

Social Networks & Health Training Workshop Schedule

Location: SSRI-East, Erwin Mill Building, Room A103
2024 W Main St, Durham, NC 27705

	Monday 16th	Tuesday 17 th	Wed 18 th	Thursday 19 th	Friday 20 th
9:00 – 10:15		Network Data Collection. <i>Moody</i>	Diffusion & Peer Influence. <i>Moody</i>	Exponential Random Graph Models (ERGM). <i>Jeff Smith</i>	Siena Models for Selection & Influence. <i>David Shafer</i>
10:30 – 12:00		Introduction to R for networks. <i>Jacob Fisher</i>	Community Detection. <i>Peter Mucha</i>	ERGM Lab <i>(DNAC Team)</i>	Siena Lab <i>(DNAC Team)</i>
12:00 – 1:00		Digital Nets. <i>Chris Bail</i>	Human Subjects <i>Jon Morgan</i>	Respondent Driven Sampling. <i>Giovanna Merli</i>	Agent Based Models <i>David Banks</i>
1:00 – 3:00	Introduction to network methods & measures I. <i>Moody</i>	Ego Network Analysis. <i>Jeff Smith</i>	Peer Influence & diffusion Lab	Network Visualization	The future of networks & health. <i>Bernice Pescosolido</i>
			Community detection lab <i>(DNAC team)</i>	Viz Lab <i>(DNAC Team)</i>	
3:00 – 5:00	Introduction to network methods & measures II. <i>Moody</i>	Network Data/software Lab <i>Jacob Fisher</i>	Statistical Approaches to networks I: Randomization <i>Moody</i>	Network Experiments & Interventions <i>Moody & Manoj Mohanan</i>	
			Lab <i>(DNAC Team)</i>	Catch up Lab <i>(DNAC Team)</i>	
6:30 →8:00		Dinner at The Pit BBQ , Durham.		Dinner at Tyler's Taproom , American Tabaco Campus, Durham	

Light blue: Lecture (largely), light green: hands-on lab (largely), orange: lunch talks (light lunch provided)

Main Modules

- *Introduction to network methods & measures.* This module is a basic overview of the field and an introduction to data methods and analysis styles. This is a “30,000ft” view – designed to help students see the breadth of the field, variety of analysis strategies, data sources and potential pitfalls. After finishing this module, students should feel comfortable reading social network papers and know where their interests fit into the field. We will preview topics & applications that will be covered in-depth the rest of the week and provide a brief introduction to alternative software programs (our labs will be mainly on tools using R, but there are many others out there).
 - *Suggested Reading*

Intro & Historical Background Readings

Kadushin, Charles (2010): *Making Connections: An introduction to social network theory, concepts and findings*. This is a great “what and why” book – not a “how to” book, particularly for students with little social networks background.

Freeman, Linton. *The Development of Social Network Analysis* by Linton Freeman. A great history of the sociological development of the field.

Valente, Thomas W. 2010. *Social Networks and Health: Models, Methods, and Applications* Oxford University Press

Martire, Lynn M. and Melissa M. Franks. “[The Role of Social Networks in Adult Health](#)” *Health Psychology* 33:501-504. See also the entire [special issue](#)

Smith, Kirsten P. and Nicholas A. Christakis. 2008. “[Social Networks and Health](#).” *Annual Review of Sociology* 34(1):405–29.

Basic Methods Texts

Borgatti, Stephen P., Martin Everett and Jeffrey C. Johnsen. 2016. *Analyzing Social Networks*. Sage.

Scott, John. 2013. *Social Network Analysis*, 3rd Ed. Sage

Hanneman’s free online text: <http://www.faculty.ucr.edu/~hanneman/nettext/>

Advanced Texts & References

Wasserman, Stanley and Katherine Faust (1994): *Social Network Analysis*. Cambridge University Press.

Kolaczyk, Eric D. 2009 *Statistical Analysis of Network Data*. Springer.

Jackson, Matthew O. 2008. *Social and Economic Networks*. Brings economic modeling/theory to networks.

- *Network data collection*. Here the focus is on the practical concerns of network data collection, storage and manipulation. Data collection topics include optimal name-generators, trade-offs related to name-generator style (roster check-off, fixed number of alters, etc.) and sources for non-survey data. Data manipulation topics include strategies for storing, searching and summarizing very large network data or continuous time network data. We will also identify strategies for sampling networks and how appropriate that is for particular types of studies. After finishing this module, students will know how to best collect the data necessary for their project and how to address issues of incomplete data in their context.

- *Suggested Reading:*

- *Human Subjects/IRB issues*

- Breiger, Ronald L. 2005. “[Introduction to special issue: ethical dilemmas in social network research](#)” *Social Networks* p89-93

- Klodahl, Alden S. 2005. “[Social network research and human subjects protection: Towards more effective infectious disease control](#)” *Social Networks* p119-137

- *Accuracy & Strategy Issues*

- Marsden, P.V. 1990. “[Network data and measurement](#).” *Annual Review of Sociology* 16:435-63

- Brashears, Matthew E. 2014. “[‘Trivial’ Topics and Rich Ties: The Relationship Between Discussion Topic, Alter Role, and Resource Availability Using the ‘Important Matters’ Name Generator](#).” *Sociological Science*, 1: 493-511. DOI 10.15195/v1.a27

- Eagle, David and Rae-Jean Proeschold-Bell. 2015. “[Methodological Considerations in the Use of Name Generators and Interpreters](#).” *Social Networks*, 40:75–83.

Effects of Missing Data

Jeff Smith and James Moody. 2013. "[Network Measurement Error and Sampling Coverage I: Nodes missing at random.](#)" *Social Networks* 35: 652-668. PubMed id: 24311893
Adams, Jimi and James Moody. 2006. "[To tell the truth: informant accuracy in sexual networks.](#)" *Social Networks* 29:44-58.

- *Introduction to R for networks.* The R platform is quickly becoming the primary software for network analysis. Here we provide an introduction to R for those who have not used it before, with a focus on issues specific to loading & managing network data. After completing this module, students should know how to read in and manipulate network data in R and access primary network tools & libraries.
 - *Suggested Reading:*
 - Lots of bits online, see also:
 - TryR: <http://tryr.codeschool.com/>
 - The Stanford R Labs: <http://sna.stanford.edu/rlabs.php>
 - The Statnet tutorial page: <https://statnet.org/trac/wiki/Resources>
 - Sunbelt NDTV lab:
http://statnet.csde.washington.edu/workshops/SUNBELT/current/ndtv/ndtv_workshop.html
 - Hadley Wickham's *dplyr* tutorials from UseR! 2014 (a specialized data management package the will be used a lot in the labs):
 - <https://www.youtube.com/watch?v=8SGif63VW6E>
 - <https://www.youtube.com/watch?v=Ue08LVuk790>
 - [dplyr vignette](#)
 - and maybe the [tidyr vignette](#)) for data management in R.
 - Kolaczyk, Eric D., Csárdi, Gábor , 2014, *Statistical Analysis of Network Data with R*. Wiley
- *Ego Network Analysis.* Many health-relevant network questions turn primarily on the focal individual and their direct peers. These "local" or "ego" networks are simple to collect within a general survey sampling design. Here we identify a set of tools & techniques for measuring the structure of ego networks and applications to health. After finishing this module, students should know how to calculate key network composition and structure scores and understand the tools available for using ego-network data in health-relevant research. Jeff Smith, University of Nebraska, has written extensively on novel uses of ego networks and will present this module.
 - *Suggested Reading:*
 - Cornwell, B., Laumann, E.O. and Schumm. 2009. "[The Social Connectedness of Older Adults: A National Profile](#)" *American Sociological Review*
 - DiPrete, Thomas A., Andrew Gelman Tyler McCormic Julien Teitler & Tian Zheng. "[Segregation in Social Networks based on Acquaintanceship and Trust](#)" *American Journal of Sociology* 116: 1234-1283.
 - Hanneman, Chapter 9:
http://www.faculty.ucr.edu/~hanneman/nettext/C9_Ego_networks.html
 - Kalmijn, M et al "[Homogeneity of social networks by age and marital status: A multilevel analysis of ego-centered networks](#)" *Social Networks* p25-43
 - Maija Reblin, Bert N Uchino. 2008. "[Social and emotional support and its implication for health](#)" *Current Opinion in Psychiatry* 21:201-205
 - Marsden, Peter:1987. "[Core discussion networks of Americans](#)" *American Sociological Review*

- McPherson, Miller, Lynn Smith-Lovin, and James M. Cook. 2001. "[Birds of a Feather: Homophily in Social Networks](#)." *Annual Review of Sociology* 27:415-44
- Uchino, Bert N.; Cacioppo, John T.; Kiecolt-Glaser, Janice K. 1999. "[The relationship between social support and physiological processes: A review with emphasis on underlying mechanisms and implications for health](#)." *Psychological Bulletin*, 119:488-531
- Van Der Gaag, Martin & Tom Snijders "[The Resource Generator: social capital quantification with concrete items](#)" *p1-29 Social Networks*
- van Duijn, M. A. J., J. T. van Busschbach, and T. A. B. Snijders. 1999. "[Multilevel Analysis of Personal Networks As Dependent Variables](#)." *Social Networks* 21:187-209

- *Diffusion & Peer Influence*. Here we review the current state-of-the-art with respect to diffusion and peer influence modeling and address core issues related to causal inference. We pair diffusion and influence as both are contagion processes on graphs, which allows us to focus on the types of tools common to both epidemiological approaches and social influence modeling. A basic overview of network simulation models is included here, as this is a primary tool for assessing pathogen diffusion and useful for understanding implications for theories of peer influence. After this module, students should have an appreciation for standard peer influence theory, the network autocorrelation framework for testing peer association, and an appreciation of the difficulties involved in establishing cause in peer influence models (which preps for the Siena module later in the week). They should understand the basic diffusion process and the sorts of formal and simulation models associated with diffusion studies.
 - *Suggested Reading*:
 - Valente, T. W. 1995. *Network models of the diffusion of innovations*. Cresskill, NJ : Hampton Press
 - Friedkin, N.E. 1998 *A Structural Theory of Social Influence* Cambridge
 - N. A. Christakis and J. H. Fowler (2007) "[The Spread of Obesity in a Large Network](#)" *New England Journal of Medicine* 357:370-379
 - Aral, Sinan, Lev Muchnik, and Arun Sundararajan 2009. "[Distinguishing influence-based contagion from homophily-driven diffusion in dynamic networks](#)" *PNAS* 2009 106: 21544-21549;
 - Centola, Damon. 2010. "[The Spread of Behavior in an Online Social Network Experiment](#)" *Science* 2010: 1194-1197.
 - Fowler, James H. and Nicholas A. Christakis. 2010. "[Cooperative Behavior Cascades in Human Social Networks](#)" *PNAS* 107:5334-5338
 - Cohen-Cole, Ethan and Jason M. Fletcher. 2008. "[Detecting Implausible Social Network Effects in Acne, Height, and Headaches: Longitudinal Analysis](#)." *BMJ (Clinical research ed.)* 337:a2533.
 - Cohen-Cole, Ethan and Jason M. Fletcher. 2009. "[Is Obesity Contagious? Social Networks vs. Environmental Factors in the Obesity Epidemic](#)." *Journal of Health Economics* 27(5):1382-87.
- *Community Detection*. While we'll cover basics of community detection in the network measures module; the field is developing rapidly, with new models focusing on identifying groups that are (a) dynamic and (b) optimized for social processes on the network. After completing this module, students should know the basic challenges and primary solutions to community detection problems

on networks. Peter Mucha, UNC Math, is one of the world's leading developers of network group detection tools and will present at this module.

○ *Suggested Reading:*

- Moody, James and John Coleman. 2015. "[Clustering and Cohesion in Networks: Concepts and Measures](#)." In: James D. Wright (editor-in-chief), *International Encyclopedia of the Social & Behavioral Sciences, 2nd edition, Vol 3*. Oxford: Elsevier. pp. 906–912
- Freeman, L. C. 1992. "[The Sociological Concept of "Group": An Empirical Test of Two Models](#)." *American Journal of Sociology* 98:152-66. (OnLine)
- Mucha, Peter J., Thomas Richardson, Kevin Macon, Mason A. Porter, and Jukka-Pekka Onnela. 2010. "[Community Structure in Time-Dependent, Multiscale and Multiplex Networks](#)" *Science* 328:876-878
- Newman, MEJ. 2006. "[Modularity and Community Structure in Networks](#)" PNAS
- Porter, Onnela & Mucha 2009. "[Communities in Networks](#)"
- Casalino, Lawrence P., Michael F. Pesko, Andrew M. Ryan, David J. Nyweide, Theodore J. Iwashyna, Xuming Sun, Jayme Mendelsohn and James Moody. "[Physician Networks and Ambulatory Care Admissions](#)" *Medical Care* 53:534-41
- Bruce E. Landon; Nancy L. Keating; Michael L. Barnett; Jukka-Pekka Onnela; Sudeshna Paul; A. James O'Malley; Thomas Keegan; Nicholas A. Christakis. 2012. "[Variation in Patient-Sharing Networks of Physicians Across the United States](#)" *JAMA*.308:265-273. doi:10.1001/jama.2012.7615.

- *Statistical Approaches to Networks I*. Traditional social network analysis tools assume a complete population and provide a descriptive scoring framework. Here we examine initial extensions into network inference, focusing on models for random graph comparisons, bootstraps and permutation approaches. After completing this module, students should understand notions of random and conditional random graphs, permutation tests and applications to testing against observed networks. These tools provide ways to understand appropriate network null models and form the foundation of later work on exponential random graphs and Siena tools.

○ *Suggested Reading:*

- Snijders, Tom A. B. 2011. "[Statistical Models for Social Networks](#)" *Annual Review of Sociology* 37:131-153
- Butts, Carter T. 2007. "[Permutation Models for Relational Data](#)" *Sociological Methodology*. 37: 257-281. DOI: 10.1111/j.1467-9531.2007.00183.
- Krackhardt, David. 1988. "[Predicting with Networks: Nonparametric Multiple Regression Analyses of Dyadic Data](#)." *Social Networks* 10:359-82.
- Newman, Mark, Duncan Watts and Steven H. Strogatz. 2002. "[Random Graphs as Models of Networks](#)" *PNAS* 99:2566-2572

- *Exponential Random Graph Models*. The development of the exponential random graph modeling (ERGM) framework has dramatically shifted the balance of social network research. These models allow one to describe the structure of a given network as a function of a network generating function, allowing one to test models of network formation and evolution. New models are now allowing missing and dynamic data specifications, which when combined with simulation tools can greatly improve our accuracy for describing network structure and relating positions in a network to health outcomes. After completing this module, students should be able to implement an ERGM model on real data and assess model degeneracy and fit.

○ *Suggested Reading:*

Snijders, Tom A. B. 2011. "[Statistical Models for Social Networks](#)" Annual Review of Sociology 37:131-153

Robins, G. et al (2006) "[An introduction to exponential random graph \(p*\) models for social networks](#)" *Social Networks* p173-191 (Part of a special issue)

STATNET Tutorial (online) & *J. of Statistical Software* review issue ([links here](#)).

Morris, Martina et al (2009) "[Concurrent Partnerships and HIV Prevalence disparities by race: Linking science and public health.](#)" *American Journal of Public Health*. 99:1023-1031

- **Network Visualization.** Intuitive insight from the full "gestalt" of a network space is the goal of exploratory network visualization, but often visualizations are poorly executed and convey misleading information. This module would work through the nuts-and-bolts of network visualization, and after finishing the module users should be able to identify the elements of effective visualization and be familiar with the tools and techniques needed to produce them.
 - *Suggested Reading:*
 - Moody, James, Daniel A. McFarland and Skye Bender-DeMoll. 2005. "[Dynamic Network Visualization: Methods for Meaning with Longitudinal Network Movies.](#)" *American Journal of Sociology* 110:1206-1241
 - Healy, Kieran and James Moody. "[Data Visualization in Sociology.](#)" *Annual Review of Sociology*. 40:105-128
 - Brandes, Ulrik, Jorg Raab, Dorethea. 2001. "[Exploratory Network Visualization: Simultaneous Display of Actor Status and Connections](#)" *Journal of Social Structure*
 - Freeman, Linton C. 2000. "[Visualizing Social Networks](#)" *Journal of Social Structure*

- **Network Experiments & Interventions.** Causal inference in networks is complicated by the natural selection processes operating in real-life social settings. Experimental designs, including on-line network experiments and lab experiments for effects of position in small groups, provide a unique opportunity to test structural theory. After completing this module, students should understand some of the basic approaches to embedding experiments in networks and be familiar with network-based interventions.
 - *Suggested Reading:*
 - Valente, Thomas W. 2012. "[Network Interventions.](#)" *Science* 337(6090):49-53.
 - Campbell, R., Starkey, F., Holliday, J., Audrey, S., Bloor, M., Parry-Langdon, N., Hughes, R., and Moore, L. 2008. "[An informal school-based peer-led intervention for smoking prevention in adolescence \(ASSIST: a cluster randomised trial.](#)" *Lancet* 371(9624):1595-1602.

- **Siena Models for Selection & Influence.** While the causal conundrum of "selection or influence" in network studies is probably as intractable as the "nature or nurture" debate in social biology (with likely the same "both" result), we still seek methods for adjudicating the weight of influence and selection for policy implementation purposes. The current best strategy for parsing selection from influence involves "stochastic actor oriented models" which use a microsimulation architecture to maximize an actor-specified utility function related to network structure, peer behavior and selection. The models are similar in form to the ERGM models, but allow a special specification around features that drive peer influence versus selection. After this module, students should be able to implement a SIENA model on real data. The module is taught by David Schafer, Arizona State, who has worked extensively applying these models to adolescent health questions.

○ *Suggested Reading:*

- Snijders, T.A.B. , van de Bunt, G.Gb, Steglich, C.E.G. 2010." [Introduction to stochastic actor-based models for network dynamics](#)" *Social Networks*. 32: 44-60
- Special Issue on Behavior & Network Dynamics in Youth, [Journal of Research on Adolescence](#).
- Schaefer, David R., John Light, Laura D. Hanish, Carol L. Martin and Richard A. Fabes. 2010. "[Fundamental Principles of Network Formation among Preschool Children](#)." *Social Networks* 32:61-71
- Osgood, D. W., Ragan, D. T., Wallace, L., Gest, S. D., Feinberg, M. E., & Moody, J. "[Peers and the emergence of alcohol use: Influence and selection processes in adolescent friendship networks](#)." *Journal of Research on Adolescence* 23:500–512.

Lunch mini-modules:

- *Respondent Driven Sampling: Giovanna Merli*
 - Lu X. 2013. "[Linked Ego Networks: Improving estimate reliability and validity with respondent-driven sampling](#)." *Social Networks*. 35:669–685
 - Merli MG, Moody J, Smith J, Li J, Weir S, Chen X. 2015. "[Challenges to recruiting population representative samples of female sex workers in China using Respondent Driven Sampling](#)." *Soc Sci Med*. 125:79–93.
 - Verdery AM, Merli MG, Moody J, Smith JA, Fisher JC. 2015. "[Respondent-driven Sampling Estimators Under Real and Theoretical Recruitment Conditions of Female Sex Workers in China](#)." *Epidemiology*. 26):661–665.
 - Volz E, Heckathorn DD. 2008. "[Probability based estimation theory for respondent driven sampling](#)." *J Off Stat*. 24:79.
- *Human Subjects & IRB for Networks*. Overview presentation & Discussion, led by Jon Morgan

An open discussion of issues related to human subjects protection & IRB in network studies.

Breiger, Ronald L. 2005. "[Introduction to special issue: ethical dilemmas in social network research](#)" *Social Networks* p89-93

Klovndahl, Alden S. 2005. "[Social network research and human subjects protection: Towards more effective infectious disease control](#)" *Social Networks* p119-137.
- *Digital Network Data Collection: Chris Bail*
 - Livine, A., MP Simmons, E Adar, LA Adamic. 2011. "[The Party is Over Here: Structure and Content in the 2010 Election](#)" *Proceedings of the ICWSM*.
 - Ruths, Derek and Jürgen Pfeffe. 2014. "Social media for large studies of behavior." *Science* 346: 1063-1064.
- *Agent Based Models for Networks: David Banks*
 - Maglio, Paul P. and Patricia L. Mabry. 2011. "[Agent-Based Models and Systems Science Approaches to Public Health](#)" *American Journal of Preventive Medicine*. 40: 392-394
 - El-Sayed, Abdulrahman M., Peter Scarborough, Lars Seemann and Sandro Galea. "[Social Network Analysis and agent-based modeling in social epidemiology](#)" *Epidemiological Perspectives & innovations*. 9:1.