

**SUSAN A. MURPHY**

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HE Robbins Professor of Statistics

& Professor of Psychiatry

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**RESEARCH INTERESTS:**

Causal inference concerning dynamic or individually tailored treatment regimes. Sequential decision problems arising in the design of dynamic treatment regimes. Inference for high dimensional models.

**EDUCATION:**

Ph.D., Statistics (1989), "Time-Dependent Coefficients in a Cox-Type Regression Model" (P.K. Sen, advisor) University of North Carolina, Chapel Hill, NC

B.S., Mathematics (1980), Louisiana State University, Baton Rouge, LA

**PROFESSIONAL POSITIONS:**

Fall, 2005 -	H.E. Robbins Professor of Statistics, Dept. of Statistics and Research Professor, Institute for Social Research, and Professor of Psychiatry, Univ. of Michigan
Fall, 2004 -	H.E. Robbins Professor of Statistics, Dept. of Statistics and Research Professor, Institute for Social Research, Univ. of Michigan
Fall, 2001 - 2004	Professor of Statistics, Dept. of Statistics and Research Professor, Institute for Social Research, Univ. of Michigan
Spring, 1998 - Fall, 2001	Associate Professor of Statistics, Dept. of Statistics and Senior Associate Research Scientist, Institute for Social Research, Univ. of Michigan
Fall, 1996 - Fall, 1997	Associate Professor of Statistics, Pennsylvania State Univ.
Fall, 1989 - Summer, 1996	Assistant Professor of Statistics, Pennsylvania State Univ.
Fall, 1987 - Spring, 1989	Graduate Research Assistant, Dept. of Biostatistics, Univ. of North Carolina
Fall, 1985 - Fall, 1987	Mathematical Statistician, National Institute of Environmental Health Sciences
Fall, 1983 - Fall, 1984	Instructor, Loyola University, New Orleans
1982 - 1983	Biostatistician, Louisiana State University Medical School, New Orleans

**HONORS, FELLOWSHIPS and INVITATIONS:**

**2014:** Elected a Fellow of the College on Problems in Drug Dependence.

**2014-2018:** MacArthur Fellow.

**2011:** Elected a Member of the International Statistical Institute.

**2007-8:** Invited Fellow at the Center for Advanced Study in the Behavioral Sciences, Stanford University

**2005:** Presented the Clifford C. Clogg Memorial Lecture, Sociology and Statistics Departments, Pennsylvania State University

**2004:** Awarded a University of Michigan Collegiate Professorship.

**2002:** Elected a Fellow of the American Statistical Association.

**2000:** Elected a Fellow of the Institute of Mathematical Statistics.

**1999:** NSF Mid-Career Methodological Opportunities Fellowship, to visit the Population Studies Center, Univ. of Michigan.

**1998:** IMS Special Invited Lecture at the Joint Statistical meetings of ASA, IMS, ENAR, and WNAR in Dallas, TX.

**March, April, 1997:** Invited Visiting Professor at Chalmers University of Technology in the Mathematics Dept. to conduct research.

**May, 1996:** Invited Visiting Professor at Universite' de Paris-Sud, in the Mathematics Dept. to conduct research with Pascal Massart and Aad van der Vaart.

**Spring, 1995:** Invited Visiting Professor at the Free Univ. (Amsterdam) in the Mathematics Dept. to conduct research with Aad van der Vaart.

**Oct. 1993:** Invited Visiting Professor at the Free Univ. (Amsterdam) in the Economics Dept. to conduct research.

**Fall, 1991:** MSRI Postdoctoral Fellowship in Berkeley, CA. During this time MSRI sponsored a special year on empirical processes and semiparametric models in survival analysis.

**Summer and Fall, 1990:** NSF-NATO Postdoctoral Fellowship in Utrecht, The Netherlands. This fellowship was to visit Richard Gill and conduct research.

**Fall, 1985- Spring, 1986:** George E. Nicholson, Jr. Fellowship. This fellowship was awarded to students for outstanding performance on the Ph.D. qualifying exam.

**SERVICE TO THE SCIENTIFIC COMMUNITY (since 2005):**

2012	Member, Organizing Committee for Workshop on Future Research Directions in Statistics
2012-	SAMSI National Advisory Committee Co-Chair
2011-12	Chair, Committee to Select Editors, AOS
2011-	Member, Joint IMS/BS Publications Management Committee
2010	Member of the Scientific Organizing Committee for International Conference on Health Policy Statistics 2011
2009-2010	Member of the NAS Oversight Committee on the Handling of Missing Data in Clinical Trials
2009-	Member of the NIMH Interventions Committee for Adult Disorders
2009-2011	Member of the Columbia University HIV Center for Clinical and Behavioral Studies's external PSMB.
2008-	Member of the SAMSI National Advisory Council
2007	Member of the Scientific Committee, International Society for Clinical Biostatistics Meeting in Greece

2007-2009	Editor of <i>The Annals of Statistics</i> (with B. Silverman)
2007	Co-Editor of a supplemental volume of <i>Drug and Alcohol Dependence</i> on Adaptive Treatment Strategies (with L. Collins and A.J. Rush).
2006-2007	Co-organizer of the SAMSI program on Challenges in Dynamic Treatment Regimes and Multistage Decision-Making in June, 2007
Aug., 2005	Organizer of the ENAR invited session on Dynamic Treatment Regimes at the JSM, Minnesota.
July, 2005	Organizer of the EMS invited session on Causal Inference and Dynamic Treatment Regimes, Norway.

## PUBLICATIONS AND MANUSCRIPTS:

### Articles in Refereed Journals and Refereed Proceedings

Lagoa, C.M., Bekiroglu, K., Lanza, S.T. & **S.A. Murphy**(in press) Designing Adaptive Intensive Interventions Using Methods from Engineering. *Journal of Consulting and Clinical Psychology*

Bekiroglu, K., Lagoa, C., **Murphy S.** & Lanza, S. T.(in press). A robust MPC approach to the design of treatments. *Proceedings of the 52nd IEEE Conference on Decision and Control*

Kumar, S., W.J. Nilsen, A. Abernethy, A. Atienza, K. Patrick, M. Pavel, W.T. Riley, A. Shar, B. Spring, D. Spruijt-Metz, D. Hedeker, V. Honavar, R. Kravitz, R. Craig Lefebvre, D.C. Mohr, **S.A. Murphy**, C. Quinn, V. Shusterman, D. Swendeman, Mobile Health Technology Evaluation, The mHealth Evidence Workshop. *Am J Prev Med* 2013;45(2):228236.

Almirall, D., Griffin BA, McCaffrey DF, Ramchand R, Yuen RA, **Murphy S.A.**, Time-varying effect moderation using the structural nested mean model: estimation using inverse-weighted regression-with-residuals. *To appear in the Statistics in Medicine*.

Fonteneau, R., **S.A. Murphy**, Wehenkel, L., D. Ernst, Batch Mode Reinforcement Learning based on the Synthesis of Artificial Trajectories. *To appear in the Annals of Operations Research*.

Lizotte D.J., Bowling M., **S.A. Murphy** (2012). Linear Fitted-Q Iteration with Multiple Reward Functions. *Journal of Machine Learning Research*.13(Nov):3253-3295.

Almirall D., Compton S.N., Rynn M.A., Walkup J.T., **S.A. Murphy**, SMARTer Discontinuation Trials: With Application to the Treatment of Anxious Youth. *To appear in the Journal of Child and Adolescent Psychopharmacology*.

Little RJ, D Agostino R, Cohen ML, Dickersin K, Emerson SS, Farrar JT, Frangakis C, Hogan JW, Molenberghs G, **S.A. Murphy**, Neaton JD, Rotnitzky A, Scharfstein D, Shih W, Siegel JP and H Stern. (2012). The Prevention and Treatment of Missing Data in Clinical Trials. *New England Journal of Medicine*. vol. 367:1355-1360

I. Nahum-Shani, M. Qian, D. Almiral, W.. Pelham, B. Gnagy, G. Fabiano, J. Waxmonsky, J. Yu and **S.A. Murphy**. Experimental Design and Primary Data Analysis Methods for Comparing Adaptive Interventions. *Psychological Methods* 17(4), 457-477. doi: 10.1037/a0029372. Epub 2012 Oct 1 PMID: PMC3825557

I. Nahum-Shani, M. Qian, D. Almiral, W.. Pelham, B. Gnagy, G. Fabiano, J. Waxmonsky, J. Yu and **S.A. Murphy**. Q-Learning: A Data Analysis Method for Constructing Adaptive Interventions. *Psychological Methods* 17(4):478-94. doi: 10.1037/a0029373. Epub 2012 Oct 1. PMID: PMC23025434

D. Almirall, S. N. Compton, M. Gunlicks-Stoessel, N. Duan, **S.A. Murphy** (2012). Designing a Pilot Sequential Multiple Assignment Randomized Trial for Developing an Adaptive Treatment Strategy. *Statistics in Medicine* 31(17):1887-1902. PMC3399974

K. Deng, J. Pineau and **S.A. Murphy** (2011). Active Learning for Developing Personalized Treatment. *Proceedings of the Twenty-Seventh Conference Annual Conference on Uncertainty in Artificial Intelligence (UAI-11)* AUAI Press 161-8. (These papers are externally reviewed; 34% acceptance rate.)

K. Deng, J. Pineau and **S.A. Murphy** (2011). Active Learning for Personalizing Treatment. *Adaptive Dynamic Programming And Reinforcement Learning (ADPRL), 2011 IEEE Symposium on* 11-15 April 2011. pgs 32-39.

L. Gunter, J. Zhu, and S.A. Murphy (2011). Variable Selection for Qualitative Interactions in Personalized Medicine while Controlling the Family-wise Error Rate. *Journal of Biopharmaceutical Statistics*. Nov;21(6):1063-78.

Z. Li and **S.A. Murphy** (2011). Sample Size Formulae for Two-Stage Randomized Trials with Survival Outcomes. *Biometrika* 98(3):503-518, PMID: PMC3254237

D. Almirall, D.F. McCaffrey, R. Ramchand and **S.A. Murphy** (2011). Subgroups Analysis when Treatment and Moderators are Time-varying. *Prevention Science* Published Online First 22 March 2011 PMID: PMC3135740

M. Qian and **S.A. Murphy** (2011). Performance Guarantees for Individualized Treatment Rules. *Annals of Statistics* 39(2):1180-1210. PMC3110016

E. Laber and **S.A. Murphy** (2011), Adaptive Confidence Intervals for the Test Error in Classification. *Journal of the American Statistical Association* 106:904-913. (This paper was selected as the JSM 2011 JASA(T&M) Invited Paper) Posted online on 30 Mar 2011. PMC3285493

S. M. Shortreed, E. Laber, D. J. Lizotte, T. S. Stroup, J Pineau and **S.A. Murphy** (2010). Informing sequential clinical decision-making through reinforcement learning: an empirical study. *Machine Learning*, July 1; 84(1-2):109-136. PMC3143507

D. Lizotte, M. Bowling and **S.A. Murphy** (2010), Efficient Reinforcement Learning with Multiple Reward Functions for Randomized Controlled Trial Analysis, *Proceedings of the 27th International Conference on Machine Learning (ICML 2010)* pgs. 695-702. (These papers are externally reviewed.)

R. Fonteneau, **S.A. Murphy**, L. Wehenkel and D. Ernst (2011). Towards min max generalization in reinforcement learning. In *Agents and Artificial Intelligence: International Conference, ICAART 2010, Valencia, Spain, January 2010, Revised Selected Papers, Series: Communications in Computer and Information Science (CCIS), Volume 129, J. Filipe, A. Fred, and B. Sharp (Editors)*, pp. 61-77. Springer, Heidelberg. (These papers are externally reviewed.)

Fonteneau, R., **S.A. Murphy**, L. Wehenkel and D. Ernst (2010), Model-Free Monte Carlo-like Policy Evaluation. *Volume 9: AISTATS 2010 Proceedings of the Thirteenth International Conference on Artificial Intelligence and Statistics* May 13-15, 2010, Chia Laguna Resort, Sardinia, Italy 9:217-224, 2010. (These papers are externally reviewed.)

H. McGowan, R.L. Nix, **S.A. Murphy**, K.L. Bierman and CPPRG (2010), Investigating the Effects of Selection Bias in Dose-Response Analyses of Preventive Interventions. *Prevention Science* 11:239251. PMC3044506

Almirall D, Ten Have T, **Murphy SA** (2010). Structural Nested Mean Models for Assessing Time-Varying Effect Moderation. *Biometrics*. 66(1), 131-139, Published Online: 13 Apr 2009 PMC 2875310

L. Gunter, J. Zhu, **S.A. Murphy** (2011). Variable Selection for Qualitative Interactions. *Statistical Methodology* 8(1):42-55. PMC3003934

B. Chakraborty, **S.A. Murphy** and V. Strecher (2010). Inference for Nonregular Parameters in Optimal Dynamic Treatment Regimes. *Statistical Methods in Medical Research* 2010 19: 317-343. PMC2891316

Fonteneau, R., **S.A. Murphy**, L. Wehenkel and D. Ernst (2010). A Cautious Approach to Generalization in Reinforcement Learning. Joaquim Filipe, Ana L. N. Fred, Bernadette Sharp (Eds.): ICAART 2010 - Proceedings of the International Conference on Agents and Artificial Intelligence, Volume 1 - Artificial Intelligence, Valencia, Spain, January 22-24, 2010. INSTICC Press 2010, 64-73. (This paper won the Best Student Paper Award; these are externally reviewed papers.).

R. Fonteneau, **S.A. Murphy**, L. Wehenkel and D. Ernst. (2009) Inferring bounds on the performance of a control policy from a sample of trajectories. In Proceedings of the IEEE International Symposium on Adaptive Dynamic Programming and Reinforcement Learning (ADPRL09), pages 117-123. Nashville, United States, March 30 April 2, 2009. (These are externally reviewed.)

**S.A. Murphy** and D. Bingham (2009). Screening Experiments for Developing Dynamic Treatment Regimes. *Journal of the American Statistical Association*, Vol 184:391-408. PMC2892819

Chakraborty B, Collins L, Strecher V, **Murphy SA** (2009). Developing Multicomponent Interventions using Fractional Factorial Designs. *Statistics in Medicine* September 20; 28(21): 2687-2708. PMC2746448

Collins, LM, Chakraborty B, **Murphy SA**, Strecher V (2009). Comparison of a phased experimental approach and a single randomized clinical trial for developing multicomponent behavioral interventions. *Clinical Trials*, Vol 6(1): 5-15. PMC2711350

E. Laber, **S.A. Murphy** (2008). Small Sample Inference for Generalization Error in Classification Using the CUD Bound, *Proceedings of the 2008 Uncertainty in Artificial Intelligence Conference* AUAI Press, 357:365. These papers are externally reviewed. PMC2876736

V. Nair, V. Strecher, A. Fagerlin, P. Ubel, K. Resnicow, **S.A. Murphy**, R. Little, B. Chakraborty, A. Zhang, 2008. Screening Experiments and Fractional Factorial Designs in Behavioral Intervention Research, *American Journal of Public Health*, Vol.98, No.8:1354-1359. PMC2446451

**S.A. Murphy**, L.M. Collins, A.J. Rush (2007). Customizing Treatment to the Patient: Adaptive Treatment Strategies (Editorial). Drug and Alcohol Dependence, *Drug and Alcohol Dependence*. 88(2):S1-S72. PMC1924645

J. Pineau, M.G. Bellemare, A. J. Rush, A. Ghizaru, **S.A. Murphy** (2007). Constructing evidence-based treatment strategies using methods from computer science. *Drug and Alcohol Dependence*, 88, Supplement 2:S52-S60. PMC1934348

L. Gunter, J. Zhu, **S.A. Murphy** (2007). Variable Selection for Optimal Decision Making. *Proceedings of the 11th Conference on Artificial Intelligence in Medicine*. LNCS/LNAI 4594, 149-154. This proceedings had a 50% acceptance rate.

L.M. Collins, **S.A. Murphy**, V. Strecher (2007). The Multiphase Optimization Strategy (MOST) and the Sequential Multiple Assignment Randomized Trial (SMART): New Methods for More Potent e-Health Interventions. *American Journal of Preventive Medicine*, 32(5S):S112-118. PMC2062525

**S.A. Murphy**, K.G. Lynch, J.R. McKay, D. Oslin, T. TenHave (2007). Developing Adaptive Treatment Strategies in Substance Abuse Research. *Drug and Alcohol Dependence*, 88(2):S24-S30. PMC1922034

**S.A. Murphy**, D. Oslin, A.J.Rush, J. Zhu for MCATS (2007). Methodological Challenges in Constructing Effective Treatment Sequences for Chronic Disorders, *Neuropsychopharmacology*, 32(2):257-62. advance online publication, November 8 2006, doi: 10.1038/sj.npp.1301241 PMC17091129

Bierman K., R. Nix, J.J. Maples and **S.A. Murphy**. (2006). Examining Clinical Judgment in an Adaptive Intervention Design: The Fast Track Prevention Program *American Journal of Community Psychology* 74(3):468-81. PMC2753970

Bray, B., D. Almiral, R.S. Zimmerman, D. Lynam and **Murphy, S.A.** (2006). Assessing the Total Effect of Time-varying Predictors in Prevention Research. *Prevention Science*. 7(1):1-17. PMC1479302

**Murphy S.A.** (2005). A Generalization Error for Q-Learning. *Journal of Machine Learning Research*. 6(Jul):1073–1097. PMC1475741

Collins, L.M., **Murphy, S.A.**, Nair, V. and V. Strecher. (2005) A Strategy for Optimizing and Evaluating Behavioral Interventions. *The Annals of Behavioral Medicine* , **30**:65-73.

**Murphy, S.A.** (2005) An Experimental Design for the Development of Adaptive Treatment Strategies. *Statistics in Medicine*, **24**:1455-1481. PMC15586395

Barber, J.S., **Murphy, S.A.** & N. Verbitsky (2004), Adjusting for Time-Varying Confounding in Survival Analysis. *Sociological Methodology*, **34**:163-192.

Collins, L.D., **Murphy, S.A.** and K. Bierman. (2004), A Conceptual Framework for Adaptive Preventive Interventions. *Prevention Science*, **3**:185-196. PMC3544191

**Murphy, S.A.** (2003) Optimal Dynamic Treatment Regimes (with discussion). *JRSSB*, **65(2)**, 331-366.

Maples, J.J., **Murphy, S.A.** and W.G. Axinn (2002), Two Level Proportional Hazards Models. *Biometrics*, **58(4)**, 180-188.

**Murphy, S.A.**, M.J. van der Laan, JM. Robins and CPPRG (2001), Marginal Mean Models for Dynamic Regimes *JASA*, **96** 1410-1423.

**Murphy, S.A.** and A.W. van der Vaart, (2001). Semiparametric Mixtures in Case-control Studies. *Journal of Multivariate Analysis*, **79**:1-32.

Barber, J.S., **S.A. Murphy**, W.G. Axinn and J. Maples, (2000) Discrete Time Multilevel Survival Analysis. *Sociological Methodology*, **30** 201-235.

**Murphy, S.A.** and A.W. van der Vaart, (2000) On Profile Likelihood. (with discussion). *JASA*, **95** 449-485.

**Murphy S.A.**, van der Vaart AW and Wellner JA. (1999) Current Status Regression. *Mathematical Methods of Statistics*, **8** 407-425.

**Murphy S.A.** and van der Vaart AW. (1999) Observed Information in Semiparametric Models. *Bernoulli*. **5** 381-412.

Bacik, J.M., **S.A. Murphy** and J.C. Anthony, (1998) Drug Use Prevention Data, Missing Assessments and Survival Analysis. *Multivariate Behavioral Research*, **33** 573-588.

**Murphy, S.A.**, A.J. Rossini and A.W. van der Vaart, (1997) MLE in the Proportional Odds Model. *JASA*, **92** 968-976

**Murphy, S.A.** and A.W. van der Vaart, (1997) Semiparametric Likelihood Ratio Inference. *Annals of Statistics*, **25** 1471-1509

**Murphy, S.A.** and A.W. van der Vaart, (1996) Likelihood Inference in the Errors-in-Variables Model. *J. of Multivariate Analysis*, **59** 81-108

**Murphy, S.A.**, (1995) Likelihood Ratio-Based Confidence Intervals in Survival Analysis. *JASA*, **90** 1399-1405.

**Murphy, S.A.** (1995) A Central Limit Theorem for Local Martingales with Applications to the Analysis of Longitudinal Data, *Scand. J. of Stat.*, **22** 279-294.

**Murphy, S.A.**, M.A. O'Hanesian, and G. Bentley, (1995) An Analysis for Menstrual Data with Time-Varying Covariates, *Stat. in Med.*, **14** 1843-1857.

**Murphy S.A.** (1995) Asymptotic Theory for the Frailty Model, *Annals of Statistics*, **23** 182-198.

**Murphy, S.A.** and B. Li, (1995) Projected Partial Likelihood and its Application to Longitudinal Data, *Biometrika*, **82** 399-406.

Akritas, M., **S. Murphy**, M. LaValley, and E. Feigelson, (1995) The Theil-Sen Estimator with Doubly Censored Data and Applications to Astronomy, *JASA*, **90** 170-177.

**Murphy S.A.** (1994) Consistency in a Proportional Hazards Model Incorporating a Random Effect, *Annals of Statistics*, **22** 712-731.

**Murphy S.**, Tice R., Smit M., and B. Margolin (1992) Contributions to the Design and Statistical Analysis of in vivo SCE Experiments. *Mutation Research*, 271 39-48.

**Murphy S.A.** (1991) Testing for a Time Dependent Coefficient in Cox's Regression Model, *Scandinavian Journal of Statistics*, **20** 35-50.

**Murphy S.A.** and Sen P.K. (1991) Time Dependent Coefficients in a Cox-type Regression Model, *Stochastic Processes and Their Applications*, **39** 153-180.

**Murphy S.**, Caspary W., and B. Margolin (1988) A Statistical Analysis for the Mouse Lymphoma Cell Forward Mutation Assay, *Mutation Research* 203 145-154.

Jauhar P., Henika P., MacGregor J., Wehr C., Shelby M., **Murphy S.**, and B. Margolin (1988) 1,3- Butadiene: Induction Micronucleated Erythrocytes in the Peripheral Blood of *B6C3F1* Mice Exposed by Inhalation for Thirteen Weeks. *Mutation Research*, 209 171-176.

#### Other Refereed Articles/Editorials/Book Chapters

Nahum-Shani, I., Xi, L., Henderson, M.M., & **S.A. Murphy** (2013). Innovative experimental design for developing effective technology-supported help-seeking interventions. Book chapter to appear in Advances in Help Seeking Research and Applications: The Role of Information and Communication Technologies. S.A. Karabenick and M. Puustinen (Eds). Information Age Publishing. PMC Exempt-invited review.

Qian, M., Nahum-Shani, I., **S.A. Murphy** (2013). Dynamic treatment regimes, Modern Clinical Trial Analysis, Series: Applied Bioinformatics and Biostatistics in Cancer Research Tang, Wan; Tu, Xin (Eds.), Springer Science, pgs. 127-148. PMC Exempt-invited review.

Almirall, D., Lizotte, D. & **S.A. Murphy** (2012). SMART Design Issues and the Consideration of Opposing Outcomes, Discussion of the paper. Evaluation of Viable Dynamic Treatment Regimes in a Sequentially Randomized Trial of Advanced Prostate Cancer by Wang et al. *Journal of the American Statistical Association*, 107(498):509-512. NIHMSID: NIHMS384756.

H. Lei, I. Nahum-Shani, K. Lynch, D. Oslin, and S.A. Murphy (2012). Using the Sequential, Multiple Assignment, Randomized Trial (SMART) Designs to Build Individualized Treatment Sequences, *Annual Review of Clinical Psychology* 8:21-48. PM22224838. PMC Exempt-invited review.

A.I. Oetting, J.A. Levy, R.D. Weiss, **S.A. Murphy** (2011). Statistical Methodology for a SMART Design in the Development of Adaptive Treatment Strategies, in *Causality and Psychopathology: Finding the Determinants of Disorders and their Cures* (P.E. Shrout, K.M. Keyes, K. Ornstein, Eds.) Arlington VA: American Psychiatric Publishing, Inc, pgs. 179-205

R. Fonteneau, **S.A. Murphy**, L. Wehenkel and D. Ernst. (2010). Generating informative trajectories by using bounds on the return of control policies ". In Proceedings of the Workshop on Active Learning and Experimental Design 2010 ( in conjunction with AISTATS 2010), 2-page highlight paper, Chia Laguna, Sardinia, Italy, May 16 2010.

National Research Council (2010). *The Prevention and Treatment of Missing Data in Clinical Trials*. Panel on Handling Missing Data in Clinical Trials. Committee on National Statistics, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press. (Member, Panel)

Almirall D, Coffman CJ, Yancy, Jr. WS, **Murphy SA**. (2010) Structural Nested Models. In Analysis of Observational Health-Care Data Using SAS (eds D. Faries, A. Leon, JM Haro & RL Obenchain) Cary NC: SAS Institute, pgs. 231-262. This was externally reviewed.

**S.A. Murphy**, D. Almirall (2009). Dynamic Treatment Regimes, *The Encyclopedia of Medical Decision Making*. (MW Kattan, ed) Sage Publications Inc. pgs. 419-422.

**S.A. Murphy** (2002). Audit Studies and the Assessment of Discrimination. In *Measuring Housing Discrimination in a National Study: Report of a Workshop* (eds: A.W. Foster, F. Mitchell, S.E. Fienberg) Committee on National Statistics, Division of Behavioral and Social Sciences and Education, National Research Council, National Academy Press, Washington, DC

**S.A. Murphy**, L.M. Collins, A.J. Rush (2007). Editorial: Customizing treatment to the patient: Adaptive treatment strategies, *Drug Alcohol Dependence*, 88(2):S1-S72.

**S.A. Murphy** and McKay, J.R. (2003). Adaptive Treatment Strategies: An Emerging Approach for Improving Treatment Effectiveness. *Clinical Science (Newsletter of the American Psychological Association Division 12, section III: The Society for the Science of Clinical Psychology) Winter 2003/Spring 2004*.

**S.A. Murphy** (1993) Discussion of paper by Hastie, T. and R. Tibshirani, *J.R. Statist. Soc. B*, **55** 793.

**S.A. Murphy**(1989) Time-Dependent Coefficients in a Cox-type Regression Model, Institute of Statistics Mimeo Series #2001, (thesis) Dept. of Statistics, University of North Carolina, Chapel Hill, North Carolina.

## RESEARCH GRANTS AND AWARDS SINCE 2005:



Project Leader of Research Component(7/1/10-8/31/15) NIDA: "SMART Methodology for Constructing Adaptive Interventions" This is one research component of a P50 center at The Pennsylvania State University. In this project we consider how best to incorporate multiple competing outcomes in developing adaptive interventions, we provide improved measures of confidence and we disseminate these methods via software and analyses of clinical trial data. (over 5 years this component has: \$1,765,822 direct costs)

Principal Investigator (5/1/07 - 4/30/12) NIMH: "Learning Adaptive Treatment Strategies in Mental Health." The goal of this project is to improve the adaptive, sequential clinical decision making that occurs in clinical practice, particularly regarding the management of patients suffering from chronic mental health disorders. This project will be conducted by a collaborative team involving a computer scientist, two psychiatrists and a statistician. (over 5 years: \$1,847,525 direct costs).

Co-Investigator (9/1/06-8/31/09) NIMH: "Antidepressants, Concurrent Treatments, and Completed Suicide in VA Registry Data" Valenstein(PI).

Research Component Leader (9/30/05-10/01/10) National Institute on Drug Abuse "Methodology for Developing Adaptive Interventions" This is one research component of a P50 center at The Pennsylvania State University. (Over 5 years this component has: \$1,086,662 direct costs).

Principal Investigator (9/30/04 - 7/31/07) National Institute on Drug Abuse R21 grant, "Methodology for Adaptive Treatment Strategies." This grant is to form a network of health scientists (mental illness, substance abuse, HIV infection), statisticians, computer scientists and engineers to proactively identify and begin to address the methodological challenges confronting the development of adaptive treatment strategies. (Over 2 years: \$150,000 direct costs)

Co-Investigator (09/01/03 - 08/31/08) NCI grant "Michigan Center for Health Communications Research." This is a P-50 center with Victor Strecher, P.I. (Over 5 years \$7,637,298 direct costs; I have a developmental project. The developmental has an approximate budget of \$300, 000 direct costs).

Independent Scientist, (9/30/02-5/31/07) National Institute on Drug Abuse K02 Mid-Career Award, "Reducing Drug Abuse with Individually Tailored Treatments." (Over 5 years: \$ 615,000 direct costs, \$ 49,200 indirect costs)

## **PRESENTATIONS:**

### Invited Papers Presented at Professional Meetings since 2005

- Nov., 2013 International Year of Statistics Public Lecture  
Univ. of Toronto on SMART Designs to Improve Health
- Nov., 2013 Future of the Statistical Sciences Workshop  
SMART Designs for Combatting Autism
- October, 2013 Implementation Sciences and the Global Response to HIV/AIDS  
Gladstone Institutes, San Francisco  
Keynote speaker: Beyond Efficacy Innovative Designs for Effectiveness
- October, 2013 Inter. Conf. on Health Policy Statistics, Chicago  
Machine Learning Methods for Individualizing Real-Time Treatment Policies
- August, 2013 ISI World Statistics Conference 2013, Hong Kong  
Machine Learning Methods for Individualizing Real-Time Treatment Policies
- August, 2013 ISI Young Statisticians Meeting 2013, Hong Kong

Machine Learning Methods for Individualizing Real-Time Treatment Policies

June, 2013 9th Annual RSA Pre-Conference Satellite Meeting on Mechanisms of Behavior Change; Orlando, FL  
Getting SMART about Adapting Interventions!

June, 2013 Guelph Biomathematics and Biostatistics Symposium; Guelph, Canada  
Plenary: Gordon C. Ashton Memorial Biometrics Lecture  
A Clinical Trial Design for Constructing and Individualizing Real-Time Treatment Policies

May, 2013 Statistical Genomics and Data Integration for Personalized Medicine; Ascona, Switzerland  
A Clinical Trial Design for Constructing and Individualizing Real-Time Treatment Policies

April, 2013 IBS Eastern Mediterranean Region, Tel Aviv  
Advances in Sequential, Multiple Assignment, Randomized Trials and Treatment Policies

February, 2013 AAAS Annual Meeting, Boston  
Experimenting to Improve Clinical Practice

August, 2012 Meaningful Use of Complex Medical Data, Los Angeles  
Sequential, Multiple Assignment, Randomized Trials and Treatment Policies

August, 2012 Session on Treatment Heterogeneity, JSM, San Diego  
Treatment Effect Heterogeneity and Dynamic Treatment Regime Development

July, 2012 Statistical Inference in Complex, High Dimensional Problems, Vienna  
Treatment Policies, Q-Learning and Adaptive Confidence Intervals

June, 2012 Conference on Statistical Learning and Data Mining, Ann Arbor  
Adaptive Confidence Intervals for Nonregular Parameters

May, 2012 2012 Atlantic Causal Inference Conference, Baltimore  
Piloting and Sizing Sequential Multiple Assignment Randomized Trials in Dynamic Treatment Regime Development

April, 2012 Time for Causality Workshop, Bristol UK  
Confidence Intervals, Q-Learning and Dynamic Treatment Regimes

April, 2012 Early Childhood Interventions Inaugural Conference, Chicago  
Getting SMART about Adapting Interventions

April, 2012 ENAR Session in Memory of T. TenHave on Sizing Sequential, Multiple Assignment, Randomized Trials for Survival Analysis

March, 2012 10th Annual ASA CT Chapter Mini-Conference, on SMART Clinical Trial Designs for Developing Dynamic Treatment Regimes

March, 2012 Invited Participant at the Oberwolfach meeting on Frontiers in Nonparametric Statistics, Oberwolfach, Germany

Sept., 2011 High Dimensional Problems in Statistics Workshop, ETH Zurich, on Adaptive Confidence Intervals for Non-regular Parameters

August, 2011 Joint Statistical Meeting: JASA, Theory and Methods Invited Session (joint with E. Laber)

August, 2011 mHealth Evidence Workshop, NIH Campus, Bethesda  
SMART Designs for Advancing mHealth Adaptive Interventions

May, 2011 Society for Clinical Trials Annual Meeting Session on Practical Application of Adaptive Treatment Strategies in Trial Design and Analysis

May, 2011 Causal Inference in Health Workshop at the CRM, Montreal  
Session on Time Varying Treatments and Optimal Treatment Strategies

April, 2011 Society for Behavioral Medicine Session: Drawing on Ideas from Engineering and Computer Science to Build Better Behavioral Interventions

March, 2011 ENAR Session: Recent Method Development on Reinforcement Learning and Personalized Medicine

August, 2010 European Meeting of Statisticians Session: Causal Inference and Dynamic Models (presented by E. Laber)

August, 2010 Joint Statistical Meetings Session: Topics in Nonstandard Asymptotics (presented by E. Laber)

July, 2010 From Probability to Statistics and Back: High-Dimensional Models and Processes, Conference in honor of Jon Wellner, Seattle WA

June, 2010 NIDA/OBSSR Conference on Behavioral Intervention Optimization: Capitalizing on Engineering, Computer Science and Technology

June, 2010 International College of Neuropsychopharmacology 2010 Biennial International Congress, (presentation by Daniel Almirall)

June, 2010 Society for Prevention Research Annual Meeting Session: Innovative Methodology for Adaptive Interventions Drawing from Engineering and Computer Science (presentation by Inbal Nahum-Shani)

May, 2010 NIH Pain Consortium: 5th Annual Symposium on Advances in Pain Research

March, 2010 Third Midwest Statistics Research Colloquium

Jan., 2010 International Conference on Health Policy and Statistics

Oct., 2009 60th Anniversary Celebration of the UNC Biostatistics Department

Oct., 2009 NIH Roadmap meeting, "Facilitating Interdisciplinary Research: Methodological and Technological Innovation in the Behavioral and Social Sciences."

Sept., 2009 15th Annual Duke Nicotine Research Conference

Aug., 2009 Joint Statistical Meetings, Washington DC., USA

August, 2009 Mathematisches Forschungsinstitut Oberwolfach: Challenges in Statistical Theory: Complex Data Structures and Algorithmic Optimization(presented by E. Laber)

June, 2009 American Control Conference

June, 2009 UW CSSS 10th Anniversary Conference

May, 2009 Keynote Lecture at the 11th Annual Statistics in Psychiatry Symposium Columbia University, Brown University, New York University, and the University of Pennsylvania, Philadelphia, PA

March, 2009 ENAR Session: Application of Dynamic Treatment Regimes

January, 2009 University of Florida Winter Workshop

October, 2008 Session: Mathematical and Statistical Models for Mental Health at INFORMS Annual Meeting 2008, Washington, DC

July, 2008 Keynote Speaker at PolMeth XXV, Michigan (The Society for Political Methodology Annual Meeting)

May, 2008 Session: Statistical Applications in Psychiatry at the ICSA 2008 Applied Statistics Symposium, Piscataway, NJ

May, 2008 Session: Innovative Methods at the Society for Prevention Research, San Francisco, CA (organized paper symposium)

May, 2008 Plenary Speaker at Benelearn08, Spa, Belgium  
(Belgium-Netherlands Machine Learning Conference)

March, 2008 Session: Dynamic Treatment Regimes: Practice and Theory  
at ENAR, Washington, DC

March, 2008 98th Annual Meeting American Psychopathological Association, New York

Jan., 2008 Plenary Speaker  
Platinum Jubilee Conference at the Indian Statistical Institute, Calcutta

May, 2007 Session: Optimizing Therapy  
Harvard Biostatistics/Schering-Plough Conference

March, 2007 Session: Dynamic Treatment Regimes  
at ENAR, Atlanta, GA

Feb., 2007 International Society for CNS Clinical Trials and Methodology

January, 2006 Conference on Theoretical Statistics at University of Florida

January, 2006 Causality Conference at Johns Hopkins

August, 2005 Conference on Statistical Analysis of Complex Event History  
Data at the Norwegian Academy of Science  
and Letters, Oslo, Norway

August, 2005 Session: Recent Advances in Causal Inference  
at the JSM, Minneapolis

March, 2005 Session: Evaluating Causation, at the 10th Biennial CDC  
and ATSDR Symposium on Statistical Methods

Invited Seminars Since 2005

Feb., 2012	Dept. of Biostatistics Harvard University	Machine Learning Methods for Individualizing Real-Time Treatment Policies
Jan., 2014	Dept. of Preventive Medicine Northwestern University	SMART Designs for Developing Adaptive Interventions
Jan., 2014	Dept. of Biostatistics Univ. of Washington	Machine Learning Methods for Individualizing Real-Time Treatment Policies
May, 2013	Mathematical Association of America Carriage House Lecture	Getting SMART About Adapting Interventions
Feb., 2013	Mathematics Department University of Alberta	Adaptive Confidence Intervals for Non-regular Parameters
Sept, 2012	Computing Science Dept. University of Alberta	Sequential, Multiple Assignment, Randomized Trials and Treatment Policies
Feb., 2012	Statistical Science Cornell University	Adaptive Confidence Intervals for Non-regular Parameters
Dec., 2011	Biostatistics Department Univ. of Pittsburgh	Collecting and Using Data to Inform Sequential, Individualized, Clinical Decision Making
Dec., 2011	HIV Training Program Columbia University	Getting SMART about Adapting Interventions
Nov., 2010	Biostatistics Department Johns Hopkins	Inference for Dynamic Treatment Regimens
Nov., 2010	Statistics Department	Inference for Dynamic Treatment Regimens

Nov., 2010	Columbia University Statistics Department	Inference for Dynamic Treatment Regimens
Oct., 2010	Colorado State University Statistics Department	Inference for Dynamic Treatment Regimens
Oct., 2010	Michigan State University Mathematics Department	Inference for Dynamic Treatment Regimens
April, 2010	Texas Tech University Center for Clinical Trials Network NIDA	Practical Application of Adaptive Treatment Strategies in Trial Design and Analysis
April, 2010	Statistics Department Purdue University	K. C. S. Pillai Memorial Lecture
Jan., 2010	Center for Advancing Longitudinal Drug Abuse Research, UCLA	Developing Evidence-Based Adaptive Treatment Strategies
Sept., 2009	Johns Hopkins Biostatistics	Revisiting an Old Topic: Probability of Replication
Sept., 2009	Behavioral Pharmacology Research Unit at Johns Hopkins University	Exploratory Analyses Aimed at Generating Proposals for Individualizing and Adapting Treatment
March, 2009	Rutgers University, Statistics	A Prediction Interval for the Misclassification Rate
March, 2009	Rutgers University, Statistics	A Prediction Interval for the Misclassification Rate
Feb., 2009	Univ. of Columbia, Biostatistics	A Prediction Interval for the Misclassification Rate
Feb., 2009	NY State Psychiatric Institute	Adaptive Treatment Strategies: Challenges in Data Analysis
Nov., 2008	Georgia ASA Fall Meeting	Variable Selection for Tailoring Treatment
Nov., 2008	Emory, Biostatistics Dept.	A Prediction Interval for the Misclassification Rate
Oct., 2008	NCState, Statistics Dept.	A Prediction Interval for the Misclassification Rate
Dec., 2007	NIAID BRB	Experiments & Dynamic Treatment Regimes
Nov., 2007	Univ. of Alberta, CS Dept.	Possible Roles for Reinforcement Learning in Clinical Research
Feb., 2007	NIDA DESPR	SMART Experimental Designs for Developing Adaptive Treatment Strategies
Dec., 2006	MD Anderson Cancer Center	SMART Designs for Developing Dynamic Treatment Regimes
April, 2006	National Development and Research Institutes, NY, NY	SMART Designs for Developing Adaptive Treatment Strategies
April, 2006	Dept. of Statistics Harvard University	Experiments and Dynamic Treatment Regimes

Feb., 2006	Mathematics Dept. Oberlin College	Tamura/Lilly Lecture
Dec., 2005	Southwestern Medical Center University of Texas	Developing Adaptive Treatment Strategies using MOST Experimental Designs
Nov., 2005	Dept. of Statistics Yale University	Experiments and Dynamic Treatment Regimes
May, 2005	Dept. of Health Studies Univ. of Chicago	Experiments and Adaptive Treatment Strategies
Feb., 2005	Center for Active Learning and Discovery, CMU	A Finite Sample Upper Bound on the Generalization Error for Q-Learning

Other Presentations and Workshops Since 2005

Nov. 2011	Workshop on Adaptive Treatment Strategies Association for Behavioral and Cognitive Therapies 2011 Annual Meeting	
June, 2011	Workshop on Getting SMART About Developing Individualized Sequences of Adaptive Health Interventions at the College on Problems in Drug Dependence Annual Meeting Organized and (partially) given by D. Almirall and S. Murphy	
June, 2011	Workshop on Developing Dynamic, Sequential Treatments that Optimize Mental Health Outcomes: Experiences with a Novel Clinical Trial Design at NCDEU Organized and (partially) given by D. Almirall and S. Murphy	
June, 2011	Workshop on Getting SMART About Developing Individualized Sequences of Adaptive Health Interventions at the University of Minnesota NIMH-Prevention Center Summer Institute Organized and given by D. Almirall and S. Murphy	
April, 2011	Society for Behavioral Medicine Workshop on Getting SMART About Developing Individualized Sequences of Health Interventions Organized and given by D. Almirall and S. Murphy	
Dec., 2010	NIPS workshop on, Learning and Planning from Batch Time Series Data Organized by D. Lizotte, M. Bowling, S. Murphy, S. Vijan and J. Pineau	
June, 2009	American Control Conference Special Session on Control Engineering and Related Systems Approaches for Improving Behavioral Health	
June, 2008	NIMH Convergence Workshop	Invited Speaker
	Workshop on Adaptive Treatment Strategies	
June, 2006	46th Annual NCDEU meeting	Invited Speaker
	Workshop on Adaptive Treatment Design	
October, 2005	Cliff Clogg Lecture on Dynamic Treatment Regimes	Three Lectures
August, 2005	RAND Two Day Workshop on Dynamic Treatment Regimes	Sole Speaker
June, 2005	College on Problems in Drug Dependence Workshop on Methodology	Invited Speaker