Using SAS/GRAPH Software to Detect Fraud in the Utah Medicaid Program

Terry Allen, Ph.D., Utah Bureau of Medicaid Fraud
Salt Lake City, Utah

INTRODUCTION

The Utah Bureau of Medicaid Fraud is charged with policing fraud and abuse in a $670 million a year state Medicaid system. This system processes approximately 300,000 claims each month. In the past, the sheer volume of claims precluded effective analysis to detect specific fraudulent doctors and fraudulent methods. SAS/GRAPH software effectively presents masses of observations in a single visual, making it possible to detect fraudulent trends and to compare Medicaid providers with their peers. This paper examines univariate, bivariate and multivariate graphical methods to detect billing patterns that may indicated fraud.

EXAMPLES

FIGURE 1: [GSLIDE] Office-visit billing codes are determined by the amount of time the doctor spends with the patient. This figure shows the maximum charges allowed by Medicaid for each code. The services range from "minimal" service (99211) where a doctor might give a shot or take someone's blood pressure to "comprehensive" service (99215) where a doctor may spend 40 minutes or more with the Medicaid patient. Medicaid pays more as the level of service increases.

Office visit fraud occurs in two ways, both involve doctors who bill for services that are were not provided. First, a doctor may bill Medicaid for an office visit that never occurred, and second, a doctor may provide a low-level service but bill Medicaid as though a higher level of service was provided.

UNIVARIATE EXAMPLE

FIGURE 2: [GCHARTI In this chart provider specialties are grouped so that doctors can be compared with a homogeneous group of their peers, i.e. an individual pediatrician with all pediatricians. By summarizing all office visits by procedure code and then calculating a percent for each code, we are able to use side by side bar charts to graph the comparisons. Figure 2 is an example of a provider who is statistically similar to her peers.

FIGURE 3: [GCHARTI Here, another doctor is compared to the overall distribution of his peers. Figure 3 is an example of a doctor who bills almost exclusively at the two highest levels of service. In this case SAS/GRAPH powerfully

demonstrates an obvious mismatch with peers.

BIVARIATE EXAMPLE

FIGURE 4: [GPLOTI A problem with bar charts is that they sum over trends that could be helpful in discovering when fraud first occurs. Figure 4 is a line graph plotting the percent of each code that a particular doctor used during each quarter from 1994 to 1998. Notice that a major change occurred in either the doctor's medical practice or in her billing practice around the first quarter of 1996.

MULTIVARIATE EXAMPLE (Andrews Curves)

FIGURE 5: [GPLOTI Andrews (1972) suggested the use of harmonic functions for presenting multivariate data points. He introduced the function

$f_x(t)=X_1/\text{root}(2) + X_2\sin(t) + X_3\cos(t) + X_4\sin(2t) + X_5\cos(2t) \ldots$

for $-\text{pi} < t < \text{pi}$, as a two-dimensional representation of the observation vector $X=(X,, X_2, \ldots X_p)'$.

Andrews' curves are useful in clustering observation points in homogeneous groups. Each line represents one doctor. Figure 5 shows that the 39 highest volume pediatricians clustered into two groups (good guys and bad guys?).

FIGURE 6: [GPLOTI Of the 39 doctors represented on this graph, four had been previously convicted of fraud. By identifying those four (dotted lines), it is clear which group has the questionable billing pattern. Other doctors in the questionable group are then identified as possible upcoders.

CONCLUSION

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

ADDITIONAL READING

Andrews, D.F. (1972). Plots of high-dimensional Data. Biometrics 28: 125-136.

Allen, T., Soelberg, K., Jones, S. (1990). Using Statistical Graphics to Detect Medicaid Fraud. Sociological Practice Review. Aug 1990.

Dudley, C., Allen, T. (1998). Chaos to Order: Detecting Medicaid Fraud. The White Paper. May/June 1998.

CONTACT

Terry Allen Ph.D.
Research Analyst
Utah Bureau of Medicaid Fraud
5272 South College Dr.
Salt Lake City, Utah 84123

801/284-6264
psudi.tallen@state.ut.us

Figure 1

Office Visit Codes

procedure code	time	max. amount
99211	05	$ 8.91
99212	10	$15.95
99213	15	$22.52
99214	25	$34.72
99215	40	$54.89

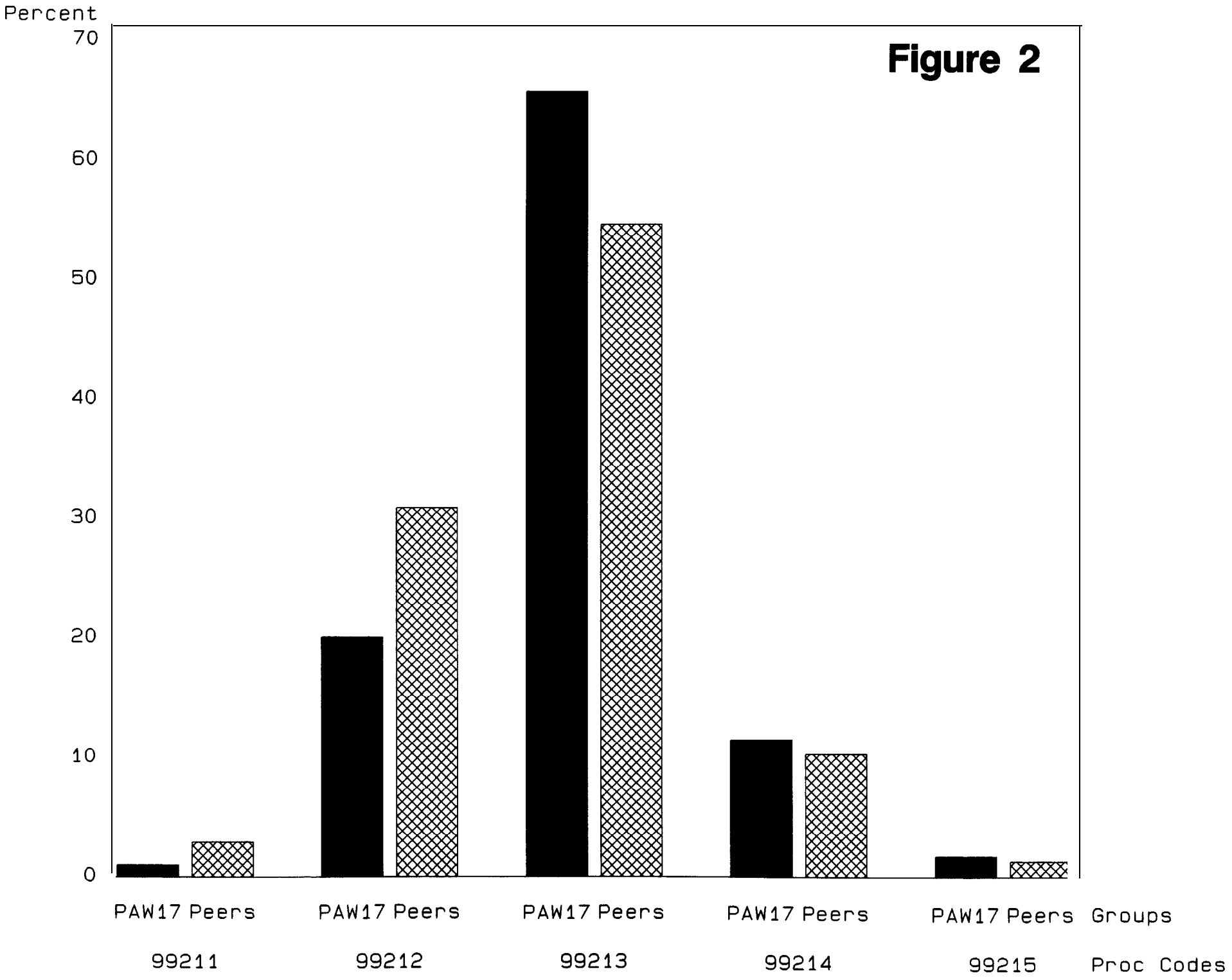
Figure 2
Percent
70
60
50
40
30
20
10
0
PAW17 Peers
PAW17 Peers
PAW17 Peers
PAW17 Peers
PAW17 Peers
Groups
99211
99212
99213
99214
99215
Proc Codes

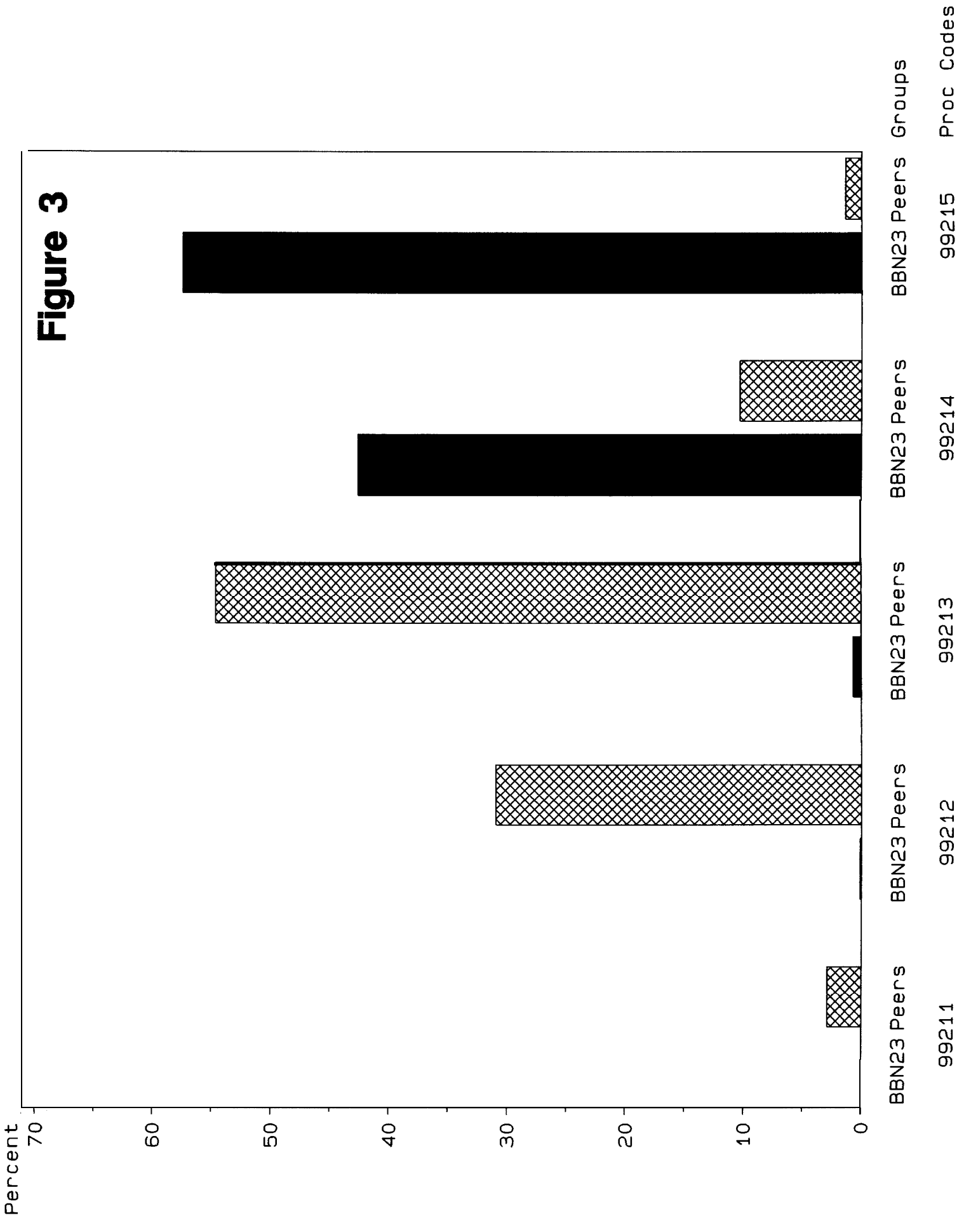
Figure 3
Percent
70
60
50
40
30
20
10
0
BBN23 Peers
99211
BBN23 Peers
99212
BBN23 Peers
99213
BBN23 Peers
99214
BBN23 Peers
99215
Groups
Proc Codes

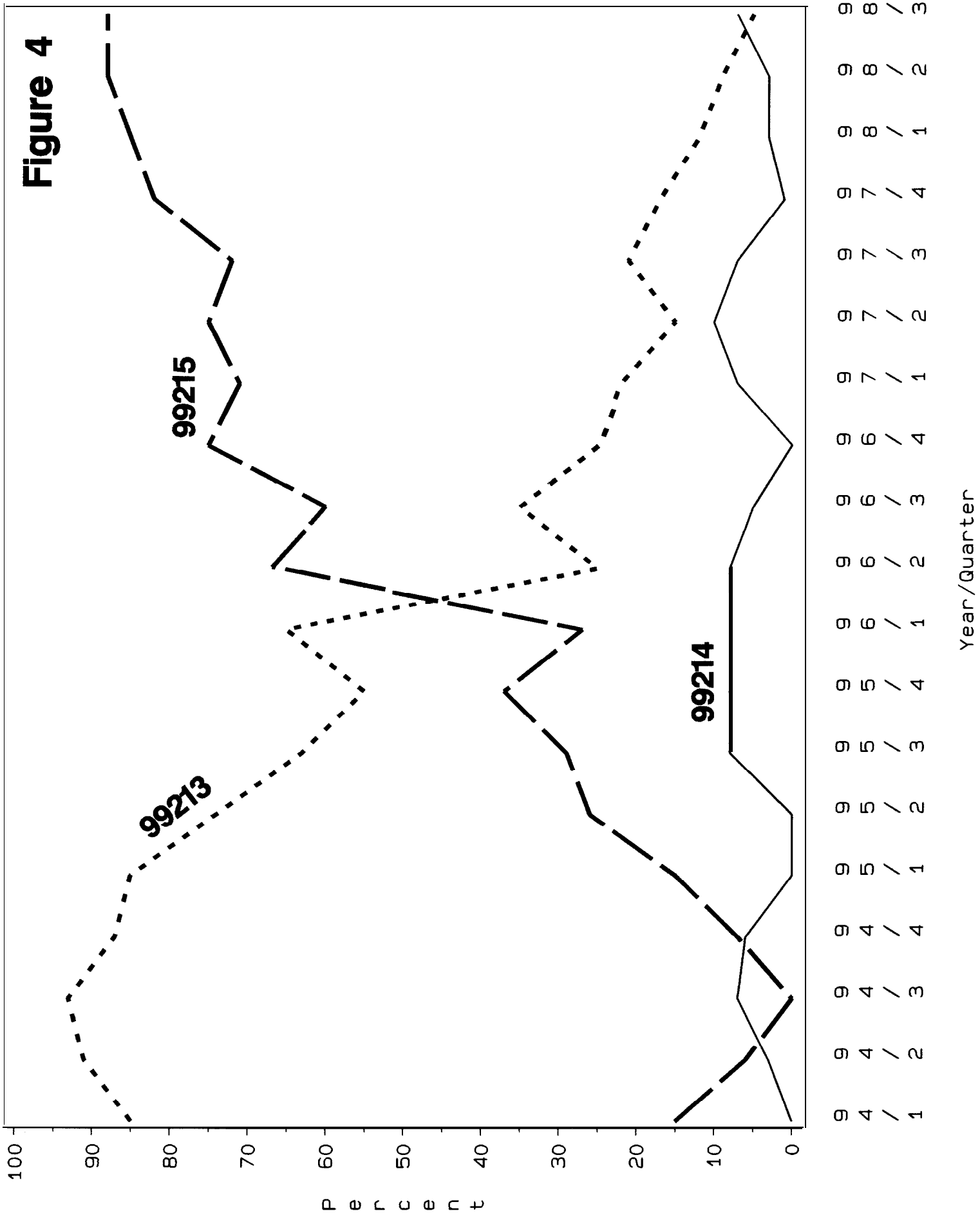
Figure 4
99213
99215
99214
Percent
100
90
80
70
60
50
40
30
20
10
0
9 4 / 1
9 4 / 2
9 4 / 3
9 4 / 4
9 5 / 1
9 5 / 2
9 5 / 3
9 5 / 4
9 6 / 1
9 6 / 2
9 6 / 3
9 6 / 4
9 7 / 1
9 7 / 2
9 7 / 3
9 7 / 4
9 8 / 1
9 8 / 2
9 8 / 3
Year/Quarter

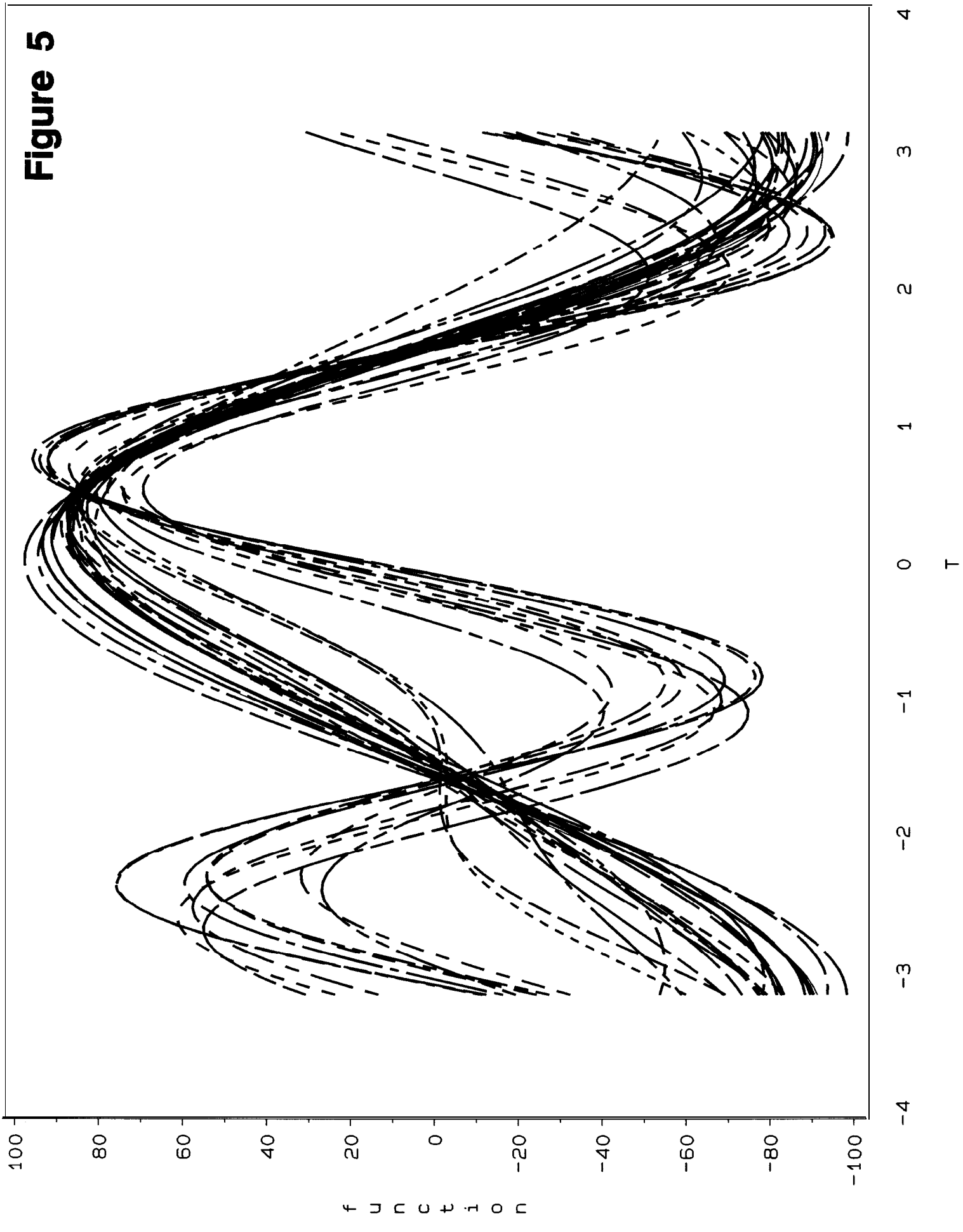
Figure 5
function
100
80
60
40
20
0
-20
-40
-60
-80
-100
-4
-3
-2
-1
0
1
2
3
4
T

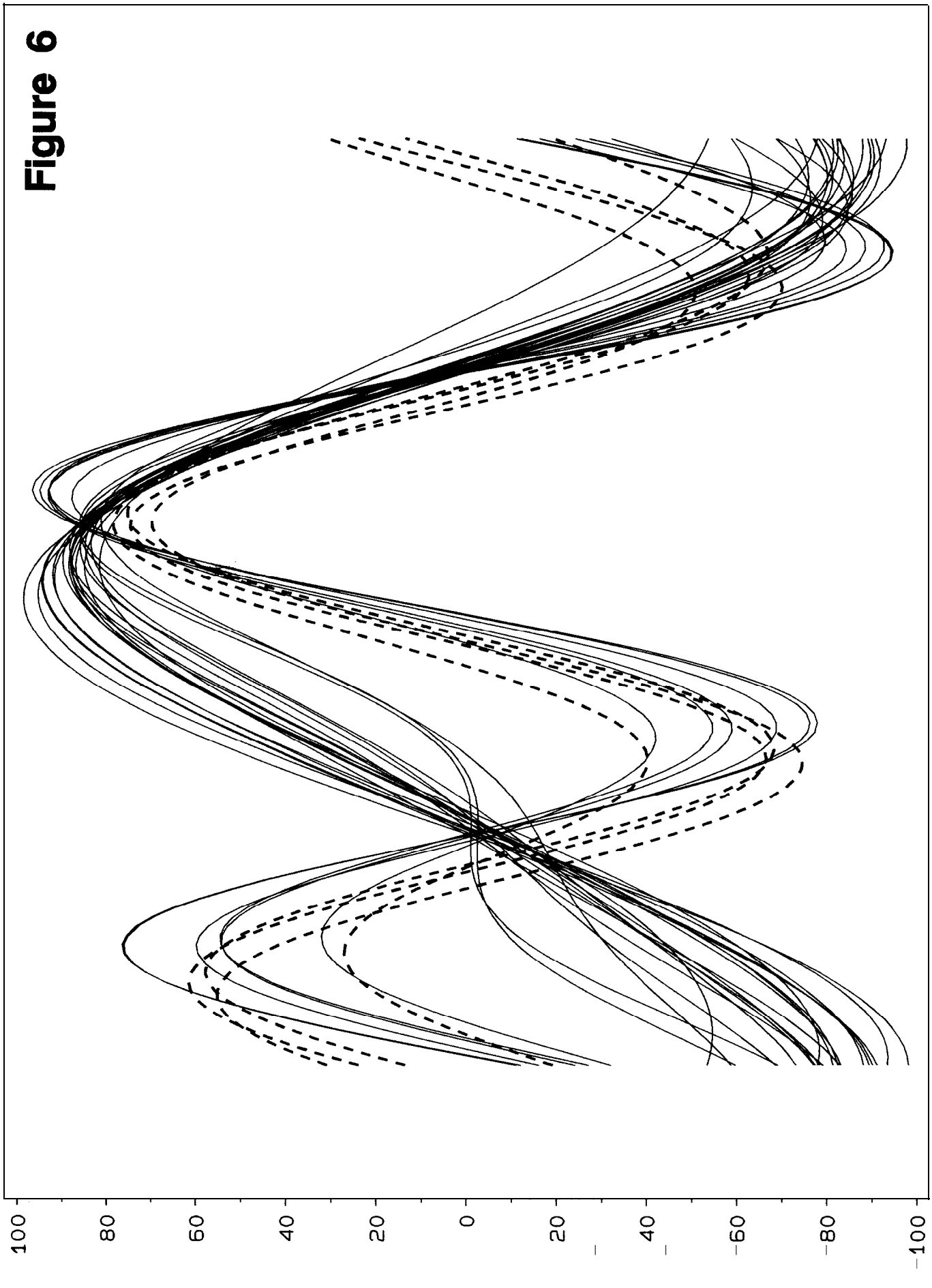
Figure 6
function
T
100
80
60
40
20
0
20
40
60
80
100
−4
−3
−2
−1
0
1
2
3
4