count of high-cost clients in 2001 who would qualify for the disease management program, we examined how many high-cost clients were grouped into the CDPS categories for diabetes, medium-cost pulmonary disease (includes chronic obstructive asthma), low-cost pulmonary disease (includes asthma), medium-cost cardiovascular disease (includes congestive heart failure), and very high-cost renal disease (includes chronic renal failure).

Exhibit 5 displays the overlap between high-cost clients identified through the methods discussed above and those eligible for disease management. Of the 2,158 individuals who were correctly identified as future high-cost clients by the prior-year cost method, 46 percent

were also potentially eligible for disease management. A much higher 67 percent of individuals who were correctly identified as future high-cost clients by the diagnosis-based method were also potentially eligible for disease management.¹¹

Exhibit 5
Overlap Between Identified High-Cost Clients
and Disease Management Eligibility



Conclusion

On average, individuals in the Categorically Needy Blind and Disabled program are among the most expensive of all Washington State Medicaid recipients. However, even in this relatively expensive program, health care expenditures are concentrated among a fairly small fraction of high-cost clients.

This analysis examined two potential approaches to identify future high-cost clients in the Categorically Needy Blind and Disabled program. Identification of individuals expected to have high future health care costs provides an opportunity to intervene through patient education, care coordination, and other medical management strategies that have the potential to reduce health care costs and improve patient outcomes.

¹¹ The CDPS categories that contain diseases covered by the current disease management program also include some diseases not included in the disease management program. For example, the medium- and low-cost pulmonary disease groups include individuals with various pneumonias, bronchitis, and emphysema as well as asthma. Therefore, the fraction of individuals identified as high-cost patients through the prior-year cost or diagnosis-based methods *and* potentially eligible for disease management may overstate the number actually eligible for the disease management program.

The use of prior-year health care costs to identify future high-cost clients was more successful than a method using diagnosis-based data. Of clients in the top 5 percent of calendar year 2000 medical costs, 55 percent were also in the top 5 percent of medical costs in calendar year 2001. The diagnosis-based method was able to correctly identify only 34 percent of the high-cost clients in 2001. However, by combining individuals identified by either method, a total of 62 percent of high-cost clients were correctly identified.

Both methods rely on existing Medicaid data sources and could be implemented with standard software and programming techniques. However, to make the identification of future high-cost clients a useful tool for the MAA, the timing suggested in the above analysis would need to be modified. Because of lags between when a medical service is provided and claim submission and processing, MAA may not have complete claims data for a calendar year until as much as six months after the end of the year. This suggests using, for example, claims data from June 2002 through May 2003 in order to have a complete 12 months of data and sufficient analysis time to identify high-cost clients in calendar year 2004. The extent to which using less recent data affects the ability to correctly identify future high-cost clients and the time needed to complete the analyses and disseminate the information will require additional research.

Once potential high-cost clients have been identified, analysis of their chronic diseases and past patterns of service utilization will help identify suitable interventions. For those individuals with diabetes, asthma, congestive heart failure, or end stage renal disease, this may mean encouraging their enrollment in the existing disease management programs. For others, providing medical management services to coordinate care or developing additional disease management programs may be appropriate.¹²

While looking to the most expensive clients in order to identify costs savings and opportunities for improved patient outcomes is a sensible approach, the potential for benefits will be higher for some types of clients than others. Likewise, some medical management techniques will prove to be more effective than others. For these reasons, an ongoing assessment of the costs and benefits of the interventions will be critical to producing Medicaid cost savings and improving patient outcomes.

¹² Recent research suggests benefits from management programs targeted at a number of different diseases. For example, see S. R. Weingarten et al., "Interventions Used in Disease Management Programmes for Patients With Chronic Illness – Which Ones Work? Meta-Analysis of Published Reports," *British Medical Journal* 26 (October 26, 2002); D. Bruce and J. Dickmeyer, "Don't Overlook Disease Management Programs for Low-Incidence, High-Cost Disease to Improve Your Bottom Line," *Journal of Health Care Finance* 28, no. 2 (Winter 2001); S. K. Pandey et al., "An Assessment of Maryland Medicaid's Rare and Expensive Case Management Program," *Evaluation and the Health Professions* 23, no. 4 (December 2000); S. Lerch and J. Mayfield, *High Cost Medicaid Clients: Targeting Diseases for Case Management* (Olympia: Washington State Institute for Public Policy, December 2000).

Appendix: Regression Results—Diagnosis-Based Approach to Identifying High-Cost Clients

The CDPS grouping software (available at <<http://medicine.ucsd.edu/fpm/cdps/index.html>>) was applied to individual-level Medicaid claims data from calendar year 2000 to obtain indicators for which of the diagnosis-based groups and subgroups applied to each client in the analysis sample. Demographic variables (age, gender, race/ethnicity, primary language spoken, rural/urban residence) are from the Medicaid eligibility data; the dependent variable is total calendar year 2001 Medicaid health care expenditures calculated from claims data.

Exhibit A-1

Dependent Variable: Total Calendar Year 2001 Medicaid Expenditures

| Sample Size: 74,739* | | | |
|------------------------------------|--------------------|----------------|--------------------|
| Adjusted R ² : 0.239 | | | |
| Independent Variables | Parameter Estimate | Standard Error | Significance Level |
| Intercept | 1,552 | 150.9 | <.01 |
| Language Other Than English | -1,653 | 244.6 | <.01 |
| Ethnic/Racial Minority | -341 | 147.1 | 0.02 |
| Live in Rural Area | 141 | 265.6 | 0.59 |
| Age < 1 | 6,810 | 3,850.7 | 0.08 |
| Age 1–4 | -1,075 | 501.0 | 0.03 |
| Female, age 5–14 | -778 | 346.7 | 0.02 |
| Male, age 5–14 | 273 | 275.6 | 0.32 |
| Female, age 15–24 | 77 | 310.4 | 0.80 |
| Male, age 15–24 | -413 | 278.7 | 0.14 |
| Female, age 25–44 | 587 | 188.8 | <.01 |
| Female, age 45–64 | 1,852 | 178.1 | <.01 |
| Male, age 45–64 | 1,381 | 192.8 | <.01 |
| Cancer | | | |
| High-cost | 10,318 | 567.8 | <.01 |
| Medium-cost | 3,030 | 457.5 | <.01 |
| Low-cost | -544 | 726.3 | 0.45 |
| Cardiovascular | | | |
| Very high-cost | 18,972 | 720.8 | <.01 |
| Medium-cost | 5,390 | 357.7 | <.01 |
| Low-cost | 1,987 | 223.3 | <.01 |
| Extra low-cost | 758 | 200.6 | <.01 |
| Cerebrovascular | 2,879 | 372.4 | <.01 |
| Central Nervous System | | | |
| High-cost | 11,166 | 606.9 | <.01 |
| Medium-cost | 7,864 | 354.2 | <.01 |
| Low-cost | 2,502 | 145.0 | <.01 |
| Developmental Disability | | | |
| Medium-cost | 2,695 | 990.2 | 0.01 |
| Low-cost | 1,317 | 417.2 | <.01 |

*The regression sample is smaller than the full analysis sample (78,353) due to missing data for one or more independent variables for 3,614 clients.

| Independent Variables | Parameter Estimate | Standard Error | Significance Level |
|------------------------------|---------------------------|-----------------------|---------------------------|
| Diabetes | | | |
| Type 1, high-cost | 12,640 | 1,067.3 | <.01 |
| Type 1, medium-cost | 5,079 | 343.2 | <.01 |
| Type 2, medium-cost | 2,961 | 545.0 | <.01 |
| Type 2, low-cost | 1,731 | 233.3 | <.01 |
| Eye | | | |
| Low-cost | 1,480 | 847.5 | 0.08 |
| Very low-cost | 1,356 | 295.9 | <.01 |
| Genital | 348 | 336.9 | 0.30 |
| Gastrointestinal | | | |
| High-cost | 7,230 | 826.7 | <.01 |
| Medium-cost | 5,931 | 352.8 | <.01 |
| Low-cost | 1,894 | 194.8 | <.01 |
| Hematological | | | |
| Extra high-cost | 94,924 | 1,921.5 | <.01 |
| Very high-cost | 30,418 | 2,519.9 | <.01 |
| Medium-cost | 7,756 | 661.2 | <.01 |
| Low-cost | 3,641 | 559.7 | <.01 |
| Infectious Disease | | | |
| AIDS, high-cost | 12,322 | 584.5 | <.01 |
| Other, high-cost | 5,072 | 1,393.6 | <.01 |
| HIV, medium-cost | 8,933 | 1,386.2 | <.01 |
| Other, medium-cost | 7,668 | 805.5 | <.01 |
| Other, low-cost | 1,774 | 458.5 | <.01 |
| Metabolic | | | |
| High-cost | 7,743 | 530.2 | <.01 |
| Medium-cost | 4,094 | 512.9 | <.01 |
| Very low-cost | 1,247 | 397.4 | <.01 |
| Pregnancy | | | |
| Complete | 432 | 540.6 | 0.42 |
| Incomplete | 1,903 | 545.8 | <.01 |
| Psychiatric | | | |
| High-cost | 3,827 | 212.6 | <.01 |
| Medium-cost | 1,784 | 319.2 | <.01 |
| Low-cost | 1,601 | 157.7 | <.01 |
| Pulmonary | | | |
| Very high-cost | 23,512 | 1,208.1 | <.01 |
| High-cost | 9,656 | 557.5 | <.01 |
| Medium-cost | 4,873 | 480.3 | <.01 |
| Low-cost | 1,853 | 163.2 | <.01 |
| Renal | | | |
| Very high-cost | 13,810 | 492.9 | <.01 |
| Medium-cost | 2,043 | 241.7 | <.01 |
| Low-cost | 1,213 | 282.2 | <.01 |

| Independent Variables | Parameter Estimate | Standard Error | Significance Level |
|--|---------------------------|-----------------------|---------------------------|
| Skeletal and Connective | | | |
| Medium-cost | 6,623 | 960.7 | <.01 |
| Low-cost | 3,921 | 279.5 | <.01 |
| Very low-cost | 2,413 | 226.8 | <.01 |
| Extra low-cost | 1,162 | 220.4 | <.01 |
| Skin | | | |
| High-cost | 7,159 | 587.3 | <.01 |
| Low-cost | 2,332 | 533.8 | <.01 |
| Very low-cost | 858 | 216.7 | <.01 |
| Substance Abuse | | | |
| Low-cost | 2,397 | 308.9 | <.01 |
| Very low-cost | -520 | 336.3 | 0.12 |
| Child-Disease Interaction Terms | | | |
| Cardiovascular, very high-cost | -605 | 2,107.6 | 0.77 |
| Central nervous system, medium-cost | 8,125 | 818.8 | <.01 |
| Diabetes, Type II, low-cost | 4,451 | 1,785.5 | 0.01 |
| Gastrointestinal, high-cost | 14,783 | 2,428.4 | <.01 |
| Gastrointestinal, medium-cost | 12,589 | 964.7 | <.01 |
| Gastrointestinal, low-cost | -319 | 706.5 | 0.65 |
| Hematological, very high-cost | -22,947 | 3,201.3 | <.01 |
| Infectious, medium-cost | 12,170 | 2,356.4 | <.01 |
| Metabolic, high-cost | 3,436 | 1,283.2 | 0.01 |
| Metabolic, medium-cost | 967 | 610.4 | 0.11 |
| Pulmonary, very high-cost | 27,774 | 1,701.6 | <.01 |

The above results used an ordinary least squares (OLS) specification. In previous work examining the potential of the DPS (the forerunner of the CDPS grouping system) for use in designing risk-adjusted payments for the Washington State Categorically Needy Blind and Disabled program, researchers at the University of Washington¹³ examined both OLS and generalized linear model (GLM) regression specifications. They concluded that there were no clear statistical reasons to choose one specification over the other when analyzing the entire Categorically Needy Blind and Disabled program.

¹³ C. W. Madden, S. M. Skillman, and B. P. Mackay, *Risk Distribution and Risk Assessment Among Enrollees in Washington State's Medicaid SSI Population*, final report for the Center for Health Care Strategies Inc. (Princeton, NJ: July 1998).

