

Updated March 2022

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## EDUCATION

Ph.D. Biostatistics, University of California, Berkeley, 2013  
M.S. Statistics, Universidad Nacional de Colombia, 2009  
B.S. Statistics, Universidad Nacional de Colombia, 2007

## ACADEMIC APPOINTMENTS

2016– Weill Cornell Medicine  
Assistant Professor, Division of Biostatistics, Department of Population Health Sciences  
2013–15 Johns Hopkins University  
Postdoctoral Fellow, Department of Biostatistics, Johns Hopkins Bloomberg School of Public Health

## RESEARCH AREAS

Statistics: non-parametric statistical methods for causal inference from observational and randomized studies with complex datasets, using machine learning. This includes but is not limited to mediation analysis, methods for continuous exposures, longitudinal data including survival analysis, and efficiency guarantees with covariate adjustment in randomized trials.

Clinical research: neurology, opioid use disorder, pulmonary and critical care, precision medicine for cancer, and more recently COVID-19 vaccine studies.

## PUBLICATIONS

(Note: \* indicates statistical methods article where first author was advisee at the time of writing, † indicates senior author in clinical paper)

### Preprints and Articles Under Review

1. [Iván Díaz](#), Hoffman, K. L. & Hejazi, N. S. Causal survival analysis under competing risks using longitudinal modified treatment policies. *arXiv preprint arXiv:2202.03513* (2022).
2. Benkeser, D., [Díaz, Iván](#) & Ran, J. Inference for natural mediation effects under case-cohort sampling with applications in identifying COVID-19 vaccine correlates of protection. *arXiv preprint arXiv:2103.02643* (2021).

3. Ogburn, E. L., Sofrygin, O., Díaz, Iván & van der Laan, M. J. Causal inference for social network data. *arXiv preprint arXiv:1705.08527* (2021).
4. Rudolph, K. E. & Díaz, Iván. When the ends don't justify the means: Learning a treatment strategy to prevent harmful indirect effects. *arXiv preprint arXiv:2101.08590* (2021).
5. Rudolph, K. E., Gimbrone, C., Matthay, E. C., Díaz, Iván, Davis, C. S., Pamplin II, J. R., Keyes, K. & Cerda, M. When effects cannot be estimated: redefining estimands to understand the effects of naloxone access laws. *arXiv preprint arXiv:2105.02757* (2021).
6. Rudolph, K. E., Williams, N. & Iván Díaz. Causal mediation with instrumental variables. *arXiv preprint arXiv:2112.13898* (2021).
7. Williams\*, N., Rosenblum, M. & Iván Díaz. Optimizing Precision and Power by Machine Learning in Randomized Trials, with an Application to COVID-19. *arXiv preprint arXiv:2109.04294* (2021).

### Statistics and Methodology Articles

8. Hejazi\*, N. S., Rudolph, K. E., van der Laan, M. J. & Díaz, Iván. Nonparametric causal mediation analysis for stochastic interventional (in)direct effects. *Biostatistics*. kxac002. ISSN: 1465-4644 (Feb. 2022).
9. Díaz, Iván, Williams, N., Hoffman, K. L. & Schenck, E. J. Nonparametric causal effects based on longitudinal modified treatment policies. *Journal of the American Statistical Association*, 1–16 (2021).
10. Rudolph, K. E. & Díaz, Iván. Efficiently transporting causal direct and indirect effects to new populations under intermediate confounding and with multiple mediators. *Biostatistics* (2021).
11. Benkeser, D., Díaz, Iván, Luedtke, A., Segal, J., Scharfstein, D. & Rosenblum, M. Improving Precision and Power in Randomized Trials for COVID-19 Treatments Using Covariate Adjustment, for Ordinal or Time to Event Outcomes. *Biometrics* (2020).
  - *With discussion.*
12. Díaz, Iván. Machine learning in the estimation of causal effects: targeted minimum loss-based estimation and double/debiased machine learning. *Biostatistics* **21**, 353–358 (2020).
13. Díaz, Iván & Hejazi, N. S. Causal mediation analysis for stochastic interventions. *Journal of the Royal Statistical Society Series B* **82**, 661–683 (2020).
14. Díaz, Iván, Savenkov, O. & Kamel, H. Non-parametric targeted Bayesian estimation of class proportions in unlabeled data. *Biostatistics*. ISSN: 1465-4644 (June 2020).
15. Díaz, Iván. Statistical inference for data-adaptive doubly robust estimators with survival outcomes. *Statistics in Medicine* **38**, 2735–2748 (2019).
16. Díaz, Iván, Colantuoni, E., Hanley, D. F. & Rosenblum, M. Improved precision in the analysis of randomized trials with survival outcomes, without assuming proportional hazards. *Lifetime Data Analysis*. ISSN: 1572-9249 (Feb. 2018).
17. Díaz, Iván, Savenkov, O. & Ballman, K. Targeted learning ensembles for optimal individualized treatment rules with time-to-event outcomes. *Biometrika* **105**, 723–738 (2018).
18. Díaz, Iván & van der Laan, M. J. Doubly robust inference for targeted minimum loss-based estimation in randomized trials with missing outcome data. *Statistics in Medicine*. ISSN: 1097-0258 (2018).
19. Scharfstein, D., McDermott, A., Díaz, Iván, Carone, M., Lunardon, N. & Turkoz, I. Global sensitivity analysis for repeated measures studies with informative drop-out: A semi-parametric approach. *Biometrics* **74**, 207–219 (2018).

20. Díaz, Iván. Efficient Estimation of Quantiles for Causal Inference and Missing Data. *Journal of Statistical Planning and Inference* (2017).
21. Díaz, Iván, Carone, M. & van der Laan, M. J. Second-Order Inference for the Mean of a Variable Missing at Random. *The International Journal of biostatistics* **12**, 333–349 (2016).
22. Díaz, Iván, Colantuoni, E. & Rosenblum, M. Enhanced precision in the analysis of randomized trials with ordinal outcomes. *Biometrics* **72**, 422 (2016).
  - *The methods proposed in this paper are recommended by the US Food & Drug Administration Draft Guidance for Industry document on “Adjusting for Covariates in Randomized Clinical Trials for Drugs and Biological Products”.*
23. Díaz, Iván, Hubbard, A., Decker, A. & Cohen, M. Variable Importance and Prediction Methods for Longitudinal Problems with Missing Variables. *PloS ONE* **10** (2015).
24. Díaz, Iván & Rosenblum, M. Targeted Maximum Likelihood Estimation using Exponential Families. *International Journal of Biostatistics* **11**, 233–251 (2015).
25. Frangakis, C. E., Qian, T., Wu, Z. & Díaz, Iván. Deductive derivation and turing-computerization of semiparametric efficient estimation. *Biometrics* **71**, 867–874 (2015).
26. Rudolph, K. E., Díaz, Iván, Rosenblum, M. & Stuart, E. A. Estimating Population Treatment Effects From a Survey Subsample. *American Journal of Epidemiology* **180**, 737–748 (2014).
27. Díaz, Iván & van der Laan, M. J. Assessing the Causal Effect of Policies: An Example Using Stochastic Interventions. *The international journal of biostatistics* **9**, 161–174 (2013).
28. Díaz, Iván & van der Laan, M. J. Sensitivity analysis for causal inference under unmeasured confounding and measurement error problems. *The international journal of biostatistics* **9**, 149–160 (2013).
29. Díaz, Iván & van der Laan, M. J. Targeted Data Adaptive Estimation of the Causal Dose–Response Curve. *Journal of Causal Inference* **1**, 171–192 (2013).
30. Hubbard, A., Díaz, Iván, Decker, A., Holcomb, J. B., Schreiber, M. A., Bulger, E. M., Brasel, K. J., Fox, E. E., del Junco, D. J., Wade, C. E., *et al.* Time-dependent Prediction and Evaluation of Variable Importance Using Super-Learning in High-Dimensional Clinical Data. *Journal of Trauma-Injury, Infection, and Critical Care* **75**, S53–S60 (2013).
31. Díaz, Iván & van der Laan, M. Population Intervention Causal Effects Based on Stochastic Interventions. *Biometrics* **68**. <http://goo.gl/GK112Z>, 541–549 (2012).
32. Díaz, Iván & van der Laan, M. J. Super Learner Based Conditional Density Estimation With Application to Marginal Structural Models. *The International Journal of Biostatistics* **7**, 1–20 (2011).
33. Cepeda-Cuervo, E., Aguilar, W., Cervantes, V., Corrales, M., Díaz, Iván & Rodríguez, D. Intervalos de confianza e intervalos de credibilidad para una proporción. *Revista Colombiana de Estadística* **31**, 211–228 (2008).

### Book Chapters

34. Carone, M., Díaz, Iván & van der Laan, M. J. in *Targeted Learning in Data Science* 483–510 (Springer, 2018).
35. Díaz, Iván, Luedtke, A. R. & van der Laan, M. J. in *Targeted Learning in Data Science* 511–522 (Springer, 2018).
36. Díaz, Iván & van der Laan, M. J. in *Targeted Learning in Data Science* 219–232 (Springer, 2018).
37. Díaz, Iván. in *Handbook on Big Data* (eds van der Laan, M. J., Buhlman, P., Kane, M. & Drineas, P.) (Chapman and Hall, 2016).

38. Díaz, Iván, Hubbard, A. & van der Laan, M. in *Targeted Learning* (eds van der Laan, M. J. & Rose, S.) (Springer, 2011).

### Discussion Articles and Commentaries

39. Van der Laan, M. J., Luedtke, A. R. & Díaz, Iván. Discussion of Identification, Estimation and Approximation of Risk under Interventions that Depend on the Natural Value of Treatment Using Observational Data, by Jessica Young, Miguel Hernán, and James Robins. *Epidemiologic Methods* **3**, 21–31 (2014).

### Clinical, Epidemiology, and Health Services Research

40. Bruce, S. S., Navi, B. B., Zhang, C., Kim, J., Devereux, R. B., Schenck, E. J., Sedrakyan, A., Iván Díaz & Kamel, H. Transesophageal echocardiography and risk of respiratory failure in patients who had ischemic stroke or transient ischemic attack: an IDEAL phase 4 study. *BMJ Surgery, Interventions, & Health Technologies* **4** (2022).
41. Creber, R. M. M., Daniels, B., Munjal, K., Turchioe, M. R., Topaz, L. S., Goytia, C., Díaz, Iván, Goyal, P., Weiner, M., Yu, J., *et al.* Using Mobile Integrated Health and telehealth to support transitions of care among patients with heart failure (MIGHTy-Heart): protocol for a pragmatic randomised controlled trial. *BMJ open* **12**, e054956 (2022).
42. Gilbert, P. B., Montefiori, D. C., McDermott, A. B., Fong, Y., Benkeser, D., Deng, W., Zhou, H., Houchens, C. R., Martins, K., Jayashankar, L., *et al.* Immune correlates analysis of the mRNA-1273 COVID-19 vaccine efficacy clinical trial. *Science* **375**, 43–50 (2022).
43. Rudolph, K. E., Shulman, M., Fishman, M., Díaz, Iván, Rotrosen, J. & Nunes, E. V. Association between dynamic dose increases of buprenorphine for treatment of opioid use disorder and risk of relapse. *Addiction* **117**, 637–645 (2022).
44. Zinger, N., Ponath, G., Sweeney, E., Nguyen, T. D., Lo, C. H., Díaz, Iván, Dimov, A., Teng, L., Zexter, L., Comunale, J., *et al.* Dimethyl Fumarate Reduces Inflammation in Chronic Active Multiple Sclerosis Lesions. *Neurology-Neuroimmunology Neuroinflammation* **9** (2022).
45. Bernstein, R. A., Kamel, H., Granger, C. B., Piccini, J. P., Sethi, P. P., Katz, J. M., Vives, C. A., Ziegler, P. D., Franco, N. C., Schwamm, L. H., *et al.* Effect of Long-term Continuous Cardiac Monitoring vs Usual Care on Detection of Atrial Fibrillation in Patients With Stroke Attributed to Large-or Small-Vessel Disease: The STROKE-AF Randomized Clinical Trial. *JAMA* **325**, 2169–2177 (2021).
46. Kamel, H., Parikh, N. S., Chatterjee, A., Kim, L. K., Saver, J. L., Schwamm, L. H., Zachrison, K. S., Nogueira, R. G., Adeoye, O., Díaz, I., *et al.* Access to Mechanical Thrombectomy for Ischemic Stroke in the United States. *Stroke*, STROKEAHA–120 (2021).
47. Murthy, S. B., Zhang, C., Díaz, Iván, Levitan, E. B., Koton, S., Bartz, T. M., DeRosa, J. T., Strobino, K., Colantonio, L. D., Iadecola, C., *et al.* Association Between Intracerebral Hemorrhage and Subsequent Arterial Ischemic Events in Participants From 4 Population-Based Cohort Studies. *JAMA neurology* (2021).
48. Rudolph, K. E., Díaz, Iván, Hejazi, N. S., van der Laan, M. J., Luo, S. X., Shulman, M., Campbell, A., Rotrosen, J. & Nunes, E. V. Explaining differential effects of medication for opioid use disorder using a novel approach incorporating mediating variables. *Addiction* **116**, 2094–2103 (2021).
49. Torres, L. K., Hoffman, K. L., Oromendia, C., Díaz, Iván, Harrington, J. S., Schenck, E. J., Price, D. R., Gomez-Escobar, L., Higuera, A., Vera, M. P., *et al.* Attributable mortality of acute respiratory distress syndrome: a systematic review, meta-analysis and survival analysis using targeted minimum loss-based estimation. *Thorax* (2021).

50. Zhang, W. Z., Hoffman, K. L., Schiffer, K. T., Oromendia, C., Rice, M. C., Barjaktarevic, I., Peters, S. P., Putcha, N., Bowler, R. P., Wells, J. M., Couper, D. J., Labaki, W. W., Curtis, J. L., Han, M. K., III, R. P., Woodruff, P. G., Criner, G. J., Hansel, N. N., Iván Díaz, Ballman, K. V., Nakahira, K., Choi, M. E., Martinez, F. J., Choi, A. M. K. & Cloonan, S. M. Association of plasma mitochondrial DNA with COPD severity and progression in the SPIROMICS cohort. *Respiratory research* **22**, 1–11 (2021).
51. Goyal, P., Unlu, O., Kneifati-Hayek, J., Levitan, E., Chen, L., Díaz, Iván, Hanlon, J., Lachs, M., Maurer, M. & Safford, M. *Polypharmacy in Older Adults Hospitalized for Heart Failure* in *Journal of the American Geriatrics Society* **68** (2020), S171–S171.
52. Goyal, P., Kneifati-Hayek, J., Archambault, A., Mehta, K., Levitan, E. B., Chen, L., Díaz, Iván, Hollenberg, J., Hanlon, J. T., Lachs, M. S., *et al.* Prescribing patterns of heart failure-exacerbating medications following a heart failure hospitalization. *JACC: Heart Failure* **8**, 25–34 (2020).
53. Kamel, H., Navi, B. B., Merkler, A. E., Baradaran, H., Díaz, Iván, Parikh, N. S., Kasner, S. E., Gladstone, D. J., Iadecola, C. & Gupta, A. Reclassification of Ischemic Stroke Etiological Subtypes on the Basis of High-Risk Nonstenosing Carotid Plaque. *Stroke*, STROKEAHA–119 (2020).
54. Kamel<sup>†</sup>, H., Navi, B. B., Parikh, N. S., Merkler, A. E., Okin, P. M., Devereux, R. B., Weinsaft, J. W., Kim, J., Cheung, J. W., Kim, L. K., Casadei, B., Iadecola, C., Sabuncu, M. R., Gupta, A. & Díaz, Iván. Machine Learning Prediction of Stroke Mechanism in Embolic Strokes of Undetermined Source. *Stroke* **51**, e203–e210 (2020).
55. Lin, J., Piran, P., Lerario, M. P., Ong, H., Gupta, A., Murthy, S. B., Díaz, Iván, Stieg, P. E., Knopman, J., Falcone, G. J., *et al.* Differences in Admission Blood Pressure Among Causes of Intracerebral Hemorrhage. *Stroke* **51**, 644–647 (2020).
56. Merkler, A. E., Parikh, N. S., Mir, S., Gupta, A., Kamel, H., Lin, E., Lantos, J., Schenck, E. J., Goyal, P., Bruce, S. S., Kahan, J., Lansdale, K. N., LeMoss, N. M., Murthy, S. B., Stieg, P. E., Fink, M. E., Iadecola, C., Segal, A. Z., Jr, T. R. C., Díaz, Iván, Zhang, C. & Navi, B. B. Risk of ischemic stroke in patients with coronavirus disease 2019 (COVID-19) vs patients with influenza. *JAMA neurology* **77**, 1366–1372 (2020).
57. Murthy, S. B., Díaz, Iván, Wu, X., Merkler, A. E., Iadecola, C., Safford, M. M., Sheth, K. N., Navi, B. B. & Kamel, H. Risk of Arterial Ischemic Events After Intracerebral Hemorrhage. *Stroke* **51**, 137–142 (2020).
58. Murthy, S. B., Wu, X., Díaz, Iván, Parasram, M., Parikh, N. S., Iadecola, C., Merkler, A. E., Falcone, G. J., Brown, S., Biffi, A., *et al.* Non-Traumatic Subdural Hemorrhage and Risk of Arterial Ischemic Events. *Stroke* **51**, 1464–1469 (2020).
59. Parikh, N. S., Chatterjee, A., Díaz, Iván, Merkler, A. E., Murthy, S. B., Iadecola, C., Navi, B. B. & Kamel, H. Trends in Active Cigarette Smoking Among Stroke Survivors in the United States, 1999 to 2018. *Stroke*, STROKEAHA–120 (2020).
60. Rahman, A., Schelbaum, E., Hoffman, K., Díaz, Iván, Hristov, H., Andrews, R., Jett, S., Jackson, H., Lee, A., Sarva, H., *et al.* Sex-driven modifiers of Alzheimer risk: A multimodality brain imaging study. *Neurology* **95**, e166–e178 (2020).
61. Telesford, K. M., Kaunzner, U. W., Perumal, J., Gauthier, S. A., Wu, X., Díaz, Iván, Kruse-Hoyer, M., Engel, C., Marcille, M. & Vartanian, T. Black African and Latino/a identity correlates with increased plasmablasts in MS. *Neurology-Neuroimmunology Neuroinflammation* **7** (2020).
62. Hung, P., Finn, C., Chen, M., Knight-Greenfield, A., Baradaran, H., Patel, P., Díaz, Iván, Kamel, H. & Gupta, A. Effect of Clinical History on Interpretation of Computed Tomography for Acute Stroke. *The Neurohospitalist* **9**, 140–143 (2019).

63. Kamel, H., Okin, P. M., Merkler, A. E., Navi, B. B., Champion, T. R., Devereux, R. B., Díaz, Iván, Weinsaft, J. W. & Kim, J. Relationship between left atrial volume and ischemic stroke subtype. *Annals of clinical and translational neurology* **6**, 1480–1486 (2019).
64. Kummer, B. R., Lerario, M. P., Hunter, M. D., Wu, X., Efraim, E. S., Omran, S. S., Chen, M. L., Díaz, Iván, Sacchetti, D., Lekic, T., Kulick, E. R., Pishanidar, S., Mir, S. A., Zhang, Y., Glenn Asaeda, B. B. N., Marshall, R. S. & Fink, M. E. Geographic Analysis of Mobile Stroke Unit Treatment in a Dense Urban Area: The New York City METRONOME Registry. *Journal of the American Heart Association* **8**, e013529 (2019).
65. Kummer, R. B., Díaz and Iván, Wu, Xian, Aaroe, E. A., Chen, L. M., Iadecola, Costantino, Kamel, Hooman, Navi & B. B. Associations between cerebrovascular risk factors and parkinson disease. *Annals of neurology* **86**, 572–581 (2019).
66. Murthy, S., Díaz, Iván, Wu, X., Merkler, A., Iadecola, C., Navi, B. B. & Kamel, H. *Intracerebral Hemorrhage and Increased Risk of Arterial Ischemic Events* in *Annals of Neurology* **86** (2019), S259–S260.
67. Reynolds, A. S., Chen, M. L., Merkler, A. E., Chatterjee, A., Díaz, Iván, Navi, B. B. & Kamel, H. Effect of a randomized trial of unruptured brain arteriovenous malformation on interventional treatment rates for unruptured arteriovenous malformations. *Cerebrovascular Diseases* **47**, 299–302 (2019).
68. Yum, B., Archambault, A., Levitan, E. B., Dharamdasani, T., Kneifati-Hayek, J., Hanlon, J. T., Díaz, Iván, Maurer, M. S., Lachs, M. S., Safford, M. M., *et al.* Indications for  $\beta$ -Blocker Prescriptions in Heart Failure with Preserved Ejection Fraction. *Journal of the American Geriatrics Society* **67**, 1461–1466 (2019).
69. Merkler, A. E., Díaz, Iván, Wu, X., Murthy, S. B., Gialdini, G., Navi, B. B., Yaghi, S., Weinsaft, J. W., Okin, P. M., Safford, M. M., *et al.* Duration of heightened ischemic stroke risk after acute myocardial infarction. *Journal of the American Heart Association* **7**, e010782 (2018).
70. Mosconi, L., Rahman, A., Díaz, Iván, Wu, X., Scheyer, O., Hristov, H. W., Vallabhajosula, S., Isaacson, R. S., de Leon, M. J. & Brinton, R. D. Increased Alzheimer's risk during the menopause transition: A 3-year longitudinal brain imaging study. *PloS one* **13** (2018).
71. Omran, S. S., Boddu, S. R., Gusdon, A. M., Kummer, B., Baradaran, H., Patel, P., Díaz, Iván, Navi, B. B., Gupta, A., Kamel, H., *et al.* Angiographic blush after mechanical thrombectomy is associated with hemorrhagic transformation of ischemic stroke. *Journal of Stroke and Cerebrovascular Diseases* **27**, 3124–3130 (2018).
72. Parikh, N. S., Chatterjee, A., Díaz, Iván, Pandya, A., Merkler, A. E., Gialdini, G., Kummer, B. R., Mir, S. A., Lerario, M. P., Fink, M. E., *et al.* Modeling the Impact of Interhospital Transfer Network Design on Stroke Outcomes in a Large City. *Stroke* **49**, 370–376 (2018).
73. Groh, M. A., Díaz, Iván, Johnson, A. M., Ely, S. W., Binns, O. A. & Champsaur, G. L. Is Surgical Intervention the Optimal Therapy for the Treatment of Aortic Valve Stenosis for Patients With Intermediate Society of Thoracic Surgeons Risk Score? *The Annals of thoracic surgery* **103**, 1193–1198 (2017).
74. Kreif, N., Grieve, R., Díaz, Iván & Harrison, D. Evaluation of the Effect of a Continuous Treatment: A Machine Learning Approach with an Application to Treatment for Traumatic Brain Injury. *Health economics* **24**, 1213–1228 (2015).
75. Kutcher, M., Díaz, Iván, Redick, B., Vilardi, R., Nelson, M., Hubbard, A. & Cohen, M. *Critical Mediators of Coagulopathy After Trauma* in *Transfusion* **52** (2012), 33A–33A.

## INVITED TALKS

“Machine learning for observational research in stroke.”

2022 StrokeNet training core

“Inference for natural mediation effects under case-cohort sampling: identifying COVID-19 vaccine correlates of protection.”

2021 Joint Statistical Meetings (online)

“Flexible methods for mediation analysis with discrete and continuous exposures.”

2021 Columbia Biostatistics Department Seminar Series

2021 Columbia Statistics Department Seminar Series

“Covariate adjustment in randomized studies with ordinal and time-to-event endpoints”

2021 The International Chinese Statistical Association Symposium (online)

2021 FDA biostatistics working group

2020 NIH/NHLBI Office of Biostatistics Research Seminar Series

2020 FDA workshop on targeted learning

“Modern methods for causal inference from observational and randomized studies”

2020 Pediatric Epilepsy Learning Healthcare Systems Conference

“Causal effects based on longitudinal modified treatment policies”

2021 Statistical Society of Canada Annual Meeting (online)

2021 ENAR IMS Annual Meeting (online)

2020 13th International Conference of the ERCIM WG on Computational and Methodological Statistics

2020 University of Massachusetts Amherst Biostatistics Department Seminar

2020 Penn Center for Causal Inference

2020 Joint Statistical Meetings

“Causal mediation analysis for stochastic interventions”

2019 Atlantic Causal Inference Conference, Montreal, Canada

2019 Cornell Tech Causal Inference Seminar

“Targeted Learning Ensembles for Optimal Individualized Treatment Rules with Time-to-Event Outcomes”

2019 ICERM Workshop on Models and Machine Learning for Causal Inference and Decision Making in Health Research

2018 University of Washington Department of Biostatistics Seminar

2018 New York University, Population Health Sciences, Division of Biostatistics Seminar

2018 John Hopkins Bloomberg School of Public Health, Department of Biostatistics, Causal Inference Seminar

“Collaborative double robustness using the  $e$ -score”

2018 Joint Statistical Meetings, Vancouver, Canada

“Doubly robust inference for targeted minimum loss-based estimation in randomized trials with missing outcome data”

2017 Cornell Day of Statistics Cornell University

“Targeted Learning Ensembles for Optimal Individualized Treatment Rules with Time-to-Event Outcomes”

2017 Division of Biostatistics, UC Berkeley

“Improved Precision in the Analysis of Randomized Trials with Survival Outcomes, without Assuming Proportional Hazards”

- 2017 Lifetime Data Analysis Conference, LIDA University of Connecticut
- 2016 Division of Biostatistics, UC Berkeley
- 2016 Division of Biostatistics, Weill Cornell Medicine
- 2016 Department of Biostatistics and Epidemiology, Perelman School of Medicine, UPenn
- “Enhanced Precision in the Analysis of Randomized Trials with Ordinal Outcomes”
  - 2014 Food and Drug Administration, White Oak, MD, USA
  - 2014 Johns Hopkins School of Public Health Grand Rounds, Baltimore, MD, USA
- “Efficient Estimation of the Causal Effect of a Binary Treatment on an Ordinal Outcome”
  - 2014 Joint Applied Statistics Symposium of International Chinese Statistical Association & Korean International Statistical Society, Portland, OR, USA
- “Sensitivity Analysis for Causal Inference and Measurement Error”
  - 2014 ENAR IMS Annual Meeting, Baltimore, MD, USA
- “Time-varying prediction of death with associated variable importance using SuperLearning in high dimensional clinical data”
  - 2012 PROMMTT symposium, Kauai, HI, USA
- “Targeted Data Adaptive Estimation of the Causal Dose Response Curve”
  - 2012 Joint Statistical Meetings, San Diego, CA, USA

## **CONTRIBUTED TALKS**

- “Targeted Data Adaptive Estimation of the Causal Dose Response Curve.”
  - 2013 WNAR IMS Annual Meeting, Los Angeles, California.
- “Variable Importance and Prediction Methods for Longitudinal Problems with Missing Variables.”
  - 2013 Joint Statistical Meetings, Montreal, QC, Canada.
- “Causal Effects Based on Stochastic Interventions”
  - 2012 Atlantic Causal Inference Conference, Baltimore, MD, USA.
- “Population Intervention Causal Effects Based on Stochastic Interventions.”
  - 2011 Joint Statistical Meetings, Miami, FL, USA.
- “Bayesian Targeted Learning.”
  - 2010 WNAR IMS Annual Meeting, Seattle, WA, USA.

## **GRANTS AND AWARDS**

### **Awards and Honors**

- 2013 Erich L. Lehmann citation for an outstanding Ph.D. dissertation in theoretical statistics. University of California at Berkeley.
- 2013 Graduate Division Scholarship in Recognition of Scholastic Achievements. UC Berkeley.
- 2011 Graduate Division Scholarship in Recognition of Scholastic Achievements. UC Berkeley.
- 2008 Scholarship for outstanding graduate students. National University of Colombia.



## Grants and Fellowships

- 2022–25 PI. PCORI 220608-01 “Causal Mediation Analysis with Machine Learning to Understand Comparative Treatment Effects” The goal of this project is to develop a broadly general, flexible, and robust approach to estimate mediational direct and indirect effects that are appropriate for common study designs and for identifying patient heterogeneity in mediation mechanisms. We will apply the methods developed to understand differential effects in a comparative effectiveness trial for the treatment of opioid use disorder.
- 2022–27 Co-I. R01DA053243 “Role of disability and pain in opioid overdose: mechanism and risk mitigation” People with physical disabilities may be particularly vulnerable to opioid misuse and overdose, as they have a high prevalence of chronic pain due to musculoskeletal conditions and high exposure to opioid analgesics. However, disabled adults have been largely left out of research into the prevention and treatment of opioid use disorder and overdose. This project will improve understanding of the mechanisms that place low-income, disabled adults at increased risk of opioid overdose, as well as the potential for improved pain management practices, reduced exposure to risky pain practices and increased receipt of recommended treatments for substance use disorder and chronic pain to reduce overdose risk in this population.
- 2022–23 Co-I. PCORI HSD-1604-35187 “Using Mobile Integrated Health and Telehealth to Support Transitions of Care among Heart Failure Patients” Aim 1: Evaluate the effectiveness of the MIH intervention relative to the TOCC intervention on healthcare utilization. Aim 2: Evaluate the effectiveness of the MIH intervention relative to the TOCC intervention on healthcare quality. Aim 3: Evaluate the effectiveness of the MIH intervention relative to the TOCC intervention on patient reported outcomes (PROs). Aim 4: Evaluate the factors that support the adoption, implementation, and maintenance from the perspective of multiple key stakeholders.
- 2022–27 Co-I. R01 NS123576-01A1 “Quantitative susceptibility mapping for stroke risk prediction of vulnerable carotid plaques” The proposed research will develop a magnetic resonance imaging method called quantitative susceptibility mapping (QSM) for the characterization and risk evaluation of unstable carotid atherosclerotic plaque that can cause ischemic stroke. A successful outcome of this research will provide a reliable noninvasive imaging tool for stroke prevention and research on vascular diseases.
- 2020–22 Co-I. R21 NIH-NMSS “Defining ancestry associated B-cell inflammation in treatment naïve Multiple Sclerosis” Multiple sclerosis is a debilitating disease of the central nervous system (CNS) that manifests with particular severity amongst those identifying as African American and Latin American. Socioeconomic-based access to care does not appear to completely account for this clinical disparity, pointing to a biological root. MS possesses a strong B-cell-centralized immunopathogenesis, however; comparative, direct, immunologic analysis reconciling Black African ancestry and MS has not been published to the best of our knowledge. Retrospective clinical data demonstrates heightened CNS IgG class antibody levels in African Americans with MS compared to Caucasian Americans with MS. In light of these reports, as well as the direct relationship between B-cells and MS disease activity, this study aims to find out whether MS patients of African ancestry possess greater T-dependent inflammatory B cell function relative to those of Caucasian ancestry.
- 2018–21 Co-I. R01 NIH-AHRQ “Primary Care Physician-Staff Dyads (Teamlets): A Simple, Efficient Means to Improve Healthcare Quality and Decrease Cost?” The proposed research on teamlets is relevant to the AHRQ Special Emphasis Notice in 2016 which stated “revitalizing the Nation’s primary care system is critical” and requested innovative research that addresses “how different configurations of

primary care teams affect the effectiveness and efficiency of care and health outcomes” This research will provide the first large-scale evidence on whether physicians practicing in a primary care teamlet meet these goals better than physicians not practicing in a teamlet, and will identify the characteristics of high-performing teamlets.

- 2017–21 Co-I. P50 NIH-NIMH “Alacrity for late- and mid-life mood disorders.” We propose to study a novel model for developing behavioral interventions to improve the care of older and middle-aged adults with mood disorders treated in the community. Our interventions are simplified based on input by consumers and community clinicians, guided by neurobiological models, and supported by mobile technology. As a result, we expect that our novel interventions can become part of the practice of a variety of community settings and help many who are inadequately treated and suffering.
- 2018–20 Co-I. PCORI “Identifying and Predicting Patients with Preventable High Utilization: Phase II.” This project will translate the computable phenotypes into those that can be used in the real world settings, interview key stakeholders about their population health needs and priorities, adapt the phenotypes for use in learning health systems, and perform a comparative effectiveness study of the positive predictive value of phenotypes health system vs. CDRN data sources.
- 2017–19 Co-I. R03 NIH-NIA “Impact of Polypharmacy on Rehospitalization in Older Adults with Heart Failure.” The proposed research is relevant to public health because post-hospitalization outcomes remain particularly poor among older adults with heart failure. We propose to examine the role of an overlooked potentially modifiable factor, polypharmacy, on hospital readmissions among older adults with heart failure in order to develop a foundation upon which to design, implement, and evaluate an intervention aimed at preventing readmission and improving post-hospitalization quality of life.

## **TEACHING EXPERIENCE**

### **Primary Instructor**

Modern Methods in Causal Inference, Weill Cornell Medicine, Summer 2019, 2020, 2021.

Regression Analysis, Weill Cornell Medicine, Spring 2018.

Longitudinal Data Analysis, University of California at Berkeley, Spring 2010.

Probability and Statistics for Engineering, Universidad Nacional de Colombia, Fall 2008.

Nonparametric Statistics, Universidad Nacional de Colombia, Spring 2008.

### **Short Courses and Workshops**

Causal Inference using Machine Learning - Sixth Seattle Symposium in Biostatistics (2020)

Causal Mediation: Modern Methods for Path Analysis - Society for Epidemiologic Research (2021)

## **ACADEMIC SERVICE**

### **Committee membership**

*National Academy of Sciences, Engineering, and Medicine: Committee on Assessing Causality from a Multidisciplinary Evidence Base for National Ambient Air Quality Standards*

*NHLBI-CONNECTS Master Protocol Development Group*

**Associate Editor**

*Journal of Causal Inference*

**Peer Review for Statistics and Methodology Journals**

*Biometrika*

*American Journal of Epidemiology*

*Annals of Statistics*

*Journal of the American Statistical Association*

*Biometrics*

*Biostatistics*

*Statistics in Medicine*

*Statistical Methods in Medical Research*

*International Journal of Biostatistics*

*Journal of Causal Inference*

*Electronic Journal of Statistics*

*Journal of Business and Economic Statistics*

*Epidemiology*

**Peer Review for Clinical Journals**

*American Journal of Respiratory and Critical Care Medicine*

*Stroke*

**PROFESSIONAL AFFILIATIONS**

American Statistical Association

International Biometric Society, Eastern North American Region

International Chinese Statistical Association

Statistical Society of Canada