

BIOGRAPHICAL SKETCH

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NAME BELIN, Thomas R.	POSITION TITLE		
eRA COMMONS USER NAME BELIN2	Professor		
EDUCATION/TRAINING <i>(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)</i>			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	YEAR(s)	FIELD OF STUDY
Stanford University, Stanford, CA	B.S.	1986	Math/Comp Sciences
Harvard University, Cambridge, MA	M.A.	1987	Statistics
Harvard University, Cambridge, MA	Ph.D.	1991	Statistics

A. Personal Statement

As a biostatistician who has wide-ranging experience utilizing statistical methods in applied research, who has methodological expertise relevant to causal inference and handling incomplete data, who has contributed to the design and analysis of surveys and experiments in ways that facilitate insight and maintain scientific rigor, and who has served in a variety of professional leadership roles, including in a university setting, in editorial roles for scholarly journals, on review panels for granting agencies, on data safety monitoring boards, on other advisory panels, and as an expert witness, I regard myself as well-qualified to contribute to scientific discourse in diverse areas.

B. Positions and HonorsPositions

9/86-6/90	Research assistant, Department of Statistics, Harvard University
6/87-8/87	Mathematical Statistician, Bureau of Labor Statistics, Washington, D.C.
6/88-8/88, 6/89-8/89, 6/90-7/91	Mathematical Statistician, Bureau of the Census, Washington, D.C.
9/91-6/93	Postdoctoral Researcher, UCLA Department of Biomathematics
7/93-3/95	Assistant Professor in Residence, UCLA Department of Biostatistics
4/95-6/99	Assistant Professor in Residence, UCLA Department of Psychiatry and Biobehavioral Sciences / Department of Biostatistics
7/99-6/05	Associate Professor, UCLA Department of Biostatistics / Department of Psychiatry and Biobehavioral Sciences
7/05-present	Professor, UCLA Department of Biostatistics / Department of Psychiatry and Biobehavioral Sciences
9/11-6/12	Acting Chair, UCLA Department of Biostatistics
7/12-present	Vice Chair, UCLA Department of Biostatistics

Other Experience

1992 - 1997	Associate Editor, <i>Journal of Educational and Behavioral Statistics</i>
1994 - 1997	Associate Editor, <i>Journal of Official Statistics</i>
1998 - 2001	Biostatistical/Methodology consultant, <i>Journal of the American Academy of Child and Adolescent Psychiatry</i>
2001 - 2006	Member, American Statistical Association Census Advisory Committee
2006 - 2011	Associate Editor, <i>Journal of the American Statistical Association</i>
2014 - 2019	Member, American Statistical Association Committee on Professional Ethics

Honors

- 1998 Schlosser-Lewis Award, American Academy of Child and Adolescent Psychiatry (for best paper on ADHD in *Journal of the American Academy of Child and Adolescent Psychiatry* in 1998, with R. Bussing, et al.)
- 1999 Delta Omega (Public Health Honor Society)
- 2004 Elected Fellow, American Statistical Association
- 2005 Gertrude M. Cox Award, Washington Statistical Society (recognizing “a statistician making significant contributions to statistical practice”)
- 2007 Excellence in Mental Health Policy and Economics Research Award – 2005/2006, International Center of Mental Health Policy/Economics (with M. Edlund, L. Tang for 2005 paper in *J Mental Health Policy Econ*)
- 2009 Oral and Maxillofacial Surgery Foundation Daniel M. Laskin Award (with V. Shetty, K Atchison, E. Black, R. Leathers, and C. Zigler for best paper in *Journal of Oral and Maxillofacial Surgery* in 2008)
- 2011 Schlosser-Lewis Award, American Academy of Child and Adolescent Psychiatry (for best paper on ADHD in *Journal of the American Academy of Child and Adolescent Psychiatry* in 2010, with B. Zima, et al.)
- 2014 Team Science Award (as part of Steering Council for Community Partners in Care study, K. Wells, L. Jones PI’s), Association for Clinical and Translational Science/American Federation for Medical Research
- 2015 Annual Award (as part of Steering Council for Community Partners in Care study, K. Wells, L. Jones PI’s), Community-Campus Partnerships for Health
- 2015 “Outstanding Advising and Mentorship for PhD and DrPH Students” Award, UCLA Public Health Student Association
- 2015 UCLA Community Program of the Year—Landmark Award (as part of Steering Council for Community Partners in Care study, K. Wells, L. Jones PI’s)
- 2018 Lowell Reed Lecture, Applied Public Health Statistics Section, American Public Health Association (for outstanding contributions to statistics and public health and excellence in research, teaching, and service)

C. Contribution to Science

- Causal inference

Relevant contributions to the scientific literature:

- Zigler CM, Belin TR. The potential for bias in principal causal effect estimation when treatment received depends on a key covariate. *Annals of Applied Statistics*, 2011; 5: 1876-1892.
- Zigler CM, Belin TR. A Bayesian approach to improved estimation of causal effect predictiveness for a principal surrogate endpoint. *Biometrics*, 2012; 68(3): 922-932. PMID: 22348277; PMCID: PMC3860118.
- Shetty V, Atchison K, Leathers R, Black E, Zigler C, Belin TR. Do the benefits of rigid internal fixation of mandible fractures justify the added costs? Results from a randomized controlled trial. *Journal of Oral and Maxillofacial Surgery*, 2008; 66: 2203-2212. PMID: 18940481; PMCID: PMC2716721.
- Harrell L, Belin TR, Shetty V. Developing a propensity score protocol for evaluating the oral health consequences of methamphetamine use. *Communications in Statistics: Case Studies, Data Analysis and Applications*, 2015; 1(3): 125-135.

Scientific research frequently aims to quantify the effect of an intervention under an investigator’s control on a measurable outcome, which requires ruling out alternative explanations (including chance variation) for observed patterns in available data. Causal effects are not necessarily the same for all individuals in a population, and outcomes cannot be observed directly for treatments not assigned, inducing a need to control for possibilities such as self-selection of treatments and imbalances in the distributions of characteristics across units being compared. My work within the principal-stratification framework, which generalizes methods for analyzing experiments with non-compliance, builds on propensity-score methodology to put causal inferences on a firmer foundation, notably in the context of an oral-surgery project (which was recognized for an award) where clinicians were allowed to override a randomized treatment assignment. These ideas have also been applied to AIDS-vaccine trials where longitudinal antibody measurements help make estimates of potential vaccine effects more precise, a cancer-control project where unexpectedly favorable outcomes in the control arm could be explained by an imbalance in the study’s baseline covariate distributions, and an AIDS-prevention study of runaway youth where differences in shelter characteristics needed to be addressed to obtain plausible inferences about intervention effects.

- Methodology for handling missing or incomplete data

Relevant contributions to the scientific literature:

- Kim S, Belin TR, Sugar CA. Multiple imputation with non-additively related variables: Joint-modeling and approximations. *Statistical Methods in Medical Research*, 2016. PMID: 27647811.
- Kim S, Sugar CA, Belin TR. Evaluating model-based imputation methods for missing covariates in regression models with interactions. *Statistics in Medicine*, 2015; 34(11): 1876-1888. PMID: 25630757.
- Zhang X, Boscardin WJ, Belin TR, Wan X, He Y, Zhang K. A Bayesian method for analyzing combinations of continuous, ordinal, and nominal categorical data with missing values. *Journal of Multivariate Analysis*, 2015; 135: 43-58.
- He R, Belin TR. Multiple imputation for high-dimensional mixed incomplete continuous and binary data. *Statistics in Medicine*, 2014; 33: 2251-2262. PMID: 24918245.

Measurements in designed research projects can be missing or incomplete for many reasons, including nonresponse to questionnaires, errors in recording information, or intentional decisions by investigators to limit measurement queries to contain costs or reduce response burden for study participants. Building on insights on the use of multiple imputation to represent identifiable associations among variables in a data set while accurately representing uncertainty about the fact that some quantities are observed and others are missing, my research has focused on the use of multivariate statistical models, including latent-variable models, to accommodate missing or incomplete data in research. Other related strategies in my work include the use of multivariate probit and factor-analysis models with incomplete data. A related development in statistical computing growing out of this work is a flexible method for sampling correlation matrices in Markov-chain Monte Carlo algorithms.

- Evaluation of methods for handling missing or incomplete data

Relevant contributions to the scientific literature:

- Belin TR. Missing data: What a little can do, and what researchers can do in response. *American Journal of Ophthalmology*, 2009; 148: 820-822. PMID: 19932803; PMCID: PMC2900197.
- Bernaards CA, Belin TR, Schafer JL. Robustness of a multivariate normal approximation for imputation of incomplete binary data. *Statistics in Medicine*, 2007; 26:1368-1382. PMID: 16810713.
- Tang L, Song J, Belin TR, Unützer J. A comparison of imputation methods in a longitudinal randomized clinical trial. *Statistics in Medicine*, 2005; 24:2111-2128. PMID: 15889392.
- Song J, Belin TR, Lee MB, Gao X, Rotheram-Borus MJ. Handling baseline differences and missing items in a longitudinal study of HIV risk among runaway youths. *Health Services and Outcomes Research Methodology*, 2001; 2:317-329. (no PMID)

Methods for addressing missing or incomplete data routinely rely on modeling assumptions, whether explicit or implicit. The fact that commonly-invoked assumptions can be violated in practice underscores the imperative of evaluating the corresponding statistical methods, notably for bias and coverage of interval estimates. My work has included a number of evaluations of statistical methods for handling missing data, some making use of Markov-chain Monte Carlo techniques for drawing missing values from joint models, some based on hot-deck imputation methods, and some that invoke approximations such as using models for continuous data adapted to the problem of drawing values when a binary variable is incomplete.

- Design and analysis of research in cognitive science settings

Relevant contributions to the scientific literature:

- Shetty V, Harrell L, Murphy DA, Vitero S, Gutierrez A, Belin TR, Dye BA, Spolsky VW. Dental disease patterns in methamphetamine users: Findings in a large urban sample. *Journal of the American Dental Association*, 2015; 146(12): 875-885. PMID: 26610832.

- Ganz PA, Kwan L, Castellon SA, Oppenheim A, Bower JE, Silverman DHS, Cole SW, Irwin MR, Ancoli-Israel S, Belin, TR. Cognitive complaints after breast cancer treatments: examining the relationship with neuropsychological test performance. *Journal of the National Cancer Institute*, 2013; 105:791-801. PMID: 23606729; PMCID: PMC3672076.
- Ganz PA, Kwan L, Stanton AL, Bower JE, Belin TR. Physical and psychosocial recovery in the year after primary treatment of breast cancer. *Journal of Clinical Oncology*, 2011; 29:1101-1109. PMID: 21300931; PMIDCID: PMC3083865.
- Shetty V, Atchison K, Leathers R, Black E, Zigler C, Belin TR. Do the benefits of rigid internal fixation of mandible fractures justify the added costs? Results from a randomized controlled trial. *Journal of Oral and Maxillofacial Surgery*, 2008; 66(11): 2203-2212. PMID: 18940481; PMCID: PMC2716721.

Statistical methods have become central to interpreting research results in the health sciences. My applied statistical work has included a range of contributions from the design and conception to the analysis and interpretation of research across a number of branches in the health sciences, with public-health relevant oral-health research and quality-of-life for cancer survivors having been areas of focus for many years. The scope of this research has required attention to compliance with treatment protocols and collateral patient behavior as well as attention to differences in case mix across diverse patient populations, calling for the use of advanced statistical methods (one reflection of which, the 2008 *JOMS* paper cited above, received an award in the oral-health literature).

- Design and analysis of mental-health services research in naturalistic settings

- Belin TR, Jones A, Tang L, Chung B, Stockdale SE, Jones F, Lucas Wright A, Sherbourne CD, Perlman J, Pulido E, Ong MK, Gilmore J, Miranda J, Dixon E, Jones L, Wells KB. Maintaining internal validity in community partnered participatory research: Experience from the Community Partners in Care study. *Ethnicity and Disease*, 2018; 28 (Suppl 2): 357-364.
- Chung B, Ong M, Ettner SL, Jones F, Gilmore J, McCreary M, Sherbourne C, Ngo V, Koegel, P, Tang L, Dixon E, Miranda J, Belin TR, Wells KB. 12-Month outcomes of community engagement versus technical assistance to implement depression collaborative care. *Annals of Internal Medicine*, 2014; 161:10(S): S23-S34. PMID: 25402400; PMCID: PMC4235578.
- Pynoos RS, Steinberg AM, Layne CM, Liang LJ, Vivrette RL, Briggs EC, Kisiel C, Habib M, Belin TR, Fairbank JA. Modeling constellations of trauma exposure in the National Child Traumatic Stress Network Core Data Set. *Psychological Trauma: Theory, Research, Practice, and Policy*, 2014; 6(S1): S9–S17. (no PMID).
- Wells KB, Jones L, Chung B, Dixon EL, Tang L, Gilmore J, Sherbourne C, Ngo VK, Ong MK, Stockdale S, Ramos E, Belin TR, Miranda J. Community-partnered cluster-randomized comparative effectiveness trial of community engagement and planning or resources for services to address depression disparities. *Journal of General Internal Medicine*, 2013; 28: 1268-1278. PMID: 23702830; PMCID: PMC3797354.

An area of special focus has been mental-health services research, particularly using community-based collaborative-care strategies in disadvantaged communities (in the Community Partners in Care study, where I have served as chair of the Design and Analysis Committee of a study that has been recognized with multiple awards) and treatment of psychological trauma in children through the National Child Traumatic Stress Network, which has collected data on thousands of children treated for a range of traumatic experiences.

D. Research Support

Ongoing Research Support

National Institute of Justice (Brymer)

1/1/16 – 12/31/19

Examination of the Short- and Long-term Impact of School Shootings

The major goals of this mixed-methods research project are to examining the impact of school shooter events on community recovery, with specific attention to news media depictions.

Role: Co-investigator

W81XWH-BAA-13-1 (Leuchter) 8/22/14 - 8/21/19
U.S. DOD/National Security Agency
Neuromodulation as a New Treatment for PTSD in Veterans: Evaluating the Effectiveness of TNS
The major goal of this project is to conduct a randomized controlled trial of neuromodulation as a treatment for post-traumatic stress disorder.
Role: Co-investigator

5 P30 MH58017 06 (Shoptaw) 3/1/17 – 1/31/22
NIMH
Center for HIV Identification, Prevention, and Treatment Services (CHIPTS)
The major goals of this project are to provide broad-based statistical consulting support and statistical computing expertise for behavioral research projects focused on HIV-infected individuals.
Role: Co-investigator

1 R01 DE025244-01 (Shetty) 8/1/15 – 5/31/20
NIDCR
ROBAS: A Multimodal Sensor System for Remote Assessment of Oral Health Behaviors
The major goals of this project are to develop and pilot-test a system for measuring oral-hygiene behaviors and related outcomes using a sensor-enabled toothbrush, wrist actigraph, and cell-phone-based patient surveys.
Role: Co-investigator

PPRND-1507-32173 (Chung) 8/1/16-7/31/19
PCORI
Resiliency Education to Reduce Depression Disparities
The major goals of this study are to carry out a community-partnered study of alternative depression treatment strategies tailored to minority populations among clients of agencies that serve a predominately gay and lesbian clientele.
Role: Co-investigator

Movember Foundation 20172657 (Litwin) 2/1/17 – 12/31/19
Movember Foundation
Prostate Cancer Outcomes Global Initiative to Compare and Reduce Variation in Localised Prostate Cancer
The goals of this project are to measure clinical and patient-reported outcomes for prostate-cancer patients and to identify key factors influencing outcomes with the goal of improving patient care for prostate cancer.
Role: Co-investigator

UL1 RR033176-01 (Dubinett) 7/1/16 – 6/30/20
NIH/NCRR
UCLA Clinical and Translational Science Institute
The major goals of this academic-clinical-community partnership are to accelerate scientific discoveries to improve health and to bring innovations and resources to bear on the greatest health needs of Los Angeles.
Role: Co-Director of Biostatistics Core

Completed Research Support

P50 HL105188-01 (Ortega) 4/1/10-12/31/15
NHLBI
Family and Neighborhood Interventions to Reduce Heart Disease Risk in East L.A.
The major goals of this project are to evaluate household and neighborhood grocery-store interventions aimed at improving nutrition, along with investigation of links between biomarkers and acculturation.
Role: Director of Research Methods Core