1   TESTIMONY

2   OF

3   EDWARD L. SPITZNAGEL, JR.

4

5   1. Q.   Please state your name, business address, and employer.

6

7   A.   My name is Edward L. Spitznagel, Jr., and my

8   business address is Campus Box 1146, One

9   Brookings Drive, St Louis, Missouri 63130. I am

10   employed by Washington University.

11

12   2. Q.   What is your present position?

13

14   A.   I am Professor of Mathematics in the College of

15   Arts and Sciences at Washington University. I

16   also hold a joint appointment in the Division of

17   Biostatistics of the Washington University School

18   of Medicine.

19

20   3. Q.   Please review your educational background and work

21   experience.

22

23   A.   I hold a Bachelor of Science, summa cum laude, in

24   mathematics, awarded in 1962 by Xavier University,

25   Cincinnati, Ohio. I hold a Master of Science

26   (1963) and Ph.D. (1965) in mathematics awarded by

1   the University of Chicago. I have served on the

2   Faculty of Arts and Sciences of Washington

3   University since 1969. I have held a joint

4   appointment in the Division of Biostatistics

5   since 1978. From 1965 to 1969 I was on the

6   faculty of Northwestern University.

7

8   Attached to my testimony is Appendix A, which

9   provides a more detailed listing of my education and

10   qualifications in the area of mathematics and statistics.

11

12   4. Q. What is the purpose of your testimony in this case?

13

14   A. I have been employed by Tennessee American Water

15   Company to make weather-normalized predictions of

16   water utilization for the period March 2007 to

17   February 2008.

18

19   5. Q. What is weather normalization?

20

21   A. From one year to the next, variations in temperature

22   and precipitation lead to changes in water consumption.

23   More water will generally be used during hotter, drier

24   periods. The regulatory question is how to reflect

25   those weather-related differences when setting rates.

26

1   For ratemaking purposes, revenues need to be set at as

2   "normal" a level as possible, factoring out the

3   potential or actual results of unusual weather

4   conditions. This can be accomplished by building

5   statistical models that predict water utilization from

6   meteorological data and other possible predictors. An

7   estimate of future utilization can then be made by

8   using a long-term average of meteorological data

9   (since there is no better way to forecast next year's

10   weather than as an average) and known values of the

11   other predictors.

12

13 6. Q. What are examples of these other, non-meteorological

14   predictors?

15

16   A. One is the year itself. Due to gradual introduction

17   of water-conserving plumbing fixtures and appliances,

18   use of water appears to be gradually declining over time.

19

20   Another is the month of the year. While water

21   utilization increases during the warmer, drier

22   summer months, analysis of variance shows that

23   month as a categorical variable is a powerful

24   predictor even after temperature and moisture have

25   been included in the model.

26

1 7. Q. What model for water utilization did you employ?

2

3   In a previous case before the Public Service Commission

4   of the Commonwealth of Kentucky (1997), I screened a

5   large number of candidate predictors by examining data

6   from sixteen different operating companies in five states,

7   Kentucky, Missouri, Ohio, Tennessee, and Virginia.

8   Tennessee American Water Company was one of these sixteen

9   companies.

10

11   I used as candidate predictors only those variables that

12   correlated consistently with utilization for most or all

13   of these operating companies.

14

15   I then fitted the surviving candidates in a multivariate

16   model to predict utilization. I found that calendar month

17   was a strong predictor even in the presence of heat and

18   moisture variables. Therefore I included month as a

19   categorical variable. With month included, I tested drought

20   severity index, temperature, and calendar year as potential

21   numeric predictors. I found that temperature was not a useful

22   predictor in the presence of the other variables, so from

23   that point onward, I did not use it.

24

25   For the months of January through April, there was no evidence

26   that moisture predicted utilization. For the months of May

1   through December, there was evidence of moisture predicting

2   utilization, being a weak predictor in the months of May, June,

3   November, and December and a strong predictor for the months

4   of July through October.

5

6   Since only a deficit of moisture should lead to increased

7   water utilization, I tested truncated versions of the Palmer

8   Drought Severity Index as predictors, finding that truncation

9   at 0 yielded a larger R-square than the non-truncated index

10   and the index truncated at all other levels.

11

12   Month was a very strong predictor, both as a main effect and

13   interacting with the truncated drought severity index. Because

14   of this, I estimated twelve separate predictive models, one

15   for each month of the year.

16

17   For the present case I used those same predictors to estimate

18   Tennessee American Water Company utilization by fitting them

19   to monthly TAWC consumption data from July 1996 through

20   June 2006. The models were estimated separately for

21   residential and commercial consumption. The coefficient

22   estimates can be found in Appendix B.

23

24   8.   Q. Not all of the coefficient estimates are statistically

25   significant. Is this a problem?

26

1   A. No. The candidate variables were obtained as described above,

2   by examining data from 16 different water companies, selecting

3   those that correlated with utilization over most or all of

4   those companies. Once those variables were selected, the

5   resulting estimates based on them will be unbiased. If they

6   are subject to further selection based on statistical

7   signifiance, there is a chance that a small amount of bias

8   could result.

9

10 9. Q. Once you had estimated the coefficients in these monthly

11   models, how did you project utilization for March 2007

12   through February 2008?

13

14   I put the coefficients from the monthly regressions into

15   Excel spreadsheets, one for residential customers, and the

16   other for commercial customers. I calculated the mean

17   truncated Palmer Drought Severity Index for each of the

18   twelve calendar months over the 30 year period from July

19   1976 to June 2006 and inserted those values into the

20   spreadsheets.

21

22   I then projected an average daily utilization for each

23   month. Once these twelve monthly projections were computed,

24   I calculated average daily utilization for the year by taking

25   an average weighted by the number of days in each calendar

26   month.

1   These spreadsheets are given in Appendix C.

2

3   10. Q. What are your projections of daily utilization under

4   average weather for the two customer classes?

5

6   A. For residential customers: 146.23 gallons / customer / day

7   For commercial customers: 1055.43 gallons / customer / day

8

9   11. Q. Does this conclude your testimony?

10

11   A. Yes, it does.

TENNESSEE REGULATORY AUTHORITY

STATE OF MISSOURI

COUNTY OF SAINT LOUIS

BEFORE ME, the undersigned authority, duly commissioned and qualified in and for the State and County aforesaid, personally came and appeared Dr. Edward L. Spitznagel, Jr., being by me first duly sworn deposed and said that:

He is appearing as a witness on behalf of Tennessee-American Water Company before the Tennessee Regulatory Authority, and if present before the Authority and duly sworn, his testimony would set forth in the annexed transcript consisting of _7_ pages.

_____
Dr. Edward L. Spitznagel, Jr.

Sworn to and subscribed before me
this _4_ day of November 2006.

_____
Notary Public

My commission expires _04_ / _11_ / _2010_ .

Edward L. Spitznagel, Jr.

Born: Cincinnati, Ohio, September 4, 1941.

Education:
>   Xavier University, 1959-1962
>   Awarded Bachelor of Science Degree (Summa Cum Laude), 1962
>   University of Chicago, 1962-1965
>   Awarded Master of Science Degree, 1963
>   Awarded Ph.D. in Mathematics, 1965

Scholarships and Fellowships:
>   Xavier University, 1959-1962
>   Honorary Woodrow Wilson Fellow, 1962-1963
>   National Science Foundation Fellow, 1962-1965

Positions:
>   Assistant Professor of Mathematics,
>   Northwestern University, 1965-1969
>   Associate Professor of Mathematics,
>   Washington University, 1969-1980
>   Professor of Mathematics,
>   Washington University, 1980-present
>   Joint appointment,
>   Division of Biostatistics, Washington University School of Medicine, 1978-present

Consulting Experience:
>   Litton Industries (USACDCEC, Fort Ord, CA)
>   Price Waterhouse (Advanced Auditing Methods, NY)
>   Mallinckrodt, Inc.
>   St. Louis County Juvenile Court
>   Monsanto Company
>   American Red Cross
>   Carboline Corporation
>   Regional Justice Information Service
>   Harris-Stowe State College
>   University of Missouri, Columbia
>   Equal Employment Opportunity Commission
>   American Optometric Association
>   Petrolite Corporation
>   U.S. Army Atmospheric Sciences Laboratory (White Sands, NM)
>   St. Louis County Water Company
>   Gateway Medical Research, Inc.
>   Simmons Market Research Bureau
>   MasterCard
>   Capital City Water Company

1

Missouri American Water Company
Kentucky American Water Company
Tennessee American Water Company
New Jersey American Water Company
Iowa American Water Company
Partek Corporation
Nestle Purina Company
Solae Company
Anheuser-Busch, Inc.
Santa Clara County Mental Health Administration (San Jose, CA)
and many law firms

Publications:

1. New impedance method for determining viscoelastic constants. *Rev. Sci. Inst.* 35, 582-586 (1964). (With Potzick and Catanese)

2. Hall subgroups of certain families of finite groups. *Math. Z.* 97, 259-290 (1967).

3. A new look at the fifteen puzzle. *Math. Mag.* 40, 171-174 (1967).

4. Terminality of the maximal unipotent subgroups of Chevalley groups. *Math. Z* 103, 112-116 (1968).

5. Note on the alternating group. *Amer. Math. Monthly* 75, 68-69 (1968).

6. A computer study of the orders of finite simple groups. *Math. Comp.* 22, 669-671 (1968). (With Szygenda)

7. Density of finite simple group orders. *Math. Z.* 106, 175-177 (1968). (With Dornhoff)

8. An experimental approach in the teaching of probability. *The Mathematics Teacher* 61, 565-568 (1968).

9. Structure and terminality of the maximal unipotent subgroups of Steinberg groups. *Illinois J. Math.* 13, 400-405 (1969).

10. Poisson integrals: rigor or mortis? *Amer. J. Phys.* 38, 266-267 (1970). (With Hart)

11. An elementary proof that primes are scarce. *Amer. Math. Monthly* 77, 396-397 (1970).

12. *Selected topics in mathematics.* Holt, Rinehart and Winston (1971).

13. Lognormal model for ascorbic acid requirements in man. *Bioscience* 21, 981-984 (1971).

14. The uses of computing in a modernized probability and statistics course. *Proceedings of the Second Annual Conference on Computers in the Undergraduate Curricula*, 217-222 (1971).

15. Properties of a game based on Euclid's algorithm. *Math. Mag.* 46, 87-92 (1973).

16. Use of a questionnaire-oriented research project in teaching undergraduate statistics. *Proceedings of the Fourth Annual Conference on Computers in the Undergraduate Curricula*, 352-357 (1973).

17. An inexpensive computer assist in teaching large enrollment mathematics courses. *Proceedings of Symposia in Applied Mathematics (American Mathematical Society)* 20, 175-179 (1974).

18. Use of SAS in teaching a first course in statistics. *Proceedings of the First Annual Conference of SAS Users Group International*, 85-89 (1976).

3

19. Maintenance and analysis of anesthesia/surgery data with SAS. *Proceedings of the Third Annual Conference of SAS Users Group International*, 74-76 (1978). (With Owens)

20. K.W.I.C. indexes with SAS. *Proceedings of the Third Annual Conference of SAS Users Group International*, 267-270 (1978).

21. The use of loglinear and multivariate logistic models to assess the associations between HLA antigei responses and disease. *Proceedings of the 1978 American Statistical Association Section on Statistical Computing*, 271-275 (1978). (With Miller and Kass)

22. ASA physical status classifications: a study of consistency of ratings. *Anesthesiology* 49, 239-243 (1978). (With Owens and Felts)

23. Interfacing SAS with Mark IV. *Proceedings of the Fourth Annual Conference of SAS Users Group International*, 41-44 (1979).

24. SAS as a management tool for course registration and grading. *Proceedings of the Fourth Annual Conference of SAS Users Group International*, 158-161 (1979).

25. Tally of ASA classification responses. *Anesthesiology* 51, 181 (1979). (With Owens and Felts)

26. Outcome studies of anesthesia - Washington University. in *Health Care Delivery In Anesthesia*, edited by R. A. Hirsh, W. H. Forrest, Jr., F. K. Orkin, and H. Wollman. George F. Stickley Co. 67-72 (1980). (With Owens)

27. Morphological and biochemical studies in the development of cholinergic properties in cultured sympathetic neurons I. Correlative changes in choline acetyltransferase and synaptic vesicle cytochemistry. *J. Cell Biology* 84, 680-691 (1980). (With Johnson et al.)

28. Letter to the editor regarding the Mahoney, Bird and Cooke article: Annual clinical examination - the best available screening test for breast cancer (*N. Engl. J. Med.* 301, 315-316 (1979)). *New Englana Journal of Medicine* 302, 60 (1980). (With Gohagan et. al.)

29. Anesthetic side effects and complications: An overview. in *Anesthetic Side Effects and Complications: Seeking, Finding, and Treating*, edited by W. D. Owens. Little, Brown and Company. 1-9 (1980). (With Owens)

30. A SAS macro for computing the kappa statistic to assess reliability. *Proceedings of the Fifth Annua Conference of SAS Users Group International*, 159-163 (1980). (With Rice and Helzer)

31. Computer generated repeatable examinations. *Proceedings of the Fifth Annual Conference of SAS Users Group International*, 438-442 (1980).

32. Shaded map reports. *Proceedings of the Fifth Annual Conference of SAS Users Group Internationa* 475-481 (1980).

33. Individual and combined effectiveness of palpation, thermography, and mammography in breast cancer screening. *Preventive Medicine* 9, 713-721 (1980). (With Gohagan et al.)

34. Effect of pedaling rate on submaximal exercise responses of competitive cyclists. *J. Appl. Physiol.* 51, 447-451 (1981). (With Hagberg et al.)

35. Simulation of population genetics models with SAS. *Proceedings of the Sixth Annual Conference o SAS Users Group International,* 605-606 (1981).

36. Optimal strategies for breast cancer detection. in *Systems Science in Health Care,* edited by C. Tilquin. Pergamon Press. 321-330 (1981). (With Gohagan et al.)

37. Computer graphics in selection of screening strategies. *Proceedings of the Seventh Annual Conference of SAS Users Group International,* 167-170 (1982). (With Gohagan)

38. Optimal stratified sampling, with an application to auditing. *Proceedings of the Seventh Annual Conference of SAS Users Group International,* 415-417 (1982).

39. *Early Detection of Breast Cancer: Risk, Detection Procedures, and Therapeutic Implications.* Praeger Publishers (1982). (With Gohagan et al.)

40. Plasma epinephrine and norepinephrine levels during anesthesia – enflurane-N_2O-O_2 compared with fentanyl-N_2O-O_2. *Anesth. Anal.* 61, 366-370 (1982). (With Brown et al.)

41. Heterogeneity in schizophrenia – a cluster-analytic approach. *Psychiat. R* 8, 1-12 (1983). (With Farmer and McGuffin)

42. SAS methods for balanced repeated replications. *Proceedings of the Eighth Annual Conference of SAS Users Group International,* 844-847 (1983).

43. Breast self examination as a screening procedure. *Third International Conference on System Scienc in Health Care,* 455-458 (1984). (With Gohagan et al.)

44. ROC analysis of mammography alone and in combination with clinical palpation for breast screening. *Third International Conference on System Science in Health Care,* 463-466 (1984). (With Gohagan et al.)

45. Experimental design for the evaluation of nuclear magnetic resonance imaging in clinical medicine. *Third International Conference on System Science in Health Care,* 881-884 (1984). (With Gohagan et al.)

46. Graphic representation of logistic regression models. *Proceedings of the Ninth Annual Conference of SAS Users Group International,* 870-873 (1984). (With Gohagan et al.)

47. Utilization patterns of health maintenance organization disenrollees. *Medical Care* 22, 827-833 (1984). (With Griffith and Baloff)

48. ROC analysis of mammography and palpation for breast screening. *Invest Radiol* 19, 587-592 (1984). (With Gohagan et al.)

49. A proposed solution to the base rate problem in the kappa statistic. *Arch Gen Psychiatry* 42, 725-728 (1985). (With Helzer)

50. A comparison of clinical and Diagnostic Interview Schedule diagnoses: Physician reexamination of lay-interviewed cases in the general population. *Arch Gen Psychiatry* 42, 657-666 (1985). (With Helze et al.)

51. A mouse embryo culture system for quality control testing of human in vitro fertilization and embryo transfer media and fetal cord sera. *Gamete Research* 11, 411-419 (1985). (With Cheung et al.)

52. Comparison of variance estimation methods for complex sample designs under extreme conditions. *Proceedings of the Tenth Annual Conference of SAS Users Group International*, 1084-1088 (1985).

53. Sampling the household population. in *Epidemiologic Field Methods in Psychiatry: The NIMH Epidemiologic Catchment Area Program*, edited by W. Eaton and L. Kessler. Academic Press. 23-48 (1985). (With Holzer et al.)

54. Sampling: The institutional survey. in *Epidemiologic Field Methods in Psychiatry: The NIMH Epidemiologic Catchment Area Program*, edited by W. Eaton and L. Kessler. Academic Press. 49-66 (1985). (With Leaf et al.)

55. Statistical methods for estimating and extrapolating disease prevalence and incidence rates from a multisite study. in *Epidemiologic Field Methods in Psychiatry: The NIMH Epidemiologic Catchment Area Program*, edited by W. Eaton and L. Kessler. Academic Press. 351-373 (1985). (With Manton et al.)

56. Staging parameters for cancers of the head and neck: a multi-factorial analysis. *Laryngoscope* 95, 1378-1381 (1985). (With Jacobs and Sessions)

57. Radiogenic breast cancer effects of mammographic screening. *Journal of the National Cancer Institute* 77, 71-76 (1986). (With Gohagan et al.)

58. Difficult-to-recruit respondents and their effect on prevalence estimates in an epidemiologic survey. *American Journal of Epidemiology* 125, 329-339 (1987). (With Cottler et al.)

59. Left globus pallidus abnormality in never-medicated patients with schizophrenia. *Proc Natl Acad Sci USA* 84, 561-563 (1987). (With Early et al.)

60. Multispectral analysis of MR images of the breast. *Radiology* 163, 703-707 (1987). (With Gohagan et al.)

61. The predictive validity of lay Diagnostic Interview Schedule diagnoses in the general population. *Arch Gen Psychiatry* 44, 1069-1077 (1987). (With Helzer and McEvoy)

62. The effect of medication compliance on the control of hypertension. *Journal of General Internal Medicine* 2, 298-305 (1987). (With Eisen et al.)

63. Teaching biostatistics with an emphasis on reading the medical literature. *Proceedings of the 1987 American Statistical Association Section on Statistical Education*, 111-115 (1987). (With Schechtman)

64. Evidence that the biliary migrating myoelectric complex (MMC) is preserved after feeding. *Gastroenterology 95*, 894 (1988). (With Zenilman et al.)

65. Scheduling mammograms for asymptomatic women. *Preventive Medicine* 17, 155-172 (1988). (With Gohagan et al.)

66. Increased fentanyl requirement in patients receiving long-term anticonvulsant therapy. *Anesthesiology Review* 15, 54-55 (1988). (With Tempelhoff and Modica)

67. Accelerated train of four recovery from atracurium in patients receiving long-term anticonvulsant therapy. *Anesthesiology Review* 15, 55-56 (1988). (With Modica and Tempelhoff)

68. Antimicrobial misuse in patients with positive blood cultures. *The American Journal of Medicine* 87, 253-259 (1989). (With Dunagan et al.)

69. Exclusion of chromosomal mosaicism in amniotic-fluid cultures ☐ efficacy of insitu versus flask techniques. *Prenatal Diagnosis* 10, 41-57 (1990). (With Cheung et al.)

70. Anticonvulsant therapy increases fentanyl requirements during anesthesia for craniotomy. *Can J Anaesth* 37, 327-332 (1990). (With Tempelhoff and Modica)

71. Nitrous oxide, nausea, and vomiting after outpatient gynecologic surgery. *J Clin Anesth* 2, 168-171 (1990). (With Felts and Poler)

72. The relation of ulcerative colitis to psychiatric factors: a review of findings and methods. *Am J Psychiatry* 147, 974-981 (1990). (With North et al.)

73. Clinical classification and staging for primary malignancies of the maxillary antrum. *Laryngoscope* 100, 1106-1111 (1990). (With Zamora et al.)

74. Time-series analysis of myoelectric cycling of sphincter of Oddi: evidence of cycling during fed state. *Am J Physiology* 259, 511-517 (1990). (With Zenilman et al.)

75. The effect of prescribed daily dose frequency on patient medication compliance. *Arch Intern Med* 150, 1881-1884 (1990). (With Eisen et al.)

76. Resistance to atracurium-induced neuromuscular blockade in patients with intractable seizure disorders treated with anticonvulsants. *Anesthesia and Analgesia* 71, 665-669 (1990). (With Tempelhoff et al.)

77. *California Mental Health Needs* 1, 1-182. California Department of Mental Health (1990). (With Meinhardt and Jerrell).

78. *California Mental Health Needs* 2, 1-467. California Department of Mental Health (1990). (With Meinhardt and Jerrell).

79. Comments on psychiatric aspects of ulcerative colitis - reply. *Am J Psychiatry* 148, 688 (1991). (With North et al.)

80. Do life events or depression exacerbate inflammatory bowel disease? *Annals of Internal Medicine* 114, 381-386 (1991). (With North et al.)

81. Antibiotic misuse in two clinical situations - positive blood culture and administration of aminoglycosides. *Reviews of Infectious Diseases* 13, 405-412 (1991). (With Dunagan et al.)

82. Agreement between DSM-III and III-R substance use disorders. *Drug and Alcohol Dependence* 29, 17-25 (1991). (With Cottler et al.)

83. New methods in cross-cultural psychiatry: Psychiatric illness in Taiwan and the United States. *Am . Psychiatry* 148, 1697-1704 (1991). (With Compton et al.)

84. Surgical pathology of cancer of the oral cavity and oropharynx. *Laryngoscope* 101, 1175-1197 (1991). (With Sessions et al.)

85. Sensitivity of chromosomal mosaicism detected by different tissue-culture methods. *Prenatal Diagnosis* 11, 927-928 (1991). (With Cheung et al.)

86. Are hard-to-interview street dwellers needed in assessing psychiatric disorders in homeless men? *International Journal of Methods in Psychiatric Research* 1, 69-78 (1991). (With Smith and North)

87. Gender differences in sociopathy and somatization in men and women with homosexual experience. *International Journal of Methods in Psychiatric Research* 1, 89-99 (1991). (With North et al.)

88. Anticoagulant effects of nonionic versus ionic contrast-media in angiography syringes. *Investigative Radiology* 27, 185 (1992).

89. Posttraumatic stress disorder among substance users from the general population. *Am J Psychiatry* 149, 664-670 (1992). (With Cottler et al.)

90. A systematic study of mental illness, substance abuse, and treatment in 600 homeless men. *Annals of Clinical Psychiatry* 4, 111-120 (1992). (With Smith and North)

91. Clinical staging for primary malignancies of the supraglottic larynx. *Laryngoscope* 103, 69-77 (1993). (With Zamora et al.)

92. Symptomatic cytomegalovirus infection in renal transplant recipients given either Minnesota antilymphoblast globulin (MALG) or OKT3 for rejection prophylaxis. *American Journal of Kidney Diseases* **21**, 196-201 (1993). (With Bailey et al.)

93. Alcohol, drugs, and psychiatric comorbidity among homeless women. *J Clin Psychiatry* **54**, 82-87 (1993). (With Smith and North)

94. Is antisocial personality a valid diagnosis among the homeless? *Am J Psychiatry* **150**, 578-583 (1993). (With North and Smith)

95. Post-traumatic stress in survivors of three disasters. *Journal of Social Behavior and Personality* **8**, 353-368 (1993). (With Smith and North)

96. Cytomegalovirus infection and pneumonitis. *Am Rev Respir Dis* **147**, 1017-1023 (1993). (With Ettinger et al.)

97. Epidermoid carcinoma of the oral cavity and oropharynx: validity of the current AJCC staging system and new statistical tools for the prediction of subclinical neck disease. *Otolaryngology and Hea and Neck Surgery* **108**, 225-232 (1993). (With Ghouri et al.)

98. Results of a rubella screening program for hospital employees: a five-year review (1968-1990). *American Journal of Epidemiology* **138**, 756-764 (1993). (With Fraser et al.)

99. Subjective reports of withdrawal among cocaine users: recommendations for DSM-IV. *Drug and Alcohol Dependence* **33**, 97-104 (1993). (With Cottler et al.)

100. Posttraumatic stress disorder in survivors of a mass shooting. *Am J Psychiatry* **151**, 82-88 (1994). (With North and Smith)

101. Violence and the homeless: an epidemiologic study of victimization and aggression. *Journal of Traumatic Stress* **7**, 95-110 (1994). (With North and Smith)

102. On-site PT, aPTT and platelet count: A comparison between whole blood and laboratory assays with coagulation factor analysis in patients presenting for cardiac surgery. *Anesthesiology* **80**, 338-351 (1994). (With Despotis et al.)

103. Prospective evaluation and clinical utility of on-site coagulation monitoring in patients undergoing cardiac operation. *J Thorac Cardiovasc Surg* **107**, 271-279 (1994). (With Despotis et al.)

104. Two-compartment pharmacokinetics. *Proceedings of the Fifth Annual International Conference o Technology in Collegiate Mathematics*, edited by L. Lum. Addison-Wesley Publishing Company. 417-420 (1994).

105. Inhalant use: characteristics and predictors. *American Journal on Addictions* **3**, 263-272 (1994). (With Compton et al.)

106. Prediction of occult neck disease in laryngeal cancer by means of a logistic regression statistical model. *Laryngoscope* **104**, 1280-1284 (1994). (With Ghouri et al.)

107. Comparison of activated coagulation time and whole blood heparin measurements to laboratory plasma anti-Xa heparin concentration in cardiac surgical patients. *J Thorac Cardiovasc Surg* **108**, 1076-1082 (1994). (With Despotis et al.)

108. GAP: groups, algorithms, and programming (review). *Notices Amer Math Soc* **41**, 780-782 (1994.

109. Prediction of subclinical neck disease in laryngeal cancer patients using a logistic regression statistical model. in *Laryngeal Cancer Proceedings of the 2nd World Congress on Laryngeal Cancer, Sydney, 20–24 February 1994*, edited by R. Smee and G.P. Bridger. Elsevier Science B.V. 570-573 (1994). (With Ghouri et al.)

110. Predictors of mortality in alcoholic women: a 20-year follow-up study. *Alcoholism, Clinical and Experimental Research* **18**, 1177-1186 (1994). (With Smith et al.)

111. Improvement in user performance following development and routine use of an expert system. *Medinfo* **8**, 1064-1067 (1994). (With Kahn et al.)

112. Exclusion of chromosomal mosaicism in amniotic fluid cultures ☐ determination of number of colonies needed for accurate analysis. *Prenatal Diagnosis* **14**, 1009-1017 (1994). (With Featherstone e al.)

113. Adult offspring of alcoholic women as family history informants. *Alcoholism, Clinical and Experimental Research* **18**, 1354-1360 (1994). (With Smith et al.)

114. The impact of heparin concentration and activated clotting time monitoring on blood conservation: A prospective, randomized evaluation in patients undergoing cardiac operation. *J Thorac Cardiovasc Surg* **110**, 46-54 (1995). (With Despotis et al.)

115. Risk factors for a positive tuberculin skin test among employees of an urban, midwestern teaching hospital. *Annals of Internal Medicine* **122**, 580-585 (1995). (With Bailey et al.)

116. Predictors of mortality in alcoholic men: a 20-year follow-up study. *Alcoholism, Clinical and Experimental Research* **19**, 984-991 (1995). (With Lewis et al.)

117. Complaints of constipation in obsessive-compulsive disorder. *Annals of Clinical Psychiatry* **7**, 65-70 (1995). (With North et al.)

118. Is there a relationship between "heavy drinking" and HIV high risk sexual behaviors among genera population subjects? *The International Journal of the Addictions* **30**, 1453-1478 (1995). (With Shillington et al.)

119. Assessing gender interactions in the prediction of mortality in alcoholic men and women: a 20-yeal follow-up study. *Alcoholism, Clinical and Experimental Research* **19**, 1162-1172 (1995). (With Lewis et al.)

120. Factors associated with excessive postoperative blood loss and hemostatic transfusion requirement: - a multivariate analysis in cardiac surgical patients. *Anesthesia and Analgesia* 82, 13-21 (1996). (With Despotis et al.)

121. Comparing assessments of DSM-IV substance dependence disorders using CIDI-SAM and SCAN. *Drug and Alcohol Dependence* 41, 179-187 (1996). (With Compton et al.)

122. Effects of gender and comorbidity on problem drinking in a community sample. *Alcoholism, Clinical and Experimental Research* 20, 466-476 (1996). (With Lewis et al.)

123. Response of kaolin ACT to heparin: evaluation with an automated assay and higher heparin doses. *Ann Thorac Surg* 61, 795-799 (1996). (With Despotis et al.)

124. Gastrointestinal symptoms and psychiatric disorders in the general population - findings from the NIMH epidemiologic catchment area project. *Digestive Diseases and Sciences* 41, 633-640 (1996). (With North et al.)

125. Aprotinin prolongs activated and nonactivated whole blood clotting time and potentiates the effect of heparin in vitro. *Anesthesia and Analgesia* 82, 1126-1131 (1996). (With Despotis et al.)

126. Are the mentally ill homeless a distinct homeless subgroup? *Annals of Clinical Psychiatry* 8, 117-128 (1996). (With North et al.)

127. Increasing brain tumor rates: Is there a link to aspartame? *Journal of Neuropathology and Experimental Neurology* 55, 1115-1123 (1996). (With Olney et al.)

128. Structured and semi-structured assessment of ICD-10 substance dependence disorders: CIDI-SAM vs. SCAN. *International Journal of Methods in Psychiatric Research* 6, 285-293 (1996). (With Compton et al.)

129. Evaluation of a new point-of-care test that measures PAF-mediated acceleration of coagulation in cardiac surgical patients. *Anesthesiology* 85, 1311-1323 (1996). (With Despotis et al.)

130. More effective suppression of hemostatic system activation in patients undergoing cardiac surgery by heparin dosing based on heparin blood concentrations rather than ACT. *Thrombosis and Haemostasis* 76, 902-908 (1996). (With Despotis et al.)

131. The effects of cytomegalovirus serology on graft and recipient survival in cadaveric renal transplantation: implications for organ allocation. *American Journal of Kidney Diseases* 29, 428-434 (1997). (With Schnitzler et al.)

132. Predictors of achieving stable housing in a mentally ill homeless population. *Psychiatric Services* 48, 528-530 (1997). (With Pollio et al.)

133. Antithrombin III during cardiac surgery: effect on response of activated clotting time to heparin and relationship to markers of hemostatic activation. *Anesthesia and Analgesia* 85, 498-506 (1997). (With Despotis et al.)

134. Nonpsychotic thought disorder: objective clinical identification of somatization and antisocial personality in language patterns. *Compr Psychiatry* 38, 171-178 (1997). (With North et al.)

135. Changes in HIV/AIDS risk behaviors in drug users in St. Louis: applications of random regression models. *J Drug Issues* 27, 399-416 (1997). (With Gallagher et al.)

136. Whole blood heparin concentration measurements by automated protamine titration agree with plasma anti-Xa measurements. *J Thorac Cardiovasc Surg* 113, 611-613 (1997). (With Despotis et al.)

137. Impact of cytomegalovirus serology on graft survival in living related kidney transplantation: implications for donor selection. *Surgery* 121, 563-568 (1997). (With Schnitzler et al.)

138. Homeless street people report conservative sexual attitudes yet anticipate risky behavior. *Psychiatric Rehabilitation Journal* 20, 75-79 (1997). (With Song et al.)

139. One-year follow-up of survivors of a mass shooting. *Am J Psychiatry* 154, 1696-1702 (1997). (With North and Smith)

140. Cytomegalovirus and HLA-A, B, and DR locus interactions: impact on renal transplant graft survival. *American Journal of Kidney Diseases* 30, 766-771 (1997). (With Schnitzler et al.)

141. A comparison of clinical and structured interview diagnoses in a homeless mental health clinic. *Community Mental Health Journal* 33, 531-543 (1997). (With North et al.)

142. Cocaine users with antisocial personality improve HIV risk behaviors as much as those without antisocial personality. *Drug and Alcohol Dependence* 49, 239-247 (1998). (With Compton et al.)

143. The association of psychiatric diagnosis with weather conditions in a large urban homeless sample. *Soc Psychiatry Psychiatr Epidemiol* 33, 206-210 (1998). (With North et al.)

144. Agreement between DSM-III and DSM-III-R substance use disorders. in *DSM-IV Sourcebook Volume 4*, edited by T.A. Widiger et al. American Psychiatric Association. 29-42 (1998). (With Cottle et al.)

145. Taking chances: problem gamblers and mental health disorders—results from the St. Louis Epidemiologic Catchment Area Study. *Am J Public Health* 88, 1093-1096 (1998). (With Cunningham-Williams et al.)

146. Importance of hemodynamic factors in the prognosis of symptomatic carotid occlusion. *JAMA* 280 1055-1060 (1998). (With Grubb et al.)

147. Correlates of early onset and chronicity of homelessness in a large urban homeless sample. *J Nerv Ment Dis* 186, 393-400 (1998). (With North et al.)

148. Enrollment predictors of the special education outcome for students with SED. *Behavioral Disorders* 23, 243-256 (1998). (With Mattison and Felix)

12

149. Substance abuse as a predictor of VA mental health care utilization among Vietnam veterans. *J Behav Health Serv Res* 26, 126-139 (1999). (With Virgo et al.)

150. Long-term stability of Child Behavior Checklist profile types in a child psychiatric clinic population. *J Am Acad Child Adolesc Psychiatry* 38, 700-707 (1999). (With Mattison)

151. Use of point-of-care test in identification of patients who can benefit from desmopressin during cardiac surgery: a randomized controlled trial. *Lancet* 354, 106-110 (1999). (With Despotis et al.)

152. A randomized trial of povidone-iodine compared with iodine tincture for venipuncture site disinfection: effects on rates of blood culture contamination. *Am J Med* 107, 119-125 (1999). (With Little et al.)

153. Psychiatric disorders among survivors of the Oklahoma City bombing. *JAMA* 282, 755-762 (1999. (With North et al.)

154. Adverse events in platelet apheresis donors: A multivariate analysis in a hospital-based program. *Vox Sang* 77, 24-32 (1999). (With Despotis et al.)

155. Development of a new staging system for recurrent oral cavity and oropharyngeal squamous cell carcinoma. *Cancer* 86, 1387-1395 (1999). (With Lacy and Piccirillo)

156. The effects of psychiatric comorbidity on response to an HIV prevention intervention. *Drug and Alcohol Dependence* 58, 247-257 (2000). (With Compton et al.)

157. Applying artificial neural network models to clinical decision making. *Psychological Assessment* 12, 40-51 (2000). (With Price et al.)

158. The effect of epsilon-aminocaproic acid on HemoSTATUS and kaolin-activated clotting time measurements. *Anesthesia and Analgesia* 90, 1281-1285 (2000). (With Saleem et al.)

159. Substance dependence and other psychiatric disorders among drug dependent subjects: race and gender correlates. *American Journal on Addictions* 9, 113-125 (2000). (With Compton et al.)

160. Psychiatric disorders among drug dependent subjects: are they primary or secondary? *American Journal on Addictions* 9, 126-134 (2000). (With Compton et al.)

161. Evidence for the involvement of two different MHC class II regions in susceptibility or protection in allergic bronchopulmonary aspergillosis. *J Allergy Clin Immunol* 106, 723-729 (2000). (With Chauhan et al.)

162. Service use over time and achievement of stable housing in a mentally ill homeless population. *Psychiatric Services* 51, 1536-1543 (2000). (With Pollio et al.)

163. Problem gambling and comorbid psychiatric and substance use disorders among drug users recruited from drug treatment and community settings. *Journal of Gambling Studies* 16, 347-376 (2000). (With Cunningham-Williams et al.)

164. Longitudinal use of the Teacher's Report Form in tracking outcome for students with SED. *Journal of Emotional and Behavioral Disorders* 9, 94-105 (2001). (With Mattison)

165. Effect of extended coverage of immunosuppressive medication by Medicare on the survival of cadaveric renal transplants. *American Journal of Transplantation* 1, 69-73 (2001). (With Woodward et al.)

166. The association of irritable bowel syndrome and somatization disorder. *Ann Clin Psychiatry* 13, 25-30 (2001). (With Miller et al.)

167. Remission from drug abuse over a 25-year period: patterns of remission and treatment use. *Am J Public Health* 91, 1107-1113 (2001). (With Price et al.)

168. Laboratory screening prior to ECT. *The Journal of ECT* 17, 158-165 (2001). (With Lafferty et al.)

169. Validation of a comorbidity education program. *Journal of Registry Management* 28, 125-131 (2001). (With Johnston et al.)

170. A prospective study of coping after exposure to a mass murder episode. *Ann Clin Psychiatry* 13, 81-87 (2001). (With North and Smith)

171. Twenty-five year mortality of US servicemen deployed in Vietnam: predictive utility of early drug use. *Drug and Alcohol Dependence* 64, 309-318 (2001). (With Price et al.)

172. Photic and circadian expression of luciferase in MPeriod1-luc transgenic mice invivo. *Proc Natl Acad Sci USA* 99, 489-494 (2002). (With Wilsbacher et al.)

173. Psychiatric disorders in rescue workers after the Oklahoma City bombing. *Am J Psychiatry* 159, 857-859 (2002). (With North et al.)

174. Multivariate analysis to assess treatment effectiveness in advanced head and neck cancer. *Arch Otolaryngol Head Neck Surg* 128, 497-503 (2002). (With Patel and Piccirillo.)

175. The specificity of family history of alcohol and drug abuse in cocaine abusers. *Am J Addict* 11, 85-94 (2002). (With Compton et al.)

176. Coping, functioning, and adjustment of rescue workers after the Oklahoma City bombing. *J Trauma Stress* 15, 171-175 (2002). (With North et al.)

177. Three-year follow-up of survivors of a mass shooting episode. *J Urban Health* 79, 383-391 (2002) (With North et al.)

178. Test of the plausibility of adolescent substance use playing a causal role in developing adulthood antisocial behavior. *J Abnorm Psychol* 111, 144-155 (2002). (With Ridenour et al.)

179. Development of a new head and neck cancer-specific comorbidity index. *Arch Otolaryngol Head Neck Surg* 128, 1172-1179 (2002). (With Piccirillo et al.)

180. The clinical picture of depression in preschool children. *J Am Acad Child Adolesc Psychiatry* **42**, 340-348 (2003). (With Luby et al.)

181. Personality and depressive symptoms: a multi-dimensional analysis. *J Affect Disord* **74**, 123-130 (2003). (With Grucza et al.)

182. The role of psychiatric disorders in predicting drug dependence treatment outcomes. *Am J Psychiatry* **160**, 890-895 (2003). (With Compton et al.)

183. Is there a progression from abuse disorders to dependence disorders? *Addiction* **98**, 635-644 (2003). (With Ridenour et al.)

184. Modification of DSM-IV criteria for depressed preschool children. *Am J Psychiatry* **160**, 1169-1172 (2003). (With Luby et al.)

185. Improved glucose tolerance with lifetime diet restriction favorably affects disease and survival in dogs. *J Nutr* **133**, 2887-2892 (2003). (With Larson et al.)

186. Evaluation of gene expression measurements from commercial microarray platforms. *Nucleic Acids Res* **19**, 5676-5684 (2003). (With Tan et al.)

187. Alterations in stress cortisol reactivity in depressed preschoolers relative to psychiatric and no-disorder comparison groups. *Arch Gen Psychiatry* **60**, 1248-1255 (2003). (With Luby et al.)

188. Incorporation of gene-specific variability improves expression analysis using high-density DNA microarrays. *BMC Biol* **1**, 1 (2003). (With Budhraja et al.)

189. Modeling service access in a homeless population. *J Psychoactive Drugs* **35**, 487-495 (2003). (With Pollio et al.)

190. Functioning mediates between symptoms and provider assessment. *Ment Health Serv Res* **5**, 155-171 (2003). (With Striley and Stiffman)

191. Are rates of psychiatric disorders in the homeless population changing? *Am J Public Health* **94**, 103-108 (2004). (With North et al.)

192. Comparison of comorbidity indexes for patients with head and neck cancer. *Med Care* **42**, 482-48((2004). (With Piccirillo et al.)

193. Prognostic importance of comorbidity in a hospital-based cancer registry. *JAMA* **291**, 2441-2447 (2004). (With Piccirillo et al.)

194. The Preschool Feelings Checklist: a brief and sensitive screening measure for depression in young children. *J Am Acad Child Adolesc Psychiatry* **43**, 708-717 (2004). (With Luby et al.)

195. Use of mental health services among older youths in foster care. *Psychiatric Services* 55, 811-817 (2004). (With McMillen et al.)

196. Differential prognostic impact of comorbidity. *J Clin Oncol* 22, 3099-3103 (2004). (With Read et al.)

197. The Homeless Supplement to the Diagnostic Interview Schedule: test-retest analyses. *Int J Methods Psychiatr Res* 13, 184-191 (2004). (With North et al.)

198. The presentation of irritable bowel syndrome in the context of somatization disorder. *Clin Gastroenterol Hepatol* 2, 787-795 (2004). (With North et al.)

199. Improving treatment services for substance abusers with comorbid depression. *Am J Addict* 13, 295-304 (2004). (With Womack et al.)

200. A multistate trial of pharmacy syringe purchase. *J Urban Health* 81, 661-670 (2004). (With Compton et al.)

201. The course of posttraumatic stress disorder in a follow-up study of survivors of the Oklahoma City bombing. *Ann Clin Psychiatry* 16, 209-215 (2004). (With North et al.)

202. Characteristics of depressed preschoolers with and without anhedonia: evidence for a melancholic depressive subtype in young children. *Am J Psychiatry* 161, 1998-2004 (2004). (With Luby et al.)

203. The course of PTSD, major depression, substance abuse, and somatization after a natural disaster. *J Nerv Ment Dis* 192, 823-829 (2004). (With North et al.)

204. Analysis of costs, length of stay, and utilization of emergency department services by frequent users: implications for health policy. *Acad Emerg Med* 11, 1311-1317 (2004). (With Ruger et al.)

205. Post-traumatic stress disorder, drug dependence, and suicidality among male Vietnam veterans with a history of heavy drug use. *Drug Alcohol Depend* 76, S31-43 (2004). (With Price et al.)

206. A meta-analysis of soyfoods and risk of breast cancer in women. *Int J Cancer Prevention* 1, 281-293 (2004). (With Yan)

207. Prevalence of psychiatric disorders among older youths in the foster care system. *J Am Acad Child Adolesc Psychiatry* 44, 88-95 (2005). (With McMillen et al.)

208. Influence of lifetime food restriction on causes, time, and predictors of death in dogs. *J Am Vet Med Assoc* 226, 225-231 (2005). (With Lawler et al.)

209. Preoperative use of enoxaparin increases the risk of postoperative bleeding and re-exploration in cardiac surgery patients. *J Cardiothorac Vasc Anesth* 19, 4-10 (2005). (With McDonald et al.)

210. Comparison of post-disaster psychiatric disorders after terrorist bombings in Nairobi and Oklahom City. *Br J Psychiatry* 186, 487-493 (2005). (With North et al.)

211. Prevalence and predictors of pathological gambling: results from the St. Louis personality, health, and lifestyle (SLPHL) study. *J Psychiatr Res* 39, 377-390 (2005). (With Cunningham-Williams et al.)

212. The role of organizational characteristics in determining patterns of utilization of services for substance abuse, mental health, and shelter by homeless people. *J Drug Issues* 35, 575-591 (2005). (With North et al.)

213. Meta-analysis of soy food and risk of prostate cancer in men. *Int J Cancer* 117, 667-669 (2005). (With Yan)

214. Factors associated with the transition from abuse to dependence among substance abusers: Implications for a measure of addictive liability. *Drug Alcohol Depend* 80, 1-14 (2005). (With Ridenour et al.)

215. Primary and secondary transcriptional effects in the developing Down syndrome brain and heart. *Genome Biol* 6, R107.1-R107.20 (2005). (With Mao et al.)

216. An observational analysis of behavior in depressed preschoolers: further validation of early-onset depression. *J Am Acad Child Adolesc Psychiatry* 45, 203-212 (2006). (With Luby et al.)

EXHIBIT1.LST:

Run regressions by month: Chattanooga, JUL1996-JUN2006
Residential Model, JANUARY

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	404.61960	404.61960	39.30	0.0002
Error	8	82.37461	10.29683		
Corrected Total	9	486.99421			

Root MSE	3.20887	R-Square	0.8309	
Dependent Mean	142.86700	Adj R-Sq	0.8097	
Coeff Var	2.24605			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	168.33497	4.18758	40.20	<.0001
since_90	1	-2.21461	0.35328	-6.27	0.0002

Run regressions by month: Chattanooga, JUL1996-JUN2006
Residential Model, FEBRUARY

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	296.66713	296.66713	2.36	0.1631
Error	8	1006.03436	125.75430		
Corrected Total	9	1302.70149			

Root MSE	11.21402	R-Square	0.2277
Dependent Mean	142.67900	Adj R-Sq	0.1312
Coeff Var	7.85962		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	164.48648	14.63432	11.24	<.0001
since_90	1	-1.89630	1.23462	-1.54	0.1631

Run regressions by month: Chattanooga, JUL1996-JUN2006
Residential Model, MARCH

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	73.67929	73.67929	0.80	0.3969
Error	8	735.65012	91.95627		
Corrected Total	9	809.32941			

Root MSE	9.58938	R-Square	0.0910
Dependent Mean	140.29300	Adj R-Sq	-0.0226
Coeff Var	6.83525		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	151.16085	12.51416	12.08	<.0001
since_90	1	-0.94503	1.05576	-0.90	0.3969

Run regressions by month: Chattanooga, JUL1996-JUN2006
Residential Model, APRIL

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	232.73041	232.73041	17.76	0.0029
Error	8	104.82208	13.10276		
Corrected Total	9	337.55249			

Root MSE	3.61977	R-Square	0.6895
Dependent Mean	141.62900	Adj R-Sq	0.6506
Coeff Var	2.55581		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	160.94412	4.72381	34.07	<.0001
since_90	1	-1.67958	0.39852	-4.21	0.0029

Run regressions by month: Chattanooga, JUL1996-JUN2006
Residential Model, MAY

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	206.58088	103.29044	3.62	0.0834
Error	7	199.90988	28.55855		
Corrected Total	9	406.49076			

Root MSE	5.34402	R-Square	0.5082
Dependent Mean	150.37800	Adj R-Sq	0.3677
Coeff Var	3.55372		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	168.55940	6.97416	24.17	<.0001
pds0	1	-0.51136	3.74281	-0.14	0.8952
since_90	1	-1.59344	0.59609	-2.67	0.0319

Run regressions by month: Chattanooga, JUL1996-JUN2006
Residential Model, JUNE

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	265.91127	132.95563	3.30	0.0977
Error	7	281.82817	40.26117		
Corrected Total	9	547.73944			

Root MSE	6.34517	R-Square	0.4855
Dependent Mean	163.54600	Adj R-Sq	0.3385
Coeff Var	3.87975		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	181.73591	8.31034	21.87	<.0001
pds0	1	-6.25226	4.39081	-1.42	0.1975
since_90	1	-1.74918	0.72111	-2.43	0.0457

.

Run regressions by month: Chattanooga, JUL1996-JUN2006
Residential Model, JULY

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	924.13513	462.06756	7.24	0.0198
Error	7	446.89132	63.84162		
Corrected Total	9	1371.02645			

Root MSE	7.99009	R-Square	0.6740
Dependent Mean	172.60500	Adj R-Sq	0.5809
Coeff Var	4.62912		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	194.82431	9.63478	20.22	<.0001
pds0	1	-14.29174	5.35687	-2.67	0.0321
since_90	1	-2.48227	0.88042	-2.82	0.0258

Run regressions by month: Chattanooga, JUL1996-JUN2006
Residential Model, AUGUST

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	1075.13915	537.56958	41.31	0.0001
Error	7	91.08985	13.01284		
Corrected Total	9	1166.22900			

Root MSE	3.60733	R-Square	0.9219	
Dependent Mean	174.13000	Adj R-Sq	0.8996	
Coeff Var	2.07163			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	199.51075	4.46632	44.67	<.0001
pds0	1	-9.18935	1.77748	-5.17	0.0013
since_90	1	-2.83555	0.39799	-7.12	0.0002

Run regressions by month: Chattanooga, JUL1996-JUN2006
Residential Model, SEPTEMBER

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	772.91030	386.45515	3.58	0.0848
Error	7	755.11231	107.87319		
Corrected Total	9	1528.02261			

Root MSE	10.38620	R-Square	0.5058
Dependent Mean	171.26700	Adj R-Sq	0.3646
Coeff Var	6.06433		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	188.01110	13.67335	13.75	<.0001
pds0	1	-8.48677	5.31151	-1.60	0.1541
since_90	1	-1.97375	1.18260	-1.67	0.1390

Run regressions by month: Chattanooga, JUL1996-JUN2006
Residential Model, OCTOBER

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	600.95527	300.47764	5.31	0.0396
Error	7	396.27714	56.61102		
Corrected Total	9	997.23241			

Root MSE	7.52403	R-Square	0.6026
Dependent Mean	163.41700	Adj R-Sq	0.4891
Coeff Var	4.60419		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	179.09631	9.61787	18.62	<.0001
pds0	1	-5.40451	2.70198	-2.00	0.0856
since_90	1	-1.86747	0.83874	-2.23	0.0613

Run regressions by month: Chattanooga, JUL1996-JUN2006
Residential Model, NOVEMBER

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	351.49374	175.74687	60.19	<.0001
Error	7	20.43806	2.91972		
Corrected Total	9	371.93180			

Root MSE	1.70872	R-Square	0.9450
Dependent Mean	154.69000	Adj R-Sq	0.9293
Coeff Var	1.10461		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	162.11362	2.23123	72.66	<.0001
pds0	1	-4.58180	0.56518	-8.11	<.0001
since_90	1	-1.07268	0.19218	-5.58	0.0008

Run regressions by month: Chattanooga, JUL1996-JUN2006
Residential Model, DECEMBER

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	7.95850	3.97925	0.19	0.8272
Error	7	142.93066	20.41867		
Corrected Total	9	150.88916			

Root MSE	4.51870	R-Square	0.0527
Dependent Mean	148.81200	Adj R-Sq	-0.2179
Coeff Var	3.03652		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	151.84994	5.47726	27.72	<.0001
pds0	1	-0.24261	1.59340	-0.15	0.8833
since_90	1	-0.30462	0.49800	-0.61	0.5601

EXHIBIT2.LST:

Run regressions by month: Chattanooga, JUL1996-JUN2006
Commercial Model, JANUARY

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	9781.23482	9781.23482	1.46	0.2614
Error	8	53592	6699.05406		
Corrected Total	9	63374			

Root MSE	81.84775	R-Square	0.1543	
Dependent Mean	944.48100	Adj R-Sq	0.0486	
Coeff Var	8.66590			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	1069.69927	106.81148	10.01	<.0001
since_90	1	-10.88855	9.01114	-1.21	0.2614

Run regressions by month: Chattanooga, JUL1996-JUN2006
Commercial Model, FEBRUARY

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	989.17999	989.17999	0.09	0.7762
Error	8	91547	11443		
Corrected Total	9	92536			

Root MSE	106.97384	R-Square	0.0107	
Dependent Mean	976.44600	Adj R-Sq	-0.1130	
Coeff Var	10.95543			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	1016.26667	139.60108	7.28	<.0001
since_90	1	-3.46267	11.77743	-0.29	0.7762

Run regressions by month: Chattanooga, JUL1996-JUN2006
Commercial Model, MARCH

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	8236.80528	8236.80528	2.08	0.1874
Error	8	31703	3962.88304		
Corrected Total	9	39940			

Root MSE	62.95143	R-Square	0.2062	
Dependent Mean	1009.40000	Adj R-Sq	0.1070	
Coeff Var	6.23652			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	894.49200	82.15175	10.89	<.0001
since_90	1	9.99200	6.93072	1.44	0.1874

Run regressions by month: Chattanooga, JUL1996-JUN2006
Commercial Model, APRIL

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	9484.41315	9484.41315	1.94	0.2009
Error	8	39067	4883.40958		
Corrected Total	9	48552			

Root MSE	69.88140	R-Square	0.1953	
Dependent Mean	988.17800	Adj R-Sq	0.0948	
Coeff Var	7.07174			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	1111.48170	91.19536	12.19	<.0001
since_90	1	-10.72206	7.69369	-1.39	0.2009

Run regressions by month: Chattanooga, JUL1996-JUN2006
Commercial Model, MAY

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	8894.57055	4447.28527	0.59	0.5775
Error	7	52366	7480.88848		
Corrected Total	9	61261			

Root MSE	86.49213	R-Square	0.1452	
Dependent Mean	1046.94100	Adj R-Sq	-0.0990	
Coeff Var	8.26141			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	1058.61375	112.87565	9.38	<.0001
pds0	1	-65.78512	60.57687	-1.09	0.3135
since_90	1	-2.61675	9.64768	-0.27	0.7940

Run regressions by month: Chattanooga, JUL1996-JUN2006
Commercial Model, JUNE

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	3902.71616	1951.35808	0.44	0.6604
Error	7	31009	4429.80621		
Corrected Total	9	34911			

Root MSE	66.55679	R-Square	0.1118
Dependent Mean	1120.14500	Adj R-Sq	-0.1420
Coeff Var	5.94180		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	1190.74478	87.17021	13.66	<.0001
pds0	1	16.34890	46.05685	0.35	0.7331
since_90	1	-5.70124	7.56394	-0.75	0.4756

Run regressions by month: Chattanooga, JUL1996-JUN2006
Commercial Model, JULY

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	85826	42913	9.69	0.0096
Error	7	31004	4429.18014		
Corrected Total	9	116830			

Root MSE	66.55209	R-Square	0.7346
Dependent Mean	1172.76900	Adj R-Sq	0.6588
Coeff Var	5.67478		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	1417.97047	80.25117	17.67	<.0001
pds0	1	-119.41194	44.61906	-2.68	0.0317
since_90	1	-26.41174	7.33329	-3.60	0.0087

Run regressions by month: Chattanooga, JUL1996-JUN2006
Commercial Model, AUGUST

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	86258	43129	22.83	0.0009
Error	7	13224	1889.12150		
Corrected Total	9	99481			

Root MSE	43.46403	R-Square	0.8671	
Dependent Mean	1225.60800	Adj R-Sq	0.8291	
Coeff Var	3.54632			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	1533.85418	53.81386	28.50	<.0001
pds0	1	-34.26866	21.41655	-1.60	0.1536
since_90	1	-30.91682	4.79536	-6.45	0.0004

Run regressions by month: Chattanooga, JUL1996-JUN2006
Commercial Model, SEPTEMBER

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	52409	26204	7.04	0.0211
Error	7	26046	3720.82000		
Corrected Total	9	78454			

Root MSE	60.99852	R-Square	0.6680	
Dependent Mean	1220.34000	Adj R-Sq	0.5732	
Coeff Var	4.99849			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	1357.43900	80.30406	16.90	<.0001
pds0	1	-70.16769	31.19471	-2.25	0.0593
since_90	1	-16.19120	6.94543	-2.33	0.0525

Run regressions by month: Chattanooga, JUL1996-JUN2006
Commercial Model, OCTOBER

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	7202.97789	3601.48895	0.29	0.7543
Error	7	85862	12266		
Corrected Total	9	93065			

Root MSE	110.75167	R-Square	0.0774	
Dependent Mean	1205.12200	Adj R-Sq	-0.1862	
Coeff Var	9.19008			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	1209.09302	141.57238	8.54	<.0001
pds0	1	-28.01327	39.77236	-0.70	0.5040
since_90	1	-2.31778	12.34603	-0.19	0.8564

Run regressions by month: Chattanooga, JUL1996-JUN2006
Commercial Model, NOVEMBER

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	14504	7251.99007	4.57	0.0537
Error	7	11110	1587.14001		
Corrected Total	9	25614			

Root MSE	39.83893	R-Square	0.5663
Dependent Mean	1107.01000	Adj R-Sq	0.4423
Coeff Var	3.59879		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	1133.49679	52.02135	21.79	<.0001
pds0	1	-32.96574	13.17712	-2.50	0.0409
since_90	1	-5.15353	4.48059	-1.15	0.2878

Run regressions by month: Chattanooga, JUL1996-JUN2006
Commercial Model, DECEMBER

The REG Procedure
Model: MODEL1
Dependent Variable: gallons

Number of Observations Read   10
Number of Observations Used   10

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	36575	18288	0.78	0.4946
Error	7	164149	23450		
Corrected Total	9	200724			

Root MSE	153.13347	R-Square	0.1822
Dependent Mean	1070.54600	Adj R-Sq	-0.0514
Coeff Var	14.30424		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	873.15515	185.61780	4.70	0.0022
pds0	1	22.17084	53.99846	0.41	0.6937
since_90	1	20.19695	16.87653	1.20	0.2704

Projections of Residential Water Utilization, Gallons per Day, Tennessee-American

Month	Slope of PDS0	Slope of SINCE_90	Intercept	30-yr Avg PDS0	Days	2005 Gal/Day	2006 Gal/Day	2007 Gal/Day	2008 Gal/Day	2009 Gal/Day
Jan	0	-2.21461	168.3350	-0.75000	31	135.12	132.90	130.69	128.47	126.26
Feb	0	-1.89630	164.4865	-0.87767	28	136.04	134.15	132.25	130.35	128.46
Mar	0	-0.94503	151.1609	-0.90933	31	136.99	136.04	135.10	134.15	133.21
Apr	0	-1.67958	160.9441	-0.74833	30	135.75	134.07	132.39	130.71	129.03
May	-0.51136	-1.59344	168.5594	-0.58767	31	144.96	143.36	141.77	140.18	138.58
Jun	-6.25226	-1.74918	181.7359	-0.63267	30	159.45	157.70	155.96	154.21	152.46
Jul	-14.29174	-2.48227	194.8243	-0.81367	31	169.22	166.74	164.25	161.77	159.29
Aug	-9.18935	-2.83555	199.5108	-0.86433	31	164.92	162.08	159.25	156.41	153.58
Sep	-8.48677	-1.97375	188.0111	-0.68400	30	164.21	162.24	160.26	158.29	156.31
Oct	-5.40451	-1.86747	179.0963	-0.78333	31	155.32	153.45	151.58	149.72	147.85
Nov	-4.58180	-1.07268	162.1136	-0.76500	30	149.53	148.46	147.38	146.31	145.24
Dec	-0.24261	-0.30462	151.8499	-0.71333	31	147.45	147.15	146.84	146.54	146.24
Annual projections:						150.00	148.28	146.57	144.85	143.13
Projection for March 2007 through February 2008:								146.23		

TNAM2006.XLS

						Projections of Commercial Water Utilization, Gallons per Day, Tennessee-American				
Month	Slope of PDS0	Slope of SINCE_90	Intercept	30-yr Avg PDS0	Days	2005 Gal/Day	2006 Gal/Day	2007 Gal/Day	2008 Gal/Day	2009 Gal/Day
Jan	0	-10.8886	1069.699	-0.75000	31	906.37	895.48	884.59	873.71	862.82
Feb	0	-3.4627	1016.267	-0.87767	28	964.33	960.86	957.40	953.94	950.48
Mar	0	9.9920	894.492	-0.90933	31	1,044.37	1,054.36	1,064.36	1,074.35	1,084.34
Apr	0	-10.7221	1111.482	-0.74833	30	950.65	939.93	929.21	918.48	907.76
May	-65.7851	-2.6168	1058.614	-0.58767	31	1,058.02	1,055.41	1,052.79	1,050.17	1,047.56
Jun	16.3489	-5.7012	1190.745	-0.63267	30	1,094.88	1,089.18	1,083.48	1,077.78	1,072.08
Jul	-119.4119	-26.4117	1417.970	-0.81367	31	1,118.96	1,092.54	1,066.13	1,039.72	1,013.31
Aug	-34.2687	-30.9168	1533.854	-0.86433	31	1,099.72	1,068.80	1,037.89	1,006.97	976.05
Sep	-70.1677	-16.1912	1357.439	-0.68400	30	1,162.57	1,146.37	1,130.18	1,113.99	1,097.80
Oct	-28.0133	-2.3178	1209.093	-0.78333	31	1,196.27	1,193.95	1,191.63	1,189.32	1,187.00
Nov	-32.9657	-5.1535	1133.497	-0.76500	30	1,081.41	1,076.26	1,071.11	1,065.95	1,060.80
Dec	22.1708	20.1970	873.155	-0.71333	31	1,160.29	1,180.49	1,200.69	1,220.89	1,241.08
Annual projections:						1,070.66	1,063.64	1,056.62	1,049.60	1,042.58
Projection for March 2007 through February 2008:								1,055.43		

TNAM2006.XLS