

## ► 6 Degrees of Extension

What Network Analysis Can Teach Us  
About How We Collaborate

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# Pilot Project

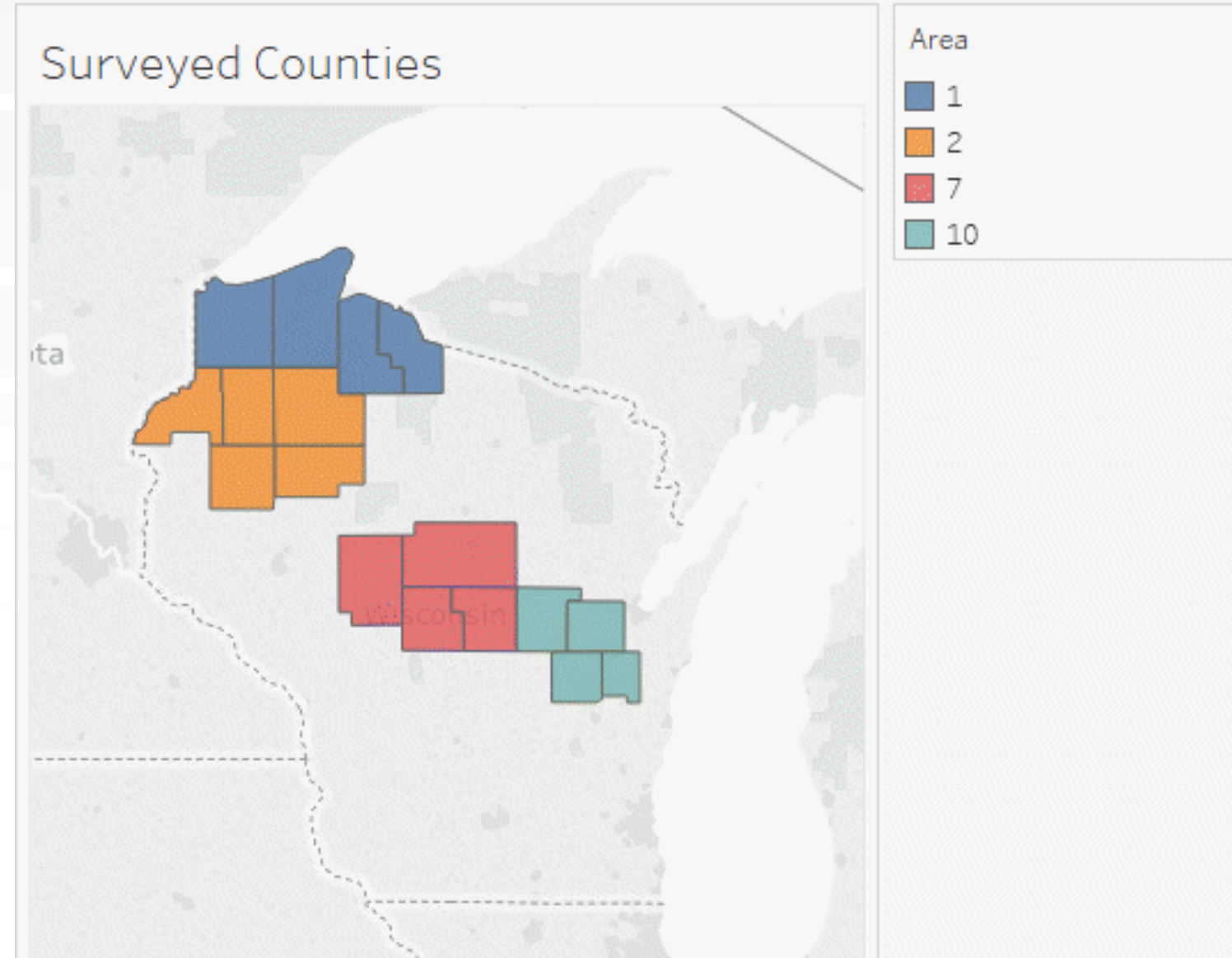
Surveyed 80 employees  
in 4 areas asking...

How often do you:

- Communicate
- Collaborate

Added:

- Employment Data
- Zoom Data



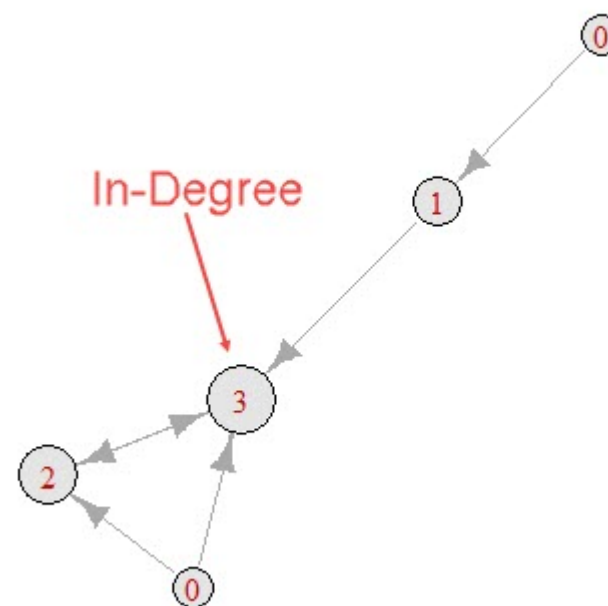
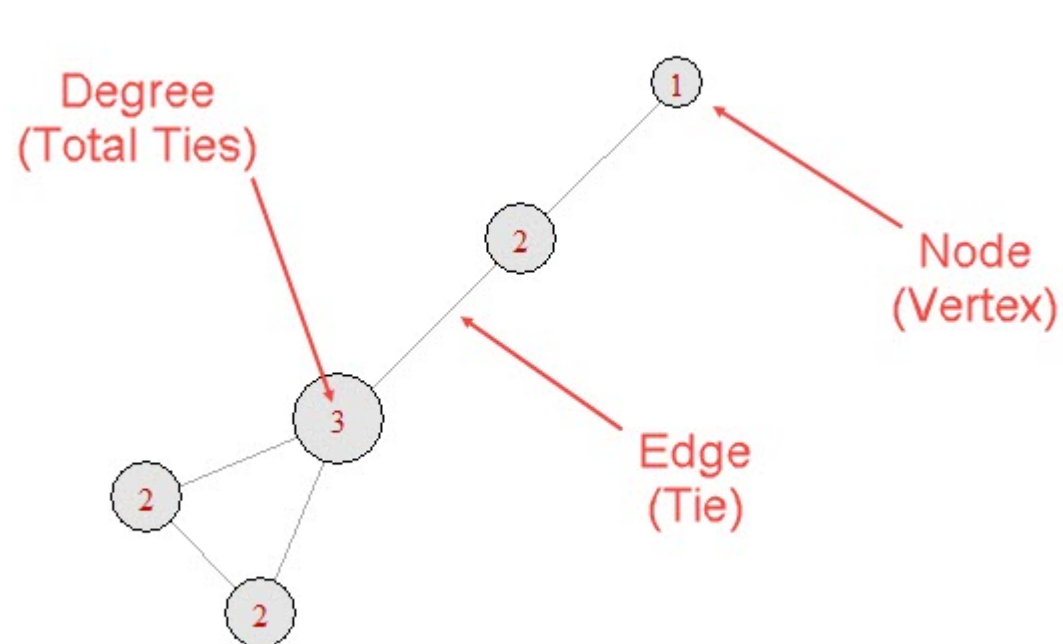
# Tools and Process

- Collect Data (Qualtrics)
- Clean Data (Excel)
- Descriptive Statistics (R/Kumu)
- Visualizations (R/Kumu)
- Modeling (R)



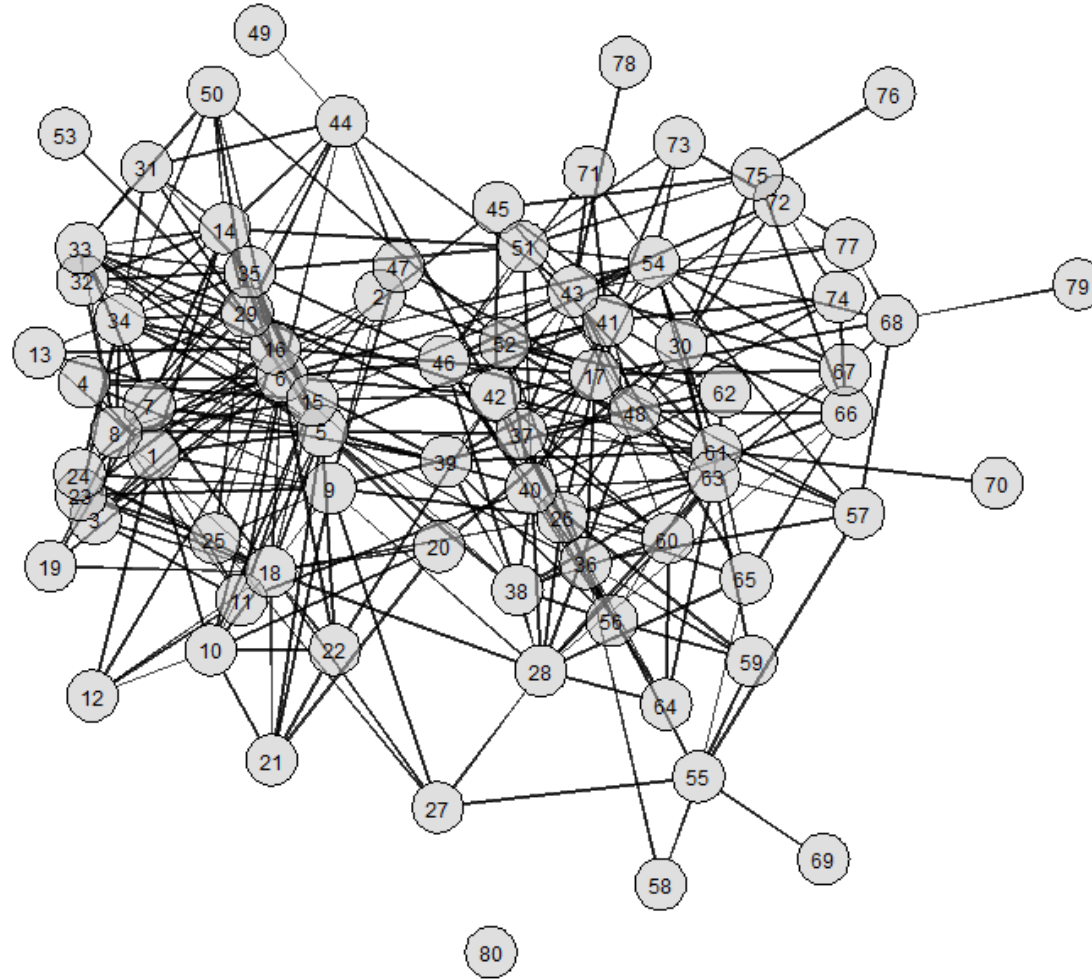
# What's a Network?

A group or system of interconnected people or things.

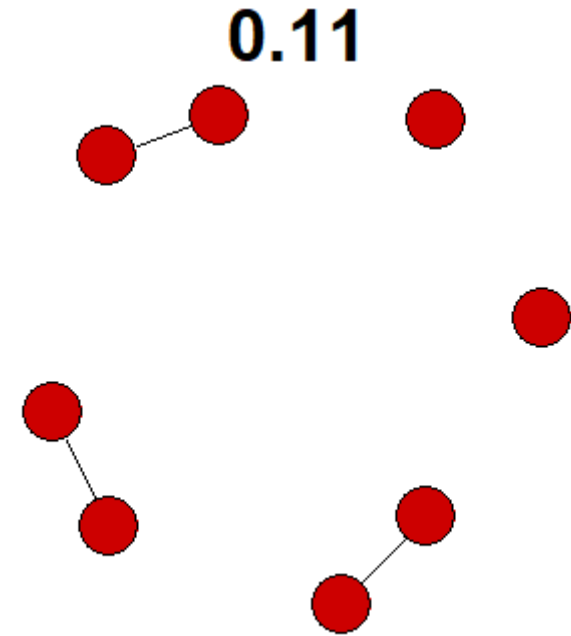
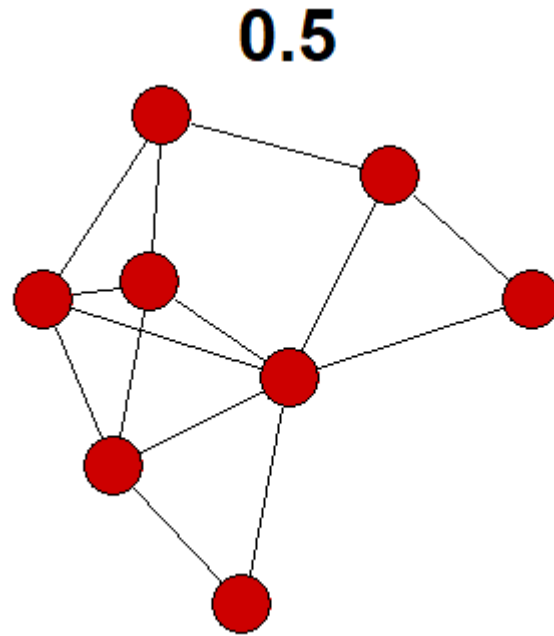
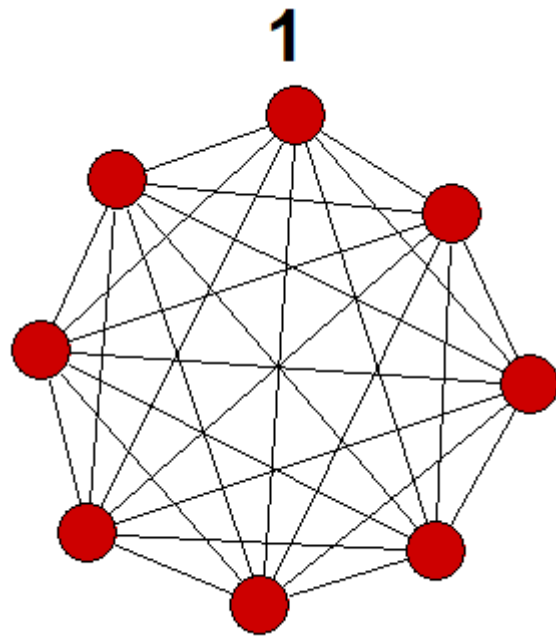


# Basic Network Statistics

- 80 nodes
- 339 edges
- 2 components
- 1 isolate



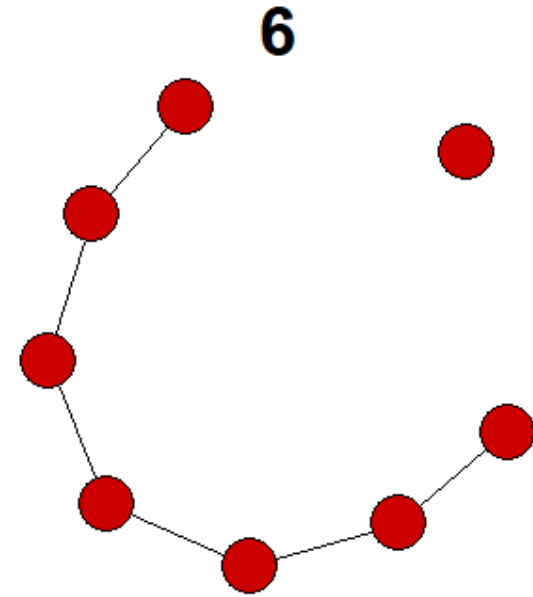
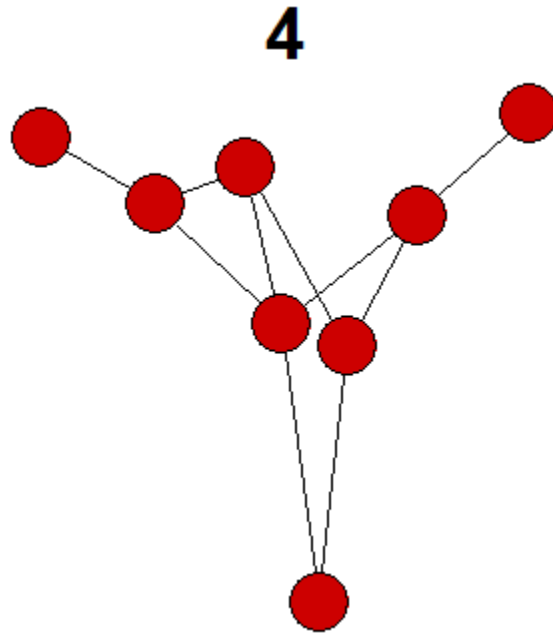
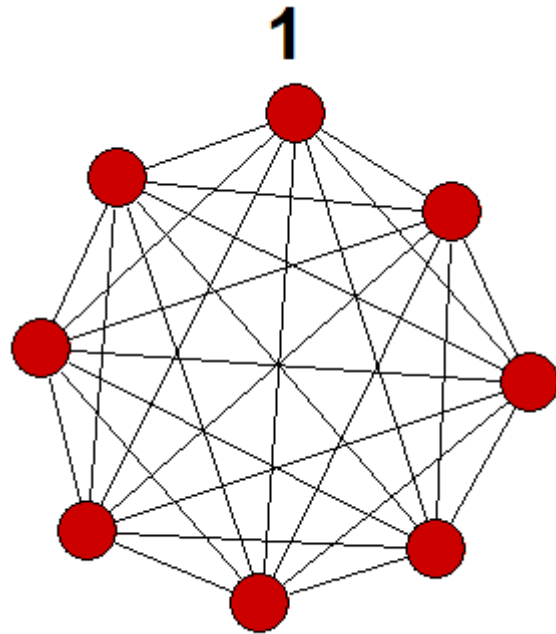
# Basic Network Statistics: Density



Density = the proportion of observed edges to possible edges



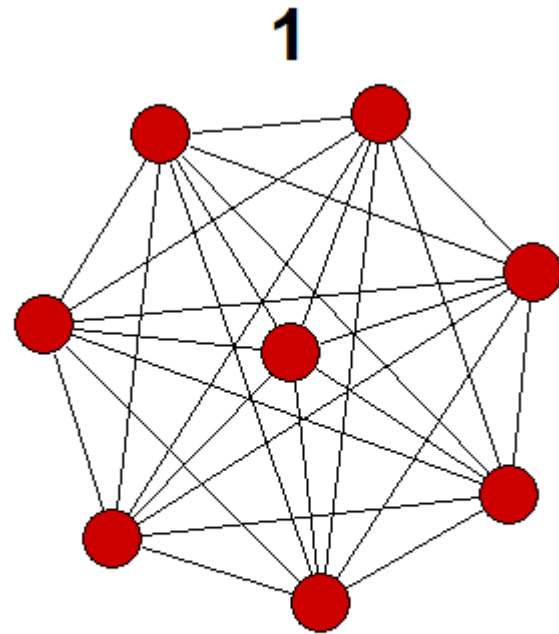
# Basic Network Statistics: Diameter



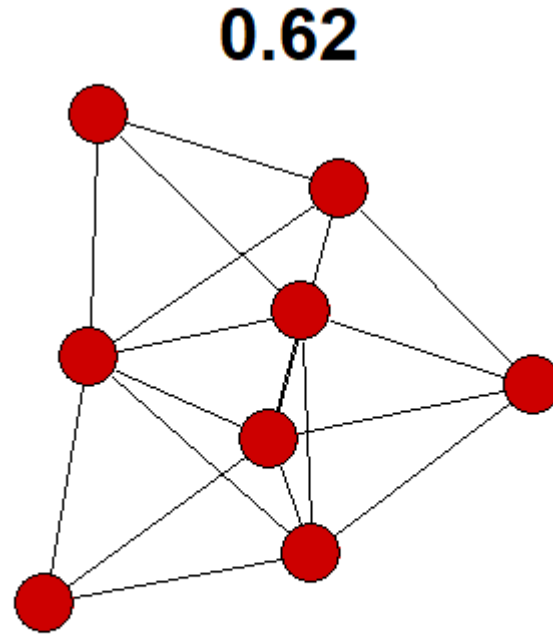
Diameter = the shortest longest path



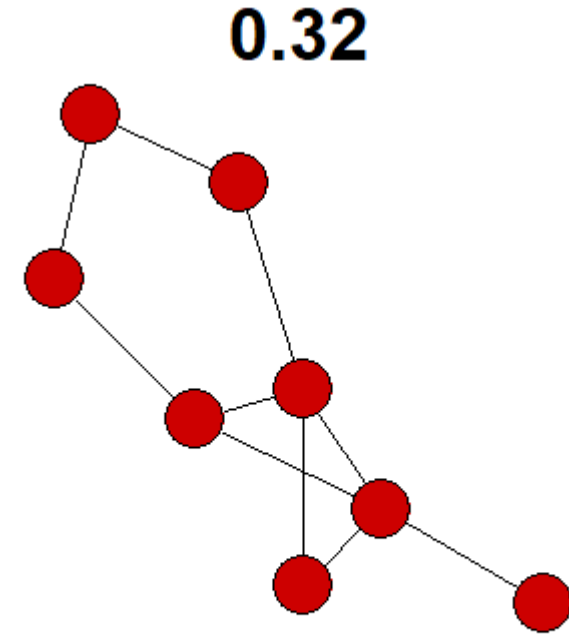
# Basic Network Statistics: Transitivity



56 Triangles



14 Triangles



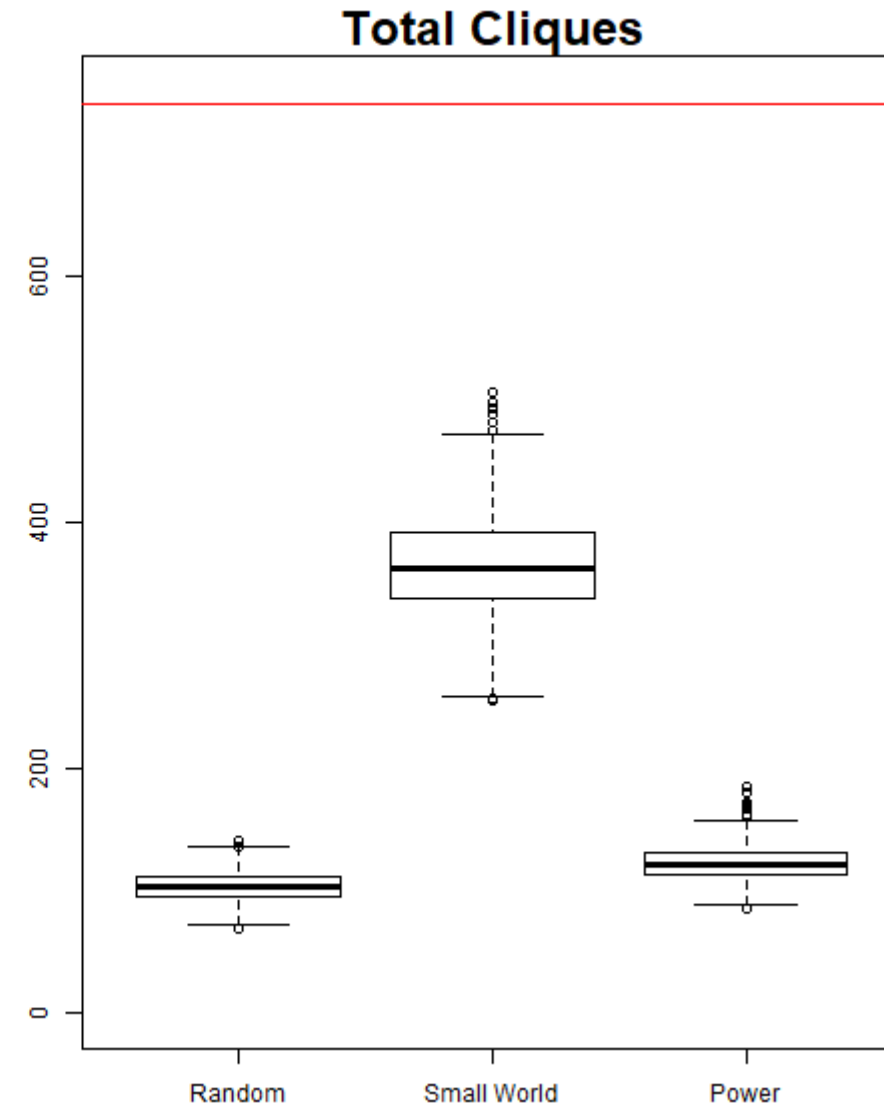
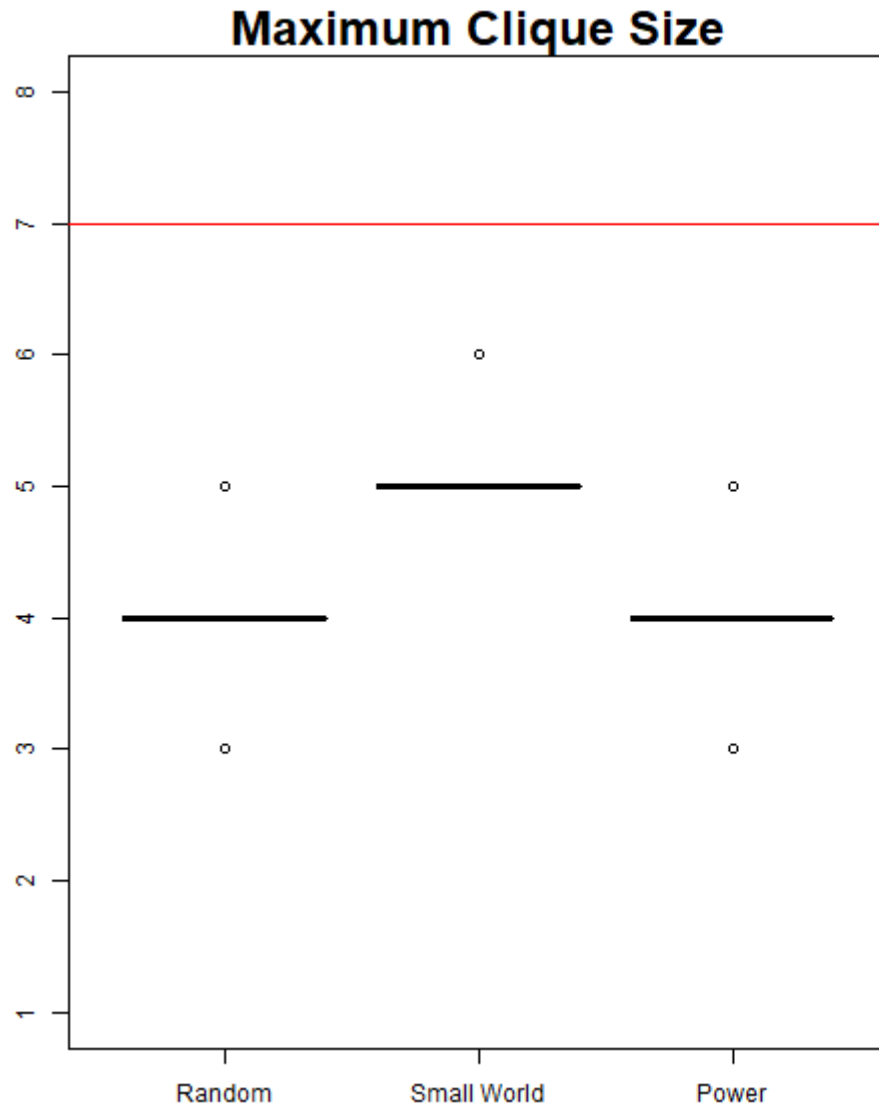
2 Triangles

Transitivity = the proportion of closed triangles to possible triangles

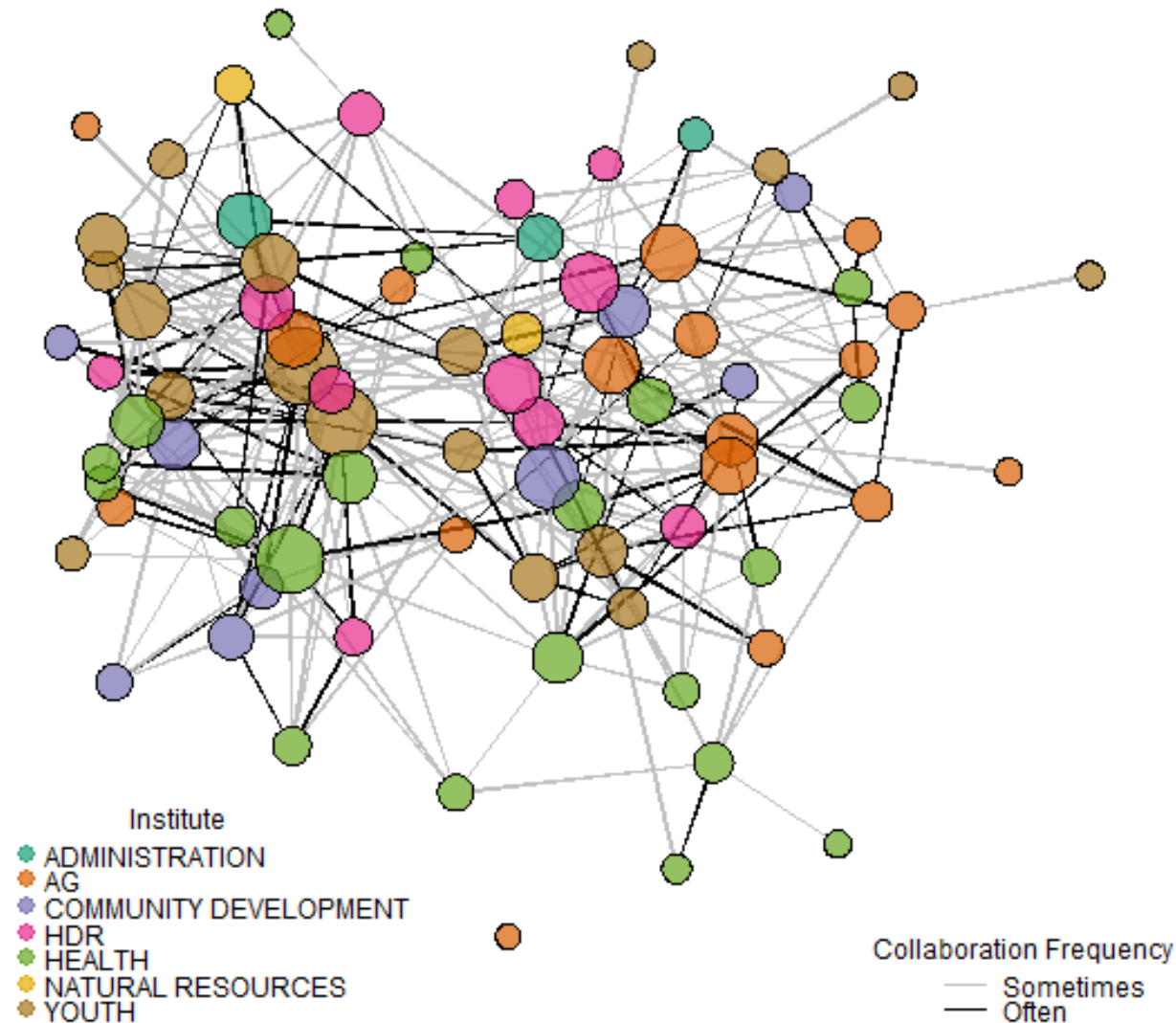




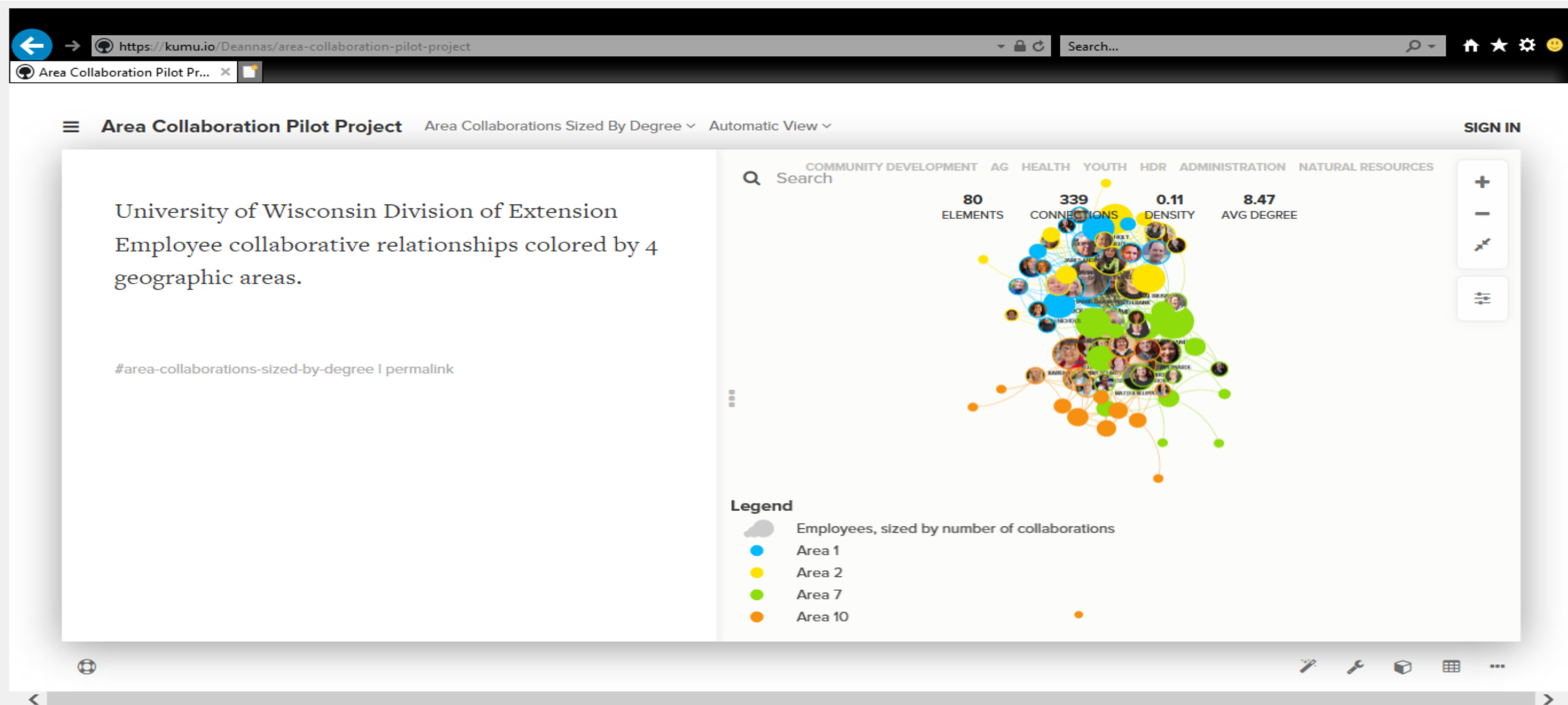
# Clique Comparison



# Visualizing Our Network – Institute Affiliation

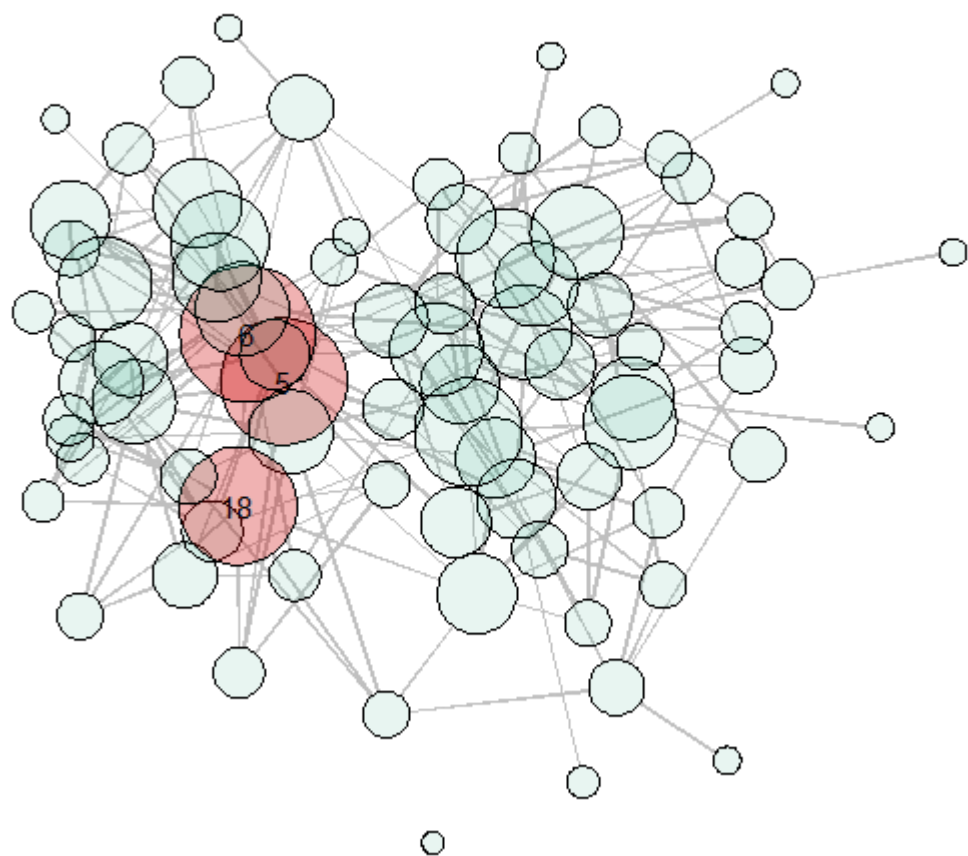


<https://kumu.io>

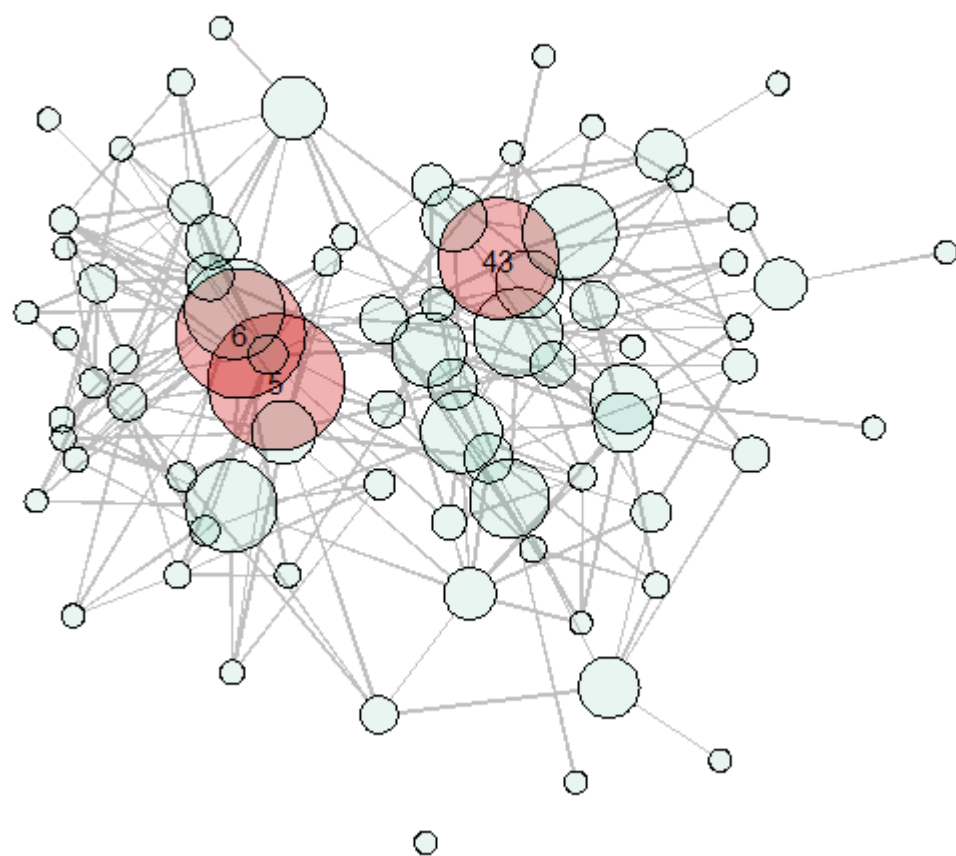


# Actor Prominence

**Degree**



**Betweenness**



# Inspecting Our Prominent Actors

ID	Area	Location	Department	Institute	Sex	Years in Job
5	1	IRON	YFCD	YOUTH	M	6.69
6	1	ASHLAND	YFCD	YOUTH	M	13.32
18	1	ASHLAND	YFCD	HEALTH	F	0.1
43	10	OUTAGAMIE	YFCD	HDR	F	28.53



## Modeling with ERGM

- Exponential Random Graph Model
- Defines probabilities of ties between 2 nodes
- Based on node, edge, and network structure characteristics.
- Interpreted like logistic regression models



# Some cautions

- Correlation, not causation
- We can only model the data we have
- Networks are fluid. Our model is static.



# The Final Fitted Model

TERM	ESTIMATE	P-VALUE
edges	-6.0198056	< 1e-04 ***
No. of Zoom Minutes	0.0015947	0.00868 **
No. of Zoom Participants	-0.0698162	0.00994 **
Faculty > Academic Staff	0.6368449	< 1e-04 ***
Limited > Academic Staff	0.8557039	< 1e-04 ***
Matching Employee Class	0.3055619	0.01302 *
Matching Area 1	1.6459646	< 1e-04 ***
Matching Area 10	1.3329971	< 1e-04 ***
Matching Area 2	1.6425401	< 1e-04 ***
Matching Area 7	1.1366766	< 1e-04 ***
Matching County	1.9273653	< 1e-04 ***
Matching Department	0.2871169	0.02873 *
Matching Institute	1.7435603	< 1e-04 ***
Amount of Communication	0.3389310	0.00150 **
No. Of Shared Collaborators	0.5946841	< 1e-04 ***





# Odds Ratios

TERM	LOWER	ODDS RATIO	UPPER
Matching County	4.79	6.87	9.85
Matching Institute	4.36	5.72	7.50
Matching Area 1	3.86	5.19	6.97
Matching Area 2	3.81	5.17	4.05
Matching Area 10	2.83	3.79	5.09
Matching Area 7	2.40	3.12	4.05
Limited > Academic Staff	1.6	2.5	3.41
Faculty > Academic Staff	1.63	1.90	2.20
No. of Shared Collaborators	1.64	1.81	2.00
Freq. of Communication	1.14	1.40	1.73
Matching Employee Class	1.07	1.36	1.73
Matching Department	1.03	1.33	1.72
No. of Zoom Minutes	1.000	1.002	1.003
No. of Zoom Participants	0.88	0.93	0.98
Edges	0.0002	0.0024	0.0031



# Will they collaborate?

## Health & Well-Being Academic Staff

- 1000 minutes in Zoom meetings with 20 participants

Communicate  
weekly



3 colleagues in  
common

Likelihood of  
collaborating

**1.9%**



## Community Development Academic Staff

- 100 minutes in Zoom meetings with 2 participants



# Will they collaborate?

## Health & Well-Being Academic Staff

- 1000 minutes in Zoom meetings with 20 participants

Communicate  
weekly



3 colleagues in  
common

Likelihood of  
collaborating

9.9%



## Health & Well-Being Academic Staff

- 100 minutes in Zoom meetings with 2 participants



# Will they collaborate?

## Health & Well-Being Academic Staff

- 1000 minutes in Zoom meetings with 20 participants

Communicate  
weekly



3 colleagues in  
common



Likelihood of  
collaborating

**79.6%**



## Health & Well-Being Academic Staff

- 100 minutes in Zoom meetings with 2 participants



# Final Thoughts

Network analysis is:

- Relatively easy to do
- Interesting and understandable

helps us:

- Understand how people are connected
- See who is left out
- Predict relationships in our network



# THANK YOU



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