Visually Detecting Fraudulent Doctors in the Medicaid Program Using SAS/GRAPH Software

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Abstract

Each year in the United States millions of taxpayer dollars are stolen from the Medicaid program by dishonest physicians, pharmacists, nursing home and hospital administrators, and other providers of medical services and supplies. It has been estimated that more money is stolen from the Medicaid and Medicare programs than in all street crime combined. Fraud occurs in all states and in all areas of Medicaid services. The purpose of this paper is demonstrate the usefulness of SAS/GRAPH software by describing several examples where graphics were used successfully to detect fraud in the Utah Medicaid program.

Introduction

The Medicaid program is funded jointly by the federal government and the individual states. Its purpose is to provide medical care to low income people. In contrast to the Medicare program for which all senior citizens qualify, Medicaid eligibility is based on income and assets, focusing on the poor of all ages. The range of services paid by Medicaid includes physician visits, dental care, hospital and nursing home care, prescription drugs, mental health care, and other medical services.

Statistical graphics have been called the single most powerful tool for analyzing numerical information. Well-chosen graphics can be used to examine billing records and gain meaningful insights into fraudulent billing patterns more clearly than computer printouts or summarized reports.

SAS/GRAPH, with its built-in procedures and its programming capability, allows users to generate both standard statistical graphs and customized graphs that fit particular needs. Following are several examples of graphs that were used by the Utah Bureau of Medicaid Fraud to target medical theft.

Figure 1

Figure 1 is a scatterplot showing the relationship between the total quantity of drugs received at all Medicaid nursing homes and the number of Medicaid recipients per institution. Each point on the plot represents a single nursing home. A regression line overlaid on the scatterplot helps illustrate the positive trend in the data. Of the 115 Utah nursing homes SAS/GRAPH clearly showed a potential problem facility.

Figure 2

Soma and lortab are two drugs that produce a heroin-type high when mixed together in about equal proportions. There is no legitimate medical reason for a doctor to prescribe large doses of both of these drugs to a single patient, but the combination has become a drug of choice for many addicts. Figure 2 shows all Medicaid recipients who filled prescriptions for both soma and lortab pills in 1995 and the number of each pill that they obtained. Each symbol represents one recipient. The circle plot symbols designate the recipients who received their prescriptions from one particular doctor. As the graph shows, most of these last recipients also received very large quantities of both drugs. This finding points to probable drug abuse and fraud.

Figure 3

Figure 3 shows the number of hours per day that a single doctor billed Medicaid for visits to nursing home patients over a five-year period. Obviously this was a very busy doctor. On twenty-seven days he was in consultation with Medicaid patients for more than twenty-four hours. Travel time, sleep, and visits with non-Medicaid patients would have occurred beyond these twenty-four hours/day.

Figure 4

Sometimes particular areas of graphs contain such a high concentration of points that some get stacked on top of others, making it difficult to determine the density. Figure 4 shows customized font symbols that can be used to overcome this "stacking" problem. The number of segments in each sunflower font shows the number of points that are located close together.

Figure 5

Figure 5 uses the sunflower plot symbols to illustrate the concentration of points found on the graph shown in Figure 3. Here, the high concentration of billings for 8-16 hours per day during 1993 and 1994 becomes apparent. It is interesting to note that these high-volume days decreased in number after the Medicaid Fraud investigator visited the doctor in February of 1996.

Figure 6

Figure 6 is a Kleiner-Hartigan tree representing one obstetrician. The branches of the tree represent specific birthing codes. The tree is created from a dendogram based on a cluster analysis. Codes 1, 2, 3, 5, 6 & 12 cluster together. They represent low-cost birthing procedures, i.e. vaginal births. Codes 4, 7, 8, 9, 10 & 11 also cluster together. They are high-cost procedures, i.e. cesarian sections.

Figure 7

Figure 7 is a matrix of Kleiner-Hartigan trees showing the cluster patterns for 42 obstetricians. Long branches on the left-side of a tree

indicate higher volumes of low-cost birthing procedures, while long right-hand branches indicate more high-cost procedures. Doctors who specialized in difficult pregnancies and births have a legitimate reason to use many expensive procedures. However, doctors who did not specialize in this way were targeted by Medicaid Fraud for further investigation.

Conclusion

Graphical methods have been highly useful for interpreting volumes of numerical data in many technical disciplines. The Utah Bureau of Medicaid Fraud has found SAS/GRAPH to be a convenient, flexible and powerful tool for generating graphs that visually depict medical fraud.

References

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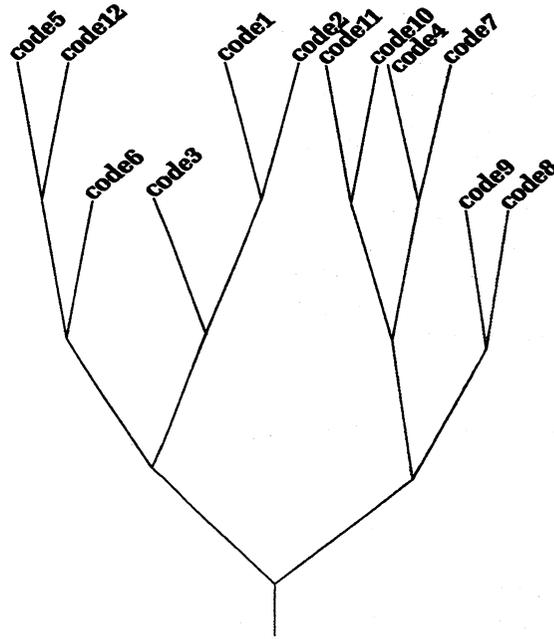
Acknowledgment

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Obstetricians

Figure 6

Obstetricians

Figure 7

xxxx40089007	xxxx62867008	xxxx87428001	xxxx28278001	xxxx43197008	xxxx05530004
xxxx09700001	xxxx63338007	xxxx63815007	xxxx40002005	xxxx40107001	xxxx20127005
xxxx02154007	xxxx80330007	xxxx84423003	xxxx22188001	xxxx63389008	xxxx80573008
xxxx25393003	xxxx26257006	xxxx45843006	xxxx49764009	xxxx61529000	xxxx08847003
xxxx23936009	xxxx84715004	xxxx21660007	xxxx80716008	xxxx29851007	xxxx82908003
xxxx62937005	xxxx83716006	xxxx88261007	xxxx08288005	xxxx25758009	xxxx69628000
xxxx84564019	xxxxx1221001	xxxx67552012	xxxx61769007	xxxx27547003	xxxx44628001

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The Sunflower Font Symbols

Figure 4

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22	23
24	25	26

Figure 3

Hours per Day

40 36 32 28 24 20 16 12 8 4 0

Date of Service

22APR92 08NOV92 27MAY93 13DEC93 01JUL94 17JAN95 05AUG95 21FEB96 08SEP96 27MAR97 13OCT97 01MAY98

Figure 5

Hours per Day

40 36 32 28 24 20 16 12 8 4 0

Date of Service

22APR92 08NOV92 27MAY93 13DEC93 01JUL94 17JAN95 05AUG95 21FEB96 08SEP96 27MAR97 13OCT97 01MAY98

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Figure 1

figure 2

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