

Lianne K. Siegel

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EDUCATION

University of Minnesota, Minneapolis, MN September 2017 - 2021
Ph.D. in Biostatistics

Carleton College, Northfield, MN September 2013 - June 2017
B.A. in Mathematics/Statistics *Magna Cum Laude*

EMPLOYMENT

Assistant Professor May 2021 - Present
University of Minnesota, School of Public Health, Division of Biostatistics and Health Data Science

Graduate Research Assistant September 2017 - May 2021
*University of Minnesota, School of Public Health, Division of Biostatistics**
Supervisor: Haitao Chu, PhD, MD

Summer Intern June 2016 - August 2016
Fred Hutchinson Cancer Research Center
Supervisors: Elizabeth Brown, PhD and Jennifer Balkus, PhD

Undergraduate Research Assistant September 2015 - June 2017
Carleton College Alumni Annual Fund
Supervisor: Alyse Simondet

**Division of Biostatistics and Health Data Science as of Oct 24, 2023*

ADDITIONAL TRAINING

Training Program in Heart, Lung, and Blood Disease September 2019 - May 2021
Supervisor: James D. Neaton, PhD at University of Minnesota
National Heart, Lung, and Blood Institute T32HL129956

Summer Institute for Training in Biostatistics (SIBS) June 2015 - July 2015
Supervisor: Tanya Kenkre, PhD, MPH at University of Pittsburgh

PUBLICATIONS

* denotes authors contributed equally

† denotes corresponding author, underline denotes student advised/mentored by Dr. Siegel

Methodological:

1. Cao, W., Chu, H., Hanson, T., **Siegel, L.**† (2024) A Bayesian Nonparametric Meta-Analysis Model for Estimating the Reference Interval. *Statistics in Medicine*; 1-15. doi: 10.1002/sim.10001.
2. **Siegel, L.K.***, Silva, M.*, Lin, L., Chen, Y., Liu, Y., Chu, H. (2023) Choice of Link Functions for Generalized Linear Mixed Models in Meta-Analyses of Proportions. *Research Methods in Medicine and Health Sciences*; 0(0). doi:10.1177/26320843231224808.

3. Wang, Z., Liu, Y., Chen, Y., **Siegel, L.**, Cappelleri, J., Chu, H. (2024) Double-Negative Results Matter: A Re-Evaluation of Sensitivities for Detecting SARS-CoV-2 Infection Using Saliva Versus Nasopharyngeal Swabs. *The American Journal of Epidemiology*; 193(3): 548-560. doi: 10.1093/aje/kwad212.
4. Liu, Z., Al Amer, F.M., Xiao, M., Xu, C., Furuya-Kanamoria, L., Hong, H., **Siegel, L.**, Lin, L. (2023). The normality assumption on between-study random defects was questionable in a considerable number of Cochrane meta-analyses. *BMC Medicine*; 21(1):1-12. doi: 10.1186/s12916-023-02823-9.
5. **Siegel, L.**, Chu, H. (2023) “An improved Bayesian approach to estimating the reference interval from a meta-analysis.” *Research Synthesis Methods*; 14(4):639-646. doi: 10.1002/jrsm.1624.
6. Jiang, Z.*, Cao, W.*, Chu, H., Bazerbachi, F., **Siegel, L.†** (2023) “RIMeta: An R Shiny Tool for estimating the reference interval from a meta-analysis.” *Research Synthesis Methods*; 14(3):468-478. doi: 10.1002/jrsm.1626.
7. **Siegel, L.**, Murad, M.H., Riley, R., Bazerbachi, F., Wang, Z., Chu, H. (2022) “A guide to estimating the reference range from a meta-analysis using aggregate or individual participant data.” *American Journal of Epidemiology* 191(5): 948-956; doi:10.1093/aje/kwac013.
8. Rott, K.W., Shi, A., Lin, L., Hodges, J.S., **Siegel, L.**, Chen, Y., Chu, H. (2021) “Arm-Based Bayesian Network Meta-Analysis of Binary Outcome Data Using SAS PROC BGLIMM.” *Research Synthesis Methods*; 12(6):692-700. doi: 10.1002/jrsm.1513.
9. Cao, W., **Siegel, L.**, Zhou, J., Zhu, M., Tong, T., Chen, Y., Chu, H. (2021), “Estimating the Reference Interval from a Fixed Effects Meta-Analysis.” *Research Synthesis Methods*; 12(5):630-640. doi: 10.1002/jrsm.1488.
10. **Siegel, L.**, Murad, M.H., Chu, H. (2021) “Estimating the reference range from a meta-analysis.” *Research Synthesis Methods*; 12(2):148-160. doi: 10.1002/jrsm.1442.
11. **Siegel, L.**, Rudser, K., Sutcliffe, S., Markland, A., Brubaker, L., Gahagan, S., Stapleton, A.E., Chu, H. (2020) “A Bayesian Multivariate Meta-Analysis of Prevalence Data”. *Statistics in Medicine*; 39(23):3105-3119. doi: 10.1002/sim.8593.

Collaborative:

1. Bramante, C.T., Beckman, K.B., Mehta, T., Karger, A.B., Odde, D.J., Tignanelli, C.J., Buse, J.B., Johnson, D.M., Watson, R.H.B., Daniel, J.J., Liebovitz, D.M., Nicklas, J.M, Cohen, K., Puskarich, M.A., Belani, H.K., **Siegel, L.K.**, Klatt, N.R., Anderson, B., Fenno, S.L., Avula, N., Reddy, N.V., Erickson, S.M., Friction, R.D., Lee, S., Griffiths, G., Pullen, M.F., Thompson, J.L., Sherwood, N., Murray, T.A., Rose, M.R., Boulware, D.R.*, Huling, J.D.* (In press) Metformin reduces SARS-CoV-2 in a Phase 3 Randomized Placebo Controlled Clinical Trial. *Accepted by Clinical Infectious Diseases*.
2. King, S., Proper, J., **Siegel, L.K.**, Tignanelli, C.J., Chipman, J.G., Ingraham, N.E., Ho, J. (In press) Acute Uncomplicated Appendicitis Treatment Strategies and Mortality Based on Admission Diagnoses: An Observational Study. *Accepted by Surgical Infections*.
3. Bramante, C.T., Buse, J.B., Liebovitz, D., Nicklas, J., Puskarich, M.A., Cohen, K., Belani, H., Anderson, B., Huling, J.D., Tignanelli, C., Thompson, J.L., Pullen, M., Wirtz, E.L., **Siegel, L.**, Proper, J., Odde, D.J., Klatt, N., Sherwood, N., Lindberg, S., Karger, A., Beckman, K.B., Erickson, S., Fenno, S., Hartman, K., Rose, M., Mehta, T., Patel, B., Griffiths, G., Bhat, N. Murray, T.A., Boulware, D.R.(2023) Outpatient treatment of Covid-19 and the development of Long Covid over 10 months: A multi-center, quadruple-blind, parallel group randomized phase 3 trial. *The Lancet Infectious Diseases*; doi: 10.1016/S1473-3099(23)00299-2.

4. Ikramuddin, F., Melnik, K., Ingraham, N.E., Nguyen, N., Siegel, L., Usher, M.G., Tignanelli, C.J., Morse, L. (2023) Predictors of Discharge Disposition and Mortality following Hospitalization with SARS-CoV-2 Infection. *PLOS ONE*; 18(4): e0283326. doi: 10.1371/journal.pone.0283326.
5. Wolters, E.A., Rabe, K.E., **Siegel, L.**, Butts, J, Klein, ME. Histopathologic Features of Breast Tissue From Transgender Men and Their Associations With Androgen Therapy *American Journal of Clinical Pathology*; 159(1):43-52. doi: 101093/ajcp/aqac123
6. Proper, J.L., Wacker, D.A., Shaker, S., Heisdorffer, J., Shaker, R.M., Shiue, L.T., Pendleton, K.M., **Siegel, L.K.**, Reilkoff RA. Patient Outcomes and Unit Composition With Transition to a High-Intensity ICU Staffing Model: A Before-and-After Study. *Critical Care Explorations*; 5(2):E0864. doi: 10.1097/CCE.0000000000000864
7. Boulware, D.R., Murray, T.A., Proper, J.L., Tignanelli, C.J., Buse, J.B., Liebovitz, D.M., Nicklas, J.M., Cohen, K., Puskarich, M.A., Belani, H.K., **Siegel, L.K.**, Klatt, N.R., Odde, D.J., Karger, A.B., Ingraham, N.E., Hartman, K.M., Rao, V., Hagen, A.A., Patel, B., Fenno, S.L., Avula, N., Reddy, N.V., Erickson, S.M., Lindberg, S., Friction, R., Lee, S., Zaman, A., Saveraid, H.G., Tordsen, W.J., Pullen, M.F., Sherwood, N.E., Huling, J.D., Bramante, C.T., COVID-OUT study team. Impact of SARS-CoV-2 vaccination and booster on COVID-19 symptom severity over time in the COVID-OUT trial. *Clinical infectious diseases*; 76(3):e1-e9 doi: 101093/cid/ciac772
8. Bramante, C.T., Huling, J.D., Tignanelli, C.J., Buse, J.B., Liebovitz, D.M., Nicklas, J.M., Cohen, K., Puskarich, M.A., Belani, H.K., Proper, J.L., **Siegel, L.K.**, Klatt, N.R., Odde, D.J., Luke, D.G., Anderson, B., Karger, A.B., Ingraham, N.E., Hartman, K.M, Rao, V., Hagen, A.A., Patel, B., Fenno, S.L., Avula, N., Reddy, N.V., Erickson, S.M., Lindberg, S., Friction, R., Lee, S., Zaman, A., Saveraid, H.G., Todsens, W.J., Pullen, M.F., Biros, M., Sherwood, N.E., Thompson, J.L., Boulware, D.R., Murray, T.A., for the COVID-OUT Trial Team. (2022) Randomized Trial of Metformin, Ivermectin, and Fluvoxamine for Covid-19. *The New England Journal of Medicine*; 387(7):599-610. doi: 10.1056/NEJMoa2201662.
9. ACTIV-3/TICO Study Group (2022) Efficacy and Safety of Ensovibep for Adults Hospitalized With COVID-19. *Annals of Internal Medicine*; 175(9):1266-1274. doi: 10.7326/M22-1503
10. Abdelwahab, N., Ingraham, N.E., Nguyen, N., **Siegel, L.**, Silverman, G., Shekhar Sahoo, H., Pakhomov, S., Morse, L.R., Billings, J., Usher, M.G., Melnik, T.E., Tignanelli, C.J., Ikramuddin, F. (2022) Predictors of Post-Acute Sequelae of COVID-19 Development and Rehabilitation: A Retrospective Study. *Archives of Physical Medicine and Rehabilitation*; 103(10):2001-2008. doi: 10.1016/j.apmr.2022.04.009
11. Douin, D.J., **Siegel L.**, Grandits, G., Phillips, A., Aggarwal, N.R., Baker, J., Brown, S.M., Chang, C.C., Goodman, A.L., Grund, B., Higgs, E.S., Hough, C.L., Murray, D.D., Paredes, R., Parmar, M., Pett, S., Polozzotto, M.N., Sandkovsky, U., Self, W.H., Young, B.E., Babiker, A.G., Davey, V.J., Kan, V., Gelijns, A.C., Matthews, G., Thompson, B.T., Lane, H.C., Neaton, J.D., Lundgren, J.D., Ginde, A.A.. (2022) Evaluating primary endpoints for COVID-19 therapeutic trials to assess recovery. *Am J Resp Crit Care Med*; 206(6):730-739. doi: 10.1164/rccm.202112-2836OC.
12. Wick, K.D., **Siegel, L.**, Neaton, J.D., Oldmixon, C., Lundgren, J., Dewar, R.L., Lane, H.C., Thompson, B.T., Matthay, M.A. (2022), "RAGE has potential pathogenetic and prognostic value in non-intubated hospitalized patients with COVID-19." *JCI Insight*. doi: 10.1172/jci.insight.157499.
13. Bramante, C.T., Proper, J.L., Boulware, D.R., Karger, A., Murray, T., Rao, V., Hagen, A., Tignanelli, C.J., Puskarich, M., Cohen, K., Liebovitz, D.M., Klatt, N.R., Broedlow, C., Hartman, K.M., Nicklas, J., Ibrahim, S., Zaman, A., Saveraid, H., Belani, H., Ingraham, N., Christensen, G., **Siegel, L.**, Sherwood, NE., Friction, R., Lee, S., Odde, D.J., Buse, J.B., Huling, J. Vaccination against SARS-CoV-2 is associated with a lower viral load and likelihood of systemic symptoms. (2022) *Open Forum Infectious Diseases*; ofac066, doi: 10.1093/ofid/ofac066.

14. Ingraham, N.E., King, S., Proper, J., **Siegel, L.**, Zolfaghari, E., Murray, T., Vakayil, V., Sheka, A., Feng, R., Guzman, G., Samit, R., Muddappa, D., Usher, M., Chipman, J., Tignanelli, C., Pendleton, K. (2021), “Morbidity and Mortality Trends in Pancreatitis: An Observational Study.” *Surgical Infections*. epub ahead of print. doi: 10.1089/sur.2020.473.
15. Luszczek, E.R., Ingraham, N.E., Karam, B., Proper, J., **Siegel, L.**, Helgeson, E., Lofti-Emran, S., Zolfaghari, E.J., Jones, E., Usher, M., Chipman, J., Dudley, R.A., Benson, B., Melton, G.B., Charles, A., Lupei, M.I., Tignanelli, C.J. (2021) “Characterizing COVID-19 Clinical Phenotypes and Associated Comorbidities and Complication Profiles.” *PLOS ONE* 16(3): e0248956. doi: 10.1371/journal.pone.0248956.
16. Chauhan, A., **Siegel, L.**, Freese, R., Racila, E., Stewart, J., III, Amin, K. (2021) “Performance of Ventana SP263 PD-L1 Assay in Endobronchial Ultrasound Guided-Fine Needle Aspiration Derived Non-Small Cell Lung Carcinoma Samples.” *Diagnostic Cytopathology*; 49:355-362. doi: 10.1002/dc.24654.
17. Toyama, A., **Siegel, L.**, Nelson, A.C., Najmuddin, M., Bu, L., LaRue, R., Henzler, C., Caicedo-Granados, E., Giubellino, A., Li, F. (2019) “Analyses of Molecular and Histopathologic Features and Expression of PRAME by Immunohistochemistry in Mucosal Melanomas.” *Modern Pathology*; 32:1727-1733. doi:10.1038/s41379-019-0335-4.

PRESENTATIONS:

Invited Conference Presentations:

1. **Siegel, L.** “An overview and comparison of recently proposed methods for estimating the reference interval from a meta-analysis,” presentation given as an invited talk at WNAR Annual Meeting, Anchorage, AK, June 2023.
2. **Siegel, L.**, Murad, M.H., Riley, R., Bazerbachi, F., Wang, Z., Chu, H. “Estimating the Reference Range from a Meta-Analysis using Aggregate or Individual Participant Data,” presentation given as an invited talk for the International Conference on Advances in Interdisciplinary Statistics and Combinatorics (Virtual Conference), October 2021.
3. **Siegel, L.**, Murad, M.H., Chu, H. “Estimating the Reference Range from a Meta-Analysis,” presentation given as an invited talk at ICSA Applied Statistics Symposium (Virtual Conference), December 2020.

Contributed Conference Presentations:

1. Cao, W., Chu, H., Hanson, T., **Siegel, L.** “A Bayesian nonparametric meta-analysis model for estimating the reference interval,” presentation given at the Society for Research Synthesis Methods Annual Meeting, Paris, France, July 2023.
2. **Siegel, L.**, Murad, M.H., Riley, R., Bazerbachi, F., Wang, Z., Chu, H. “Estimating the Reference Range from a Meta-Analysis using Aggregate or Individual Participant Data,” presentation given during a concurrent session at the Conference on Statistical Practice (Virtual Conference), February 2022.
3. **Siegel, L.**, Rudser, K., Sutcliffe, S., Markland, A., Brubaker, L., Gahagan, S., Stapleton, A.E., Chu, H. “A Bayesian Multivariate Meta-Analysis of Prevalence Data,” presentation given as contributed paper at ENAR Spring Meeting (Virtual Conference), March 2020.
4. **Siegel, L.**, Rudser, K., Sutcliffe, S., Markland, A., Brubaker, L., Gahagan, S., Stapleton, A.E., Chu, H. “A Bayesian Multivariate Meta-Analysis of Prevalence Data,” presentation given as contributed paper at Joint Statistical Meetings, Denver, CO, July 2019.

5. **Siegel, L.**, Rudser, K., Sutcliffe, S., Markland, A., Brubaker, L., Gahagan, S., Stapleton, A.E., Chu, H. “A Bayesian Multivariate Meta-Analysis of Prevalence Data,” presentation given at Society for Research Synthesis Methodology Annual Meeting, Chicago, IL, July 2019.

Departmental Seminars:

1. Hu, J., Babiker, A., Reilly, C., **Siegel, L.K.** “Type I Error Control and Interim Monitoring for Co-Primary Hypotheses Involving a Subgroup,” presentation given as an invited talk for the Carleton College Math/Stats Colloquium Series (Northfield, MN).
2. Cao, W., Chu, H., Hanson, T., **Siegel, L.** “A Bayesian nonparametric meta-analysis model for estimating the reference interval,” presentation given as an invited talk for the University of Arizona Department of Epidemiology and Biostatistics (Virtual). August 2023.
3. **Siegel, L.**, Murad, M.H., Riley, R., Bazerbachi, F., Wang, Z., Chu, H. “Estimating the Reference Range from a Meta-Analysis using Aggregate or Individual Participant Data,” presentation given as an invited talk for the Penn State College of Medicine Department of Public Health Sciences (Virtual), December 2021.
4. **Siegel, L.**, Murad, M.H., Riley, R., Bazerbachi, F., Wang, Z., Chu, H. “Estimating the Reference Range from a Meta-Analysis using Aggregate or Individual Participant Data,” presentation given as an online seminar for University of Minnesota Division of Biostatistics, February 2021.
5. **Siegel, L.**, Murad, M.H., Riley, R., Bazerbachi, F., Wang, Z., Chu, H. “Estimating the Reference Range from a Meta-Analysis,” presentation given as an online seminar for Washington University in St. Louis Division of Public Health, January 2021.

GRANT SUPPORT

Currently Funded Grants:

1. NIH R01-LM012982 9/10/19-5/31/24
 Title: *Statistical Methods and Software for Multivariate Meta-analysis*
 Role: **Principal Investigator** (3/29/2022 - present; MPI: Lifeng Lin)
 Total Award: \$1,314,881
2. AHRQ R18HS028583 8/5/22-7/31/25
 Title: *Evaluation of the SCALED (SCaling Acceptable cDs) Approach for the Implementation of the Interoperable CDS for Venous Thromboembolism Prevention*
 Role: **Co-Investigator**
 PI: Christopher Tignanelli
 Total Award: \$2,994,478
3. Leidos/NIH Contract:18X107CF6 6/1/20-ongoing
 Title: *ACTIV-3 INSIGHT 014*
 Role: **Statistician**
 PI: Cavan Reilly
 Total Award: \$152,476,156
4. Leidos/NIH Contract: 18X107CF5 9/29/20-ongoing
 Title: *COVID-19 Out-Patient Early Treatment (INSIGHT 012)*
 Role: **Statistician**
 PI: Cavan Reilly
 Total Award: \$20,889,332
5. Leidos/NIH Contract: 18X107CF6 5/1/22-5/30/25
 Title: *A Multicenter, Adaptive, Randomized, Controlled Trial Platform to Evaluate Safety and Efficacy of Strategies and Treatments for Hospitalized Patients with Respiratory and Viral Diseases*

Role: **Statistician**
PI: Cavan Reilly
Total Award: \$110,832,885

6. Hennepin Healthcare Research Institute: 186591 1/1/22-6/30/24
Title: *COVID-19 MN EHR Consortium - 2022*
Role: **Statistician**
PI: Paul Drawz
Total Award: \$525,450
7. Hennepin Healthcare Research Institute: 14391-01 8/1/22-3/31/24
Title: *Health Trends Across Communities (HTAC)*
Role: **Statistician**
PI: Paul Drawz
Total Award: \$457,305

TEACHING

University of Minnesota, PubH 7461: Exploring and Visualizing Data in R Fall 2022, Fall 2023

ADVISING/MENTORING

Ph.D. Advising, University of Minnesota:

Milena Silva (w/Jared Huling and Joseph Koopmeiners) TBD

Wenhao Cao (w/Haitao Chu and Saonli Basu) November 2023
Research Synthesis Methodology for Normative Data and Genetic Data

Ph.D. Committees, University of Minnesota:

Zheng Wang, Biostatistics Ph.D. November 2023
Innovative Multivariate Meta-Analysis Methods for Diagnostic Tests and Multiple Treatments

M.S. Advising, University of Minnesota:

Kailash Rohit Velusamy TBD

Jiayi Hu TBD
Winner of ENAR 2024 Distinguished Student Paper Award
Type I Error Control and Interim Monitoring for Co-Primary Hypotheses Involving a Subgroup

Yansong Wen July 2023
Comparing Estimation Methods for Generalized Linear Mixed Models in Electronic Health Records Analysis: Privacy and Accuracy Considerations

Ziren Jiang April 2023
Estimating the reference interval from a meta-analysis using quantile regression

Xiao Ma June 2022
SAS Macros for Estimating Reference Intervals from Meta-Analysis using Aggregate and Individual Participant Data

HONORS/AWARDS

Jacob E. Bearman Student Achievement Award	May 2021
National Research Service Award Fellowship (pre-doctoral)	September 2019
Young Investigator Award, ASA Section on Statistics in Epidemiology “ <i>A Bayesian Multivariate Meta-Analysis of Prevalence Data</i> ”	July 2019
Outstanding Research Assistant Award, University of Minnesota	May 2019
Dean’s PhD Scholar, University of Minnesota	August 2017
Biostatistics Research Fellowship, University of Minnesota	August 2017
Phi Beta Kappa, Carleton College	May 2017
Sigma Xi, Carleton College	May 2017

PROFESSIONAL SERVICE

Editorial:

- Statistical Editor - *Journal of Heart and Lung Transplantation*

Reviewer:

- *American Journal of Epidemiology*
- *Biometrics*
- *BMJ Open*
- *BMC Medical Research Methodology*
- *BMC Medicine*
- *Epidemiology*
- *Health Services and Outcomes Research Methodology*
- *JAMA Oncology*
- *Research Synthesis Methods*
- *Statistics and Its Interface*
- *Statistics in Medicine*

Service to Professional Societies:

- Reviewer for Young Investigator Award, ASA Section on Statistics in Epidemiology (2022-Present)

University Service:

- Reviewer for Diversity of Views and Experience (DOVE) Fellowship (2022-Present)
University of Minnesota

Departmental Service:

- Recruiting Committee (2021-Present)
University of Minnesota, Division of Biostatistics and Health Data Science
- Student Experience Committee (2021-Present)
University of Minnesota, Division of Biostatistics and Health Data Science

PROFESSIONAL MEMBERSHIPS

American Statistical Association	2015 - Present
Eastern North American Region of the International Biometric Society	2019 - Present
Society for Research Synthesis Methodology	2022 - Present