BIOGRAPHICAL SKETCH

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NAME: Sewell, Daniel K

eRA COMMONS USER NAME (credential, e.g., agency login): DKSEWELL

POSITION TITLE: Assistant Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Harding University	B.A.	05/2006	Education
University of Arkansas	M.S.	05/2010	Statistics
University of Illinois Urbana-Champaign	Ph.D.	05/2015	Statistics

A. Personal Statement

B. Positions and Honors

Positions and Employment

2008-2009	Teaching Assistant (Instructor), Department of Mathematical Sciences, University of Arkansas
2010	Research Assistant, Department of Mathematical Sciences, University of Arkansas
2010-2011	Teaching Assistant (Lon-Capa Programmer), Department of Statistics, University of Illinois Urbana-Champaign
2011-2012	Research Assistant to Professor Ping Ma, University of Illinois Urbana-Champaign
2012-2012	Research Assistant to Professor Yuguo Chen, University of Illinois Urbana-Champaign
2014	Teaching Assistant (Instructor), Department of Statistics, University of Illinois Urbana-Champaign
2015-present	Assistant Professor, Department of Biostatistics, University of Iowa

Honors

2007	Outstanding Calculus Award, Harding University
2014	Graduate College Travel Award, University of Illinois
2014	Finalist for the Norton Prize for Outstanding Doctoral Thesis in Statistics, University of Illinois
2014	Patrick J. Fett award for the best paper on the scientific study of Congress and the presidency
2015	New Faculty Research Award, College of Public Health, University of Iowa
2016	University of Illinois Nominee for GS/ProQuest Distinguished Dissertation Award (limit 1 per university)

C. Contributions to Science

A full listing of my published work can be found at https://orcid.org/0000-0002-9238-4026/print

Network Analysis: Network analysis is a ubiquitous area of study used by scientists in many distinct fields, and can most simply be thought of as the study of how objects interact or are connected. The statistical analysis of network data is an inherently difficult endeavor, however, and sophisticated tools are necessary to obtain correct inference. My research has focused on developing models and methods for analyzing a variety of types of network data. The first paper develops a framework for modeling temporally measured network data, and provides tools for prediction, handling missing data, and detecting influence throughout the network. The second paper develops tools for modeling networks constructed from various types of complex interactions or connections as well as accompanying computationally efficient estimation methods. The third paper provides an analytical framework for analyzing partially observed networks (egocentric network data), appropriately modeling the heteroscedastic and correlated errors involved in network data as well as estimating the effect of social influence on the response. The fourth paper develops a non-linear regression model for determining how actors in the network vary with respect to their susceptibility to influence as it diffuses through the network; I also provide an efficient algorithm for sampling from the posterior distribution and performing inference.

a) Sewell, D. K. and Chen, Y. (2015). Latent space models for dynamic networks. *Journal of the American Statistical Association* **110**(512), 1646-1657.
b) Sewell, D. K. (2017). Network autocorrelation models with egocentric data. *Social Networks,* **49**, 113-123.
c) Sewell, D. K. (2017). Heterogeneous susceptibilities in social influence models. *Social Networks*, **52**, 135-144.
d) Sewell, D. K. (2019). Latent space models for network perception data. *Network Science* In Press.

Clustering analysis: Numerous applications exist in which it is of interest to partition the data into homogeneous groups, or clusters. This is particularly difficult in longitudinal data, where researchers must think carefully about how to define such clusters within their specific contexts. The first paper derives a statistical model which takes into account temporal dependencies in the data, allows covariate information to help explain the grouping/clustering, and develops computationally efficient algorithms to make model estimation feasible. Clustering within networks, called community detection, is a particularly challenging task. Again, this is even more so when the network data is collected over time. The second paper develops a statistical framework that allows one to perform community detection on temporally collected network data, and I again provide computationally efficient algorithms to make the model estimation feasible. The methods of this has also been published in the R package 'dnc'. The last paper provides novel methodology for analyzing longitudinal, or dynamic, network rank-order data. In this work I provide explicit mechanisms for the estimation of changes over time in the stability and emerging clustering structure of the network.

a) Sewell, D. K., Chen, Y., Bernhard, W. and Sulkin, T. (2016). Model-based longitudinal clustering. *Statistica Sinica* **26**(1), 205-233.
b) Sewell, D. K., and Chen, Y. (2016). Latent space approaches to community detection in dynamic networks. *Bayesian Analysis* **12**(2), 351-377.
c) Sewell, D. K. (2016). dnc: Dynamic Network Clustering (R package). https://cran.r-project.org/web/packages/dnc/index.html
d) Sewell, D. K. and Chen, Y. (2015). Analysis of the formation of the structure of social networks using latent space models for ranked dynamic networks. *Journal of the Royal Statistical Society, Series C* **64**, 611-633.

Longitudinal Data Analysis: Studies often require a temporal component in order to track changes over time or to better understand an ongoing process. Failure to correctly account for the additional dependencies in the data induced by this temporal component can lead to biased results, wrong standard errors, and hence wrong inference and conclusions gleaned from the data. Much of my methodological research has focused on temporal, or longitudinal, data analysis. The first paper takes a commonly used network analytic approach and extends it in a non-trivial way to networks observed over time, allowing for the underlying network structure to evolve over time and providing prediction tools for future unobserved time points. The second paper also provides novel methodology for analyzing longitudinal, or dynamic, network data. In this work I provide explicit mechanisms for the estimation of changes over time in the stability and emerging clustering structure of the network. The third paper develops a model-based clustering algorithm for multivariate longitudinal data. The fourth paper considers the temporal variation in surgical site infections (SSIs); in particular, we estimate the seasonality of SSIs and the proportion of that seasonality that can be explained by climate variables.

a) Sewell, D. K. and Chen, Y. (2015). Latent space models for dynamic networks. *Journal of the American Statistical Association* **110**(512), 1646-1657.
b) Sewell, D. K. and Chen, Y. (2015). Analysis of the formation of the structure of social networks using latent space models for ranked dynamic networks. *Journal of the Royal Statistical Society, Series C* **64**, 611-633.

c) Sewell, D. K., Chen, Y., Bernhard, W. and Sulkin, T. (2016). Model-based longitudinal clustering. *Statistica Sinica* **26**(1), 205-233.
d) Anthony, C.A., Peterson, R.A., Polgreen, L.A., Sewell, D.K., and Polgreen, P.M. (2017). The seasonal variability in surgical site infections and association with warmer weather: a population-based investigation. *Infection Control & Hospital Epidemiology*. 1-8. doi:10.1017/ice.2017.84.

Computational Statistics: Statistical tools can be implemented to accomplish otherwise intractable computational problems, such as numerical integration or optimization. Network analysis is notorious for having high computational cost. In the first paper, I derive a novel estimation algorithm that reduces the computational cost from exponential to linear in the number of time points, thereby making an otherwise infeasible estimation procedure have extremely short run times. In the second paper, I implement a variational Bayes approach to perform community detection, i.e., clustering, on dynamic networks, reducing the computational burden by around 95%. In the third and fourth papers, I extend a method of reducing computational cost from quadratic to linear in the number of actors in the network to longitudinal network data and to a wide range of distributions, namely any exponential family of distributions. Additionally, I have two as of yet unpublished papers contributing to statistical computing. The first derives a method with which to perform on-line learning of static parameters in a general state space framework through a novel sequential Monte Carlo algorithm. The second provides a new way of deriving, and thus understanding, a well-known estimator for the marginal likelihood, which is often an intractable integral key to many model selection approaches.

a) Sewell, D. K., Chen, Y., Bernhard, W. and Sulkin, T. (2016). Model-based longitudinal clustering. *Statistica Sinica* **26**(1), 205-233.
b) Sewell, D. K., and Chen, Y. (2016). Latent space approaches to community detection in dynamic networks. *Bayesian Analysis* **12**(2), 351-377.
c) Sewell, D. K. and Chen, Y. (2015). Latent space models for dynamic networks. *Journal of the American Statistical Association* **110**(512), 1646-1657.
d) Sewell, D. K. and Chen, Y. (2016). Latent space models for dynamic networks with weighted edges. *Social Networks* **44**, 105-116.

Infectious Disease: Our society is dramatically impacted on multiple levels by our understanding, treatment, and prevention of infectious diseases. The study of infectious disease often requires complex analyses shaped by a substantive understanding of disease-specific mechanisms of spread. I have worked in this domain with researchers at the University of Iowa College of Medicine, College of Public Health, as well as with researchers at other R1 institutions and at the CDC. These analyses often require novel methodological developments in network analysis, longitudinal analysis, and statistical computation.

a) Sewell, D. K., (2018). Estimating the attributable disease burden and effects of inter-hospital patient sharing on *Clostridium difficile* infections in California. Oral presentation at the *International Conference on Emerging Infectious Diseases*, Atlanta, GA.
b) Medgyesi, D., Brogan, J.M., Sewell, D.K., Creve-Coeur, J. P., Kwong, L.H., and Baker, K.K. (2018). Where children play: Young child exposure to environmental hazards during play in public areas in a transitioning internally displaced persons community in Haiti. *International Journal of Environmental Research and Public Health*, **15**(8), 1646.
c) Simmering, J.E., Polgreen, L.A., Hornick, D.B., Sewell, D.K., and Polgreen, P.M. (2017). Weather-dependent risk for legionnaires' disease, United States. **23**(11):1843-1851.
d) Anthony, C.A., Peterson, R.A., Polgreen, L.A., Sewell, D.K., and Polgreen, P.M. (2017). The seasonal variability in surgical site infections and association with warmer weather: A population-based investigation. *Infection Control & Hospital Epidemiology*. 38(7), 809-816.

D. Additional Information: Research Support and/or Scholastic Performance

ACTIVE

2018X134 UOI (Baker, Kelly, PI) 7/01/18-12/31/19
IFPRI
Market-to-Mouth Infant Food Contamination Study - A Collaboration Between the Safe Start Study and IFPRI
The overall goal for this study is to understand whether household-level boiling and safe storage of infant food can effectively reduce enteric pathogen contamination in locally vended cow's milk at the point-of-consumption by infants.
Role: Co-Investigator

U01 CK000531 (Segre, Alberto, PI) 8/1/17-7/31/20
CDC
Data-Driven Modeling and Simulation of Healthcare-Associated Infections
According to the CDC, healthcare-associated infections affect about two million patients in American hospitals each year. Of particular concern are strains of antimicrobial resistant pathogens that could be quickly amplified in hospitals, transmitted to other hospitals, nursing homes, and then, eventually, to the community at large. This project will apply the analytic techniques and simulation tools of computational science to provide a much-needed framework to better understand and evaluate hospital patient safety measures, from common interventions specifically designed for infection control, such as hand-washing or patient-cohorting, targeted hand-washing compliance measures, and healthcare worker vaccination strategies, to more subtle questions about, e.g., patient/unit assignment, inter-facility transfer policies, antibiotic administration and staff/patient allocations.
Role: Co-Investigator

U48 DP005021 (Parker, Edith, Contact PI) 9/30/14-9/29/19
CDC
University of Iowa Prevention Research Center for Rural Health
The University of Iowa Prevention Research Center for Rural Health was first funded by the Centers for Disease Control and Prevention in 2002. The 26 Prevention Research Centers, designated by the CDC, constitute a network of academic, community, and public health partners that conducts applied public health research. The overall objective of this study is to determine the effectiveness, through a community-based participatory research pre-post design, of a community-based physical activity intervention that uses a lay health advisors approach to inform residents, provide social and behavioral support, and advocate for social and environmental changes in a micropolitan new destination community in the rural state of Iowa.
Role: Co-Investigator

R01 NS103475 (Paulsen, Jane, PI) 7/1/17-3/31/23
NIH
Statistical Disease Modeling and Clinimetrics to Prepare for Preventive Trials in Huntington Disease
Role: Co-Investigator

R01 NS105509 (Paulsen, Jane, PI) 3/15/18-1/31/23
NIH
Preparing for Preventive Clinical Trials in Huntington's Disease
Role: Co-Investigator

Completed Research

Internal UI Account, (Polgreen P, Project Director) 11/26/14-12/31/18
IA715-B17 US. Dept. of Agriculture (Brophy P, PI)
e-Health Network/The University of Iowa Hospitals and Clinics eHealth Extension Network Project
The University of Iowa eHealth Extension Network Project will supply 65 sites in 45 counties (Figure 2) around Iowa with telehealth carts equipped with high quality cameras, HIPPA compliant video conferencing (Vidyo) and cloud-based image sharing software (lifeIMAGE). By utilizing this technology and building collaborations with our rural providers, we can build an eHealth Extension Network to address many of the unique challenges our Iowa patients and providers face. This grant outlines multiple approaches to address rural healthcare challenges. Through its implementation we will provide access to medical specialists not currently available to rural medical professionals or their patients. The UIHC has committed to a 107% match to our grant application budget of $498,973.
Role: Co-Investigator

R25 HL131467 (Zamba, Gideon, PI) 2/15/16-1/31/19
NIH
Iowa Summer Institute for Research Education in Biostatistics
This is a proposal to the National Institutes of Health (NIH), National Heart, Lung and Blood Institute (NHLBI), from the University of Iowa, in response to RFA-HL-16-017 for a Summer Institute for Research Education in Biostatistics. The ultimate vision of our proposed research education program is to increase the number of undergraduates who enter graduate programs in Biostatistics and to maintain a solid underrepresented minority pipeline into biostatistics graduate programs. The proposal is for the University of Iowa (UI) Department of Biostatistics to recruit a diverse group of 18 trainees each year, from 2016 to 2018, with focus on minority, underrepresented and disadvantaged students who wouldn't have otherwise been exposed to the field of biostatistics.
Role: Co-Investigator