Social Network Analysis for Investigating and Supporting Implementation

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Acknowledgements

Agenda

Social Networks 101

Social Network Analysis (SNA) in Implementation

Network Interventions for Implementation

Resources
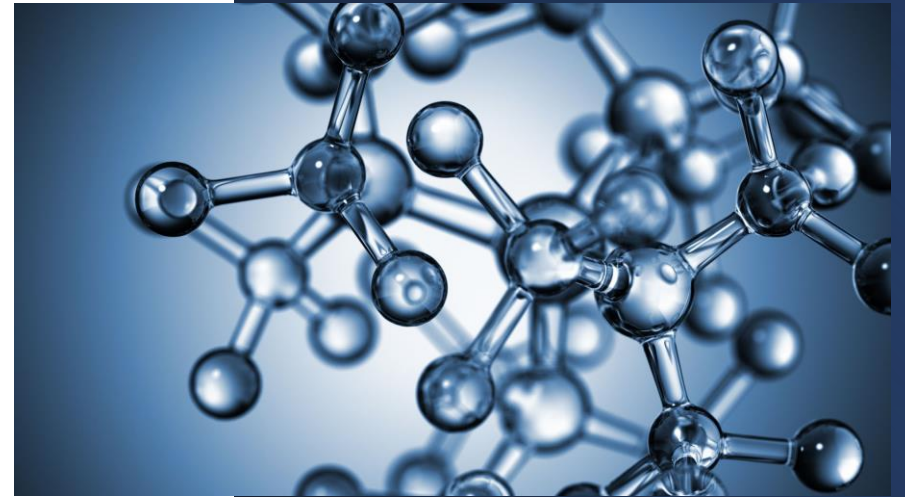
1. Social Networks 101

Social Network Analysis (SNA)

- A research tool for examining <u>RELATIONSHIPS</u> and interaction patterns
- Data collected at the individual level and analyzed at structural level
- We make inferences about *processes* based on *<u>structure</u>*

BOUNDARY
Delineates scope
and membership of
the network.
- Membership
- Events
- Geography
- Employment

ACTOR

Actors – individuals or organizations; denoted as
nodes/circles:

EGO = focal actor
ALTER = actors to which ego is connected

ALTERS

EGO

TIE

Ties – connections or relationship between actors;
denoted as lines with or without arrows:
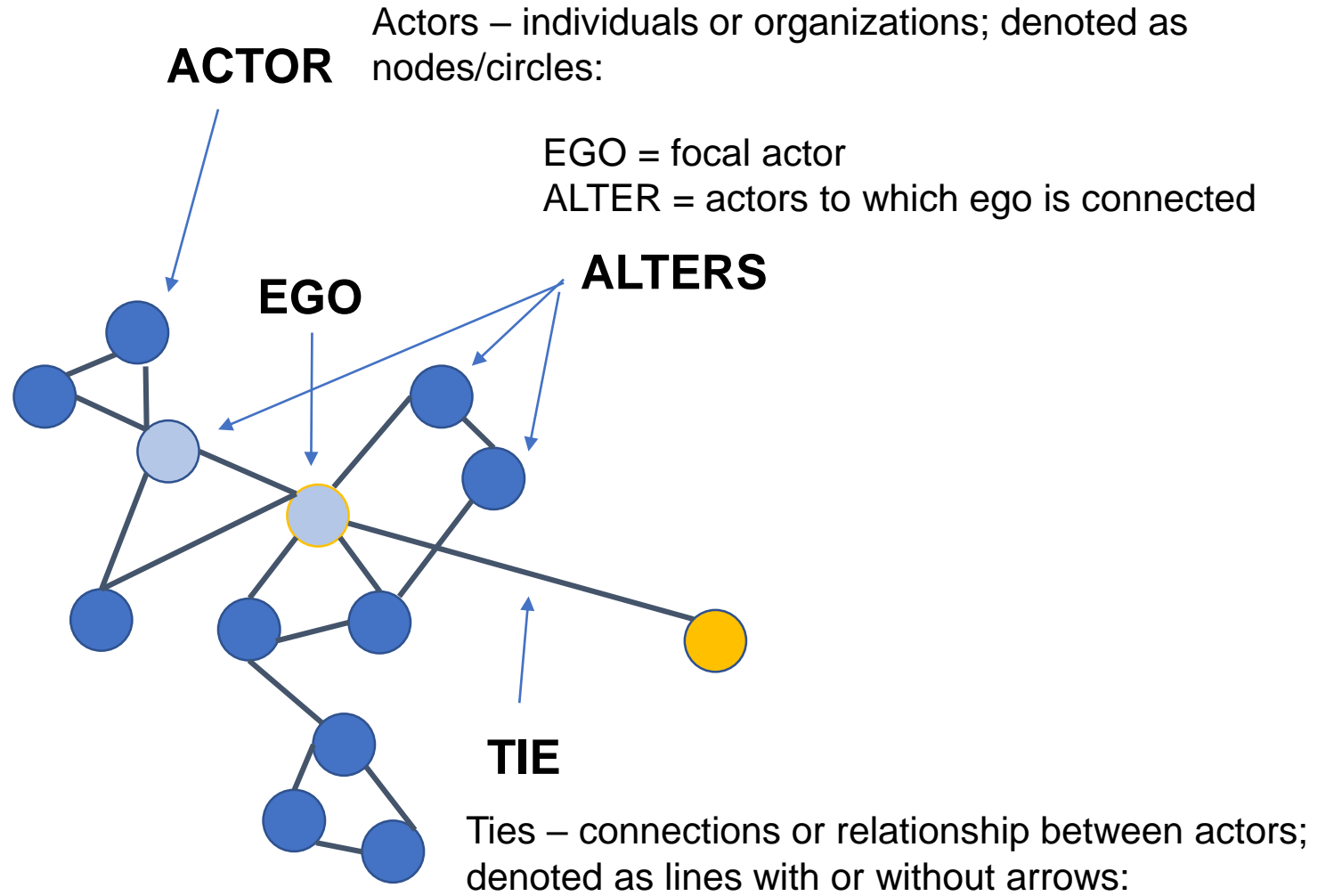
Measuring Networks & Collecting Data

- Data on **ties** among actors <u>and</u> data on actors (attributes)
  - Surveys, interviews, archival data, electronic data
- Operationalize your ties
  - Type = $, friendship, coalition membership
  - Directed/Undirected = direction of relationship
  - Binary/Valued = frequency, volume, intensity

EXAMPLE

Organizational Partnership = Resource Exchanges (in past 6 mos.)

- **Client referrals** - *% of client referrals sent*
- **Information -** *% of staff that share expertise*
- **Funding** - *% of funding shared*
- **Space -** *% of physical office space shared*

Network Survey Approaches

6. Resource Exchanges - Client Referrals 2

Please think about how much your organization SENDS CLIENT REFERRALS to each of the other organizations in the network. Each organization is listed on the left. For each one, please complete the sentence below.

Possible responses range from 0% to 100%. While 0% might be very common, the 91-100% category is unlikely to ever happen but is included as a theoretical end point. For each statement, please select the range between 0% and 100% that best describes your response.

✱ 1. During the past six Months, our organization sent:

0% of our Client Referrals	1-10%	11-20%	21-30%	31-40%	41-50%	51-60%	61-70%	71-80%	81-90%	91-100% of Our Client Referrals

Rank	Column A – Names	Column B - Communication						
	Who do you turn to for professional advice about *youth with trauma histories*? Please list their name and organization in order you would contact them.	In the past 6 months, how frequently have you communicated or been in contact with this person via in-person contact, telephone, or email? *(Circle the most accurate number from the answer scale below for each person.)*						
		Not Once	1-2 times	About once/ month	About every 2 weeks	About once/ week	About daily	Many times daily
1.	Name: Organization:	1	2	3	4	5	6	7

Behind the Scenes (Data Management)

Adjacency Matrix (Symmetrical)

	A	B	C	D
A	-	1	1	0
B	1	-	1	1
C	1	1	-	0
D	0	1	0	-

Edge List

A	B
A	C
B	C
B	D
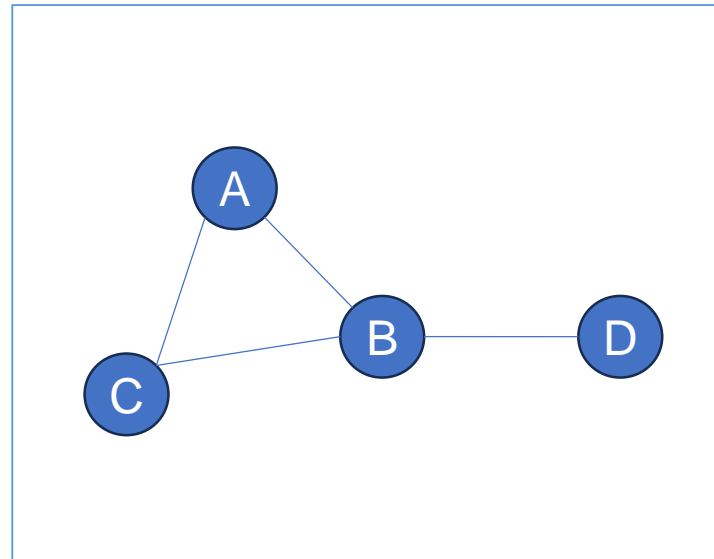
Attribute File

id	age	role
A	47	Clinician
B	57	Supervisor
C	27	Clinician
D	55	Senior Leader

Analysis

1. Network Description

- examines overall analytic network characteristics (e.g. density and diameter).

2. Network Visualization

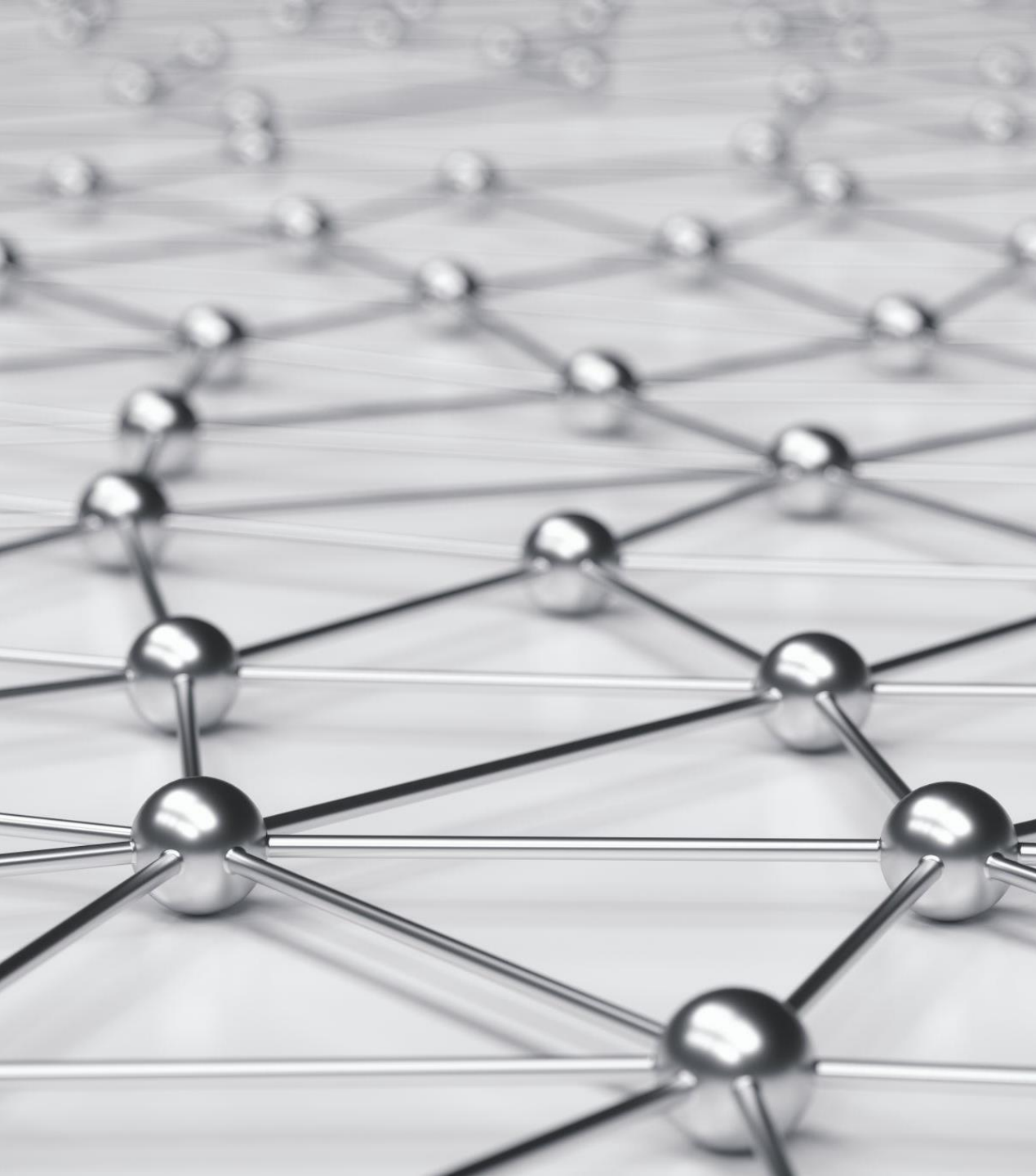- Visually describe and inspect network graphs

3. Network Modeling

- Statistical strategies for predicting the ties between nodes

Structures at Multiple Levels

- Nodes/Actors (e.g., degree)
- Dyads (e.g. tendency toward reciprocity)
- Subgroups (e.g, cliques)
- Whole Network (e.g, density)

2. Social Network Analysis in Implementation

Why Are Networks Important in Implementation?

Social ties are conduits for

- Technical information (about an innovation)
- Expertise (how to use)
- Social influence
- Resources

(Valente, 2010)

3 Questions and Approaches

1. Describe - Describe and explore network structures

2. Change/Evolution - Examine how and why networks change

3. Impact - Examine associations between network structures and outcomes (e.g. attitudes, behaviors, services, health)
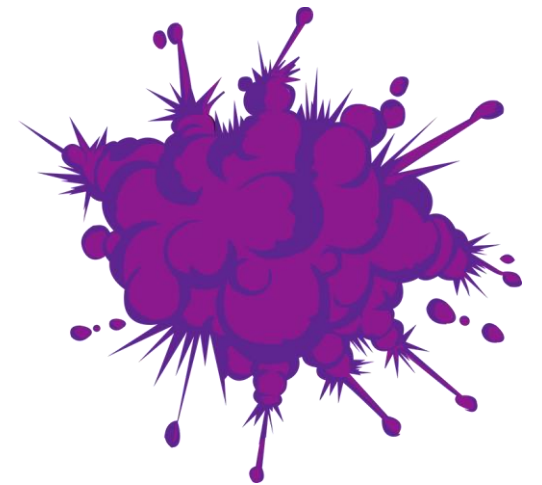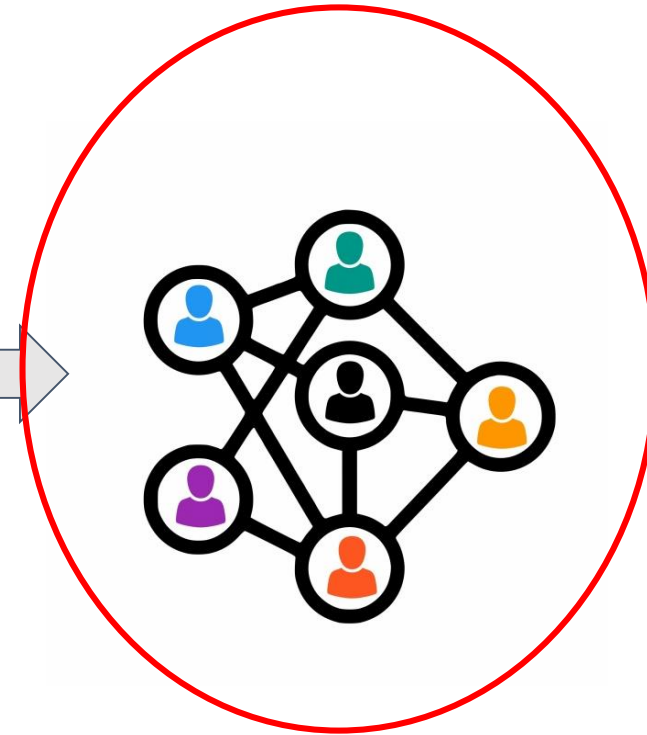
2   1   3

1. Describe Network Structure

Who Do Clinicians Rely on for Advice? How well connected are they?

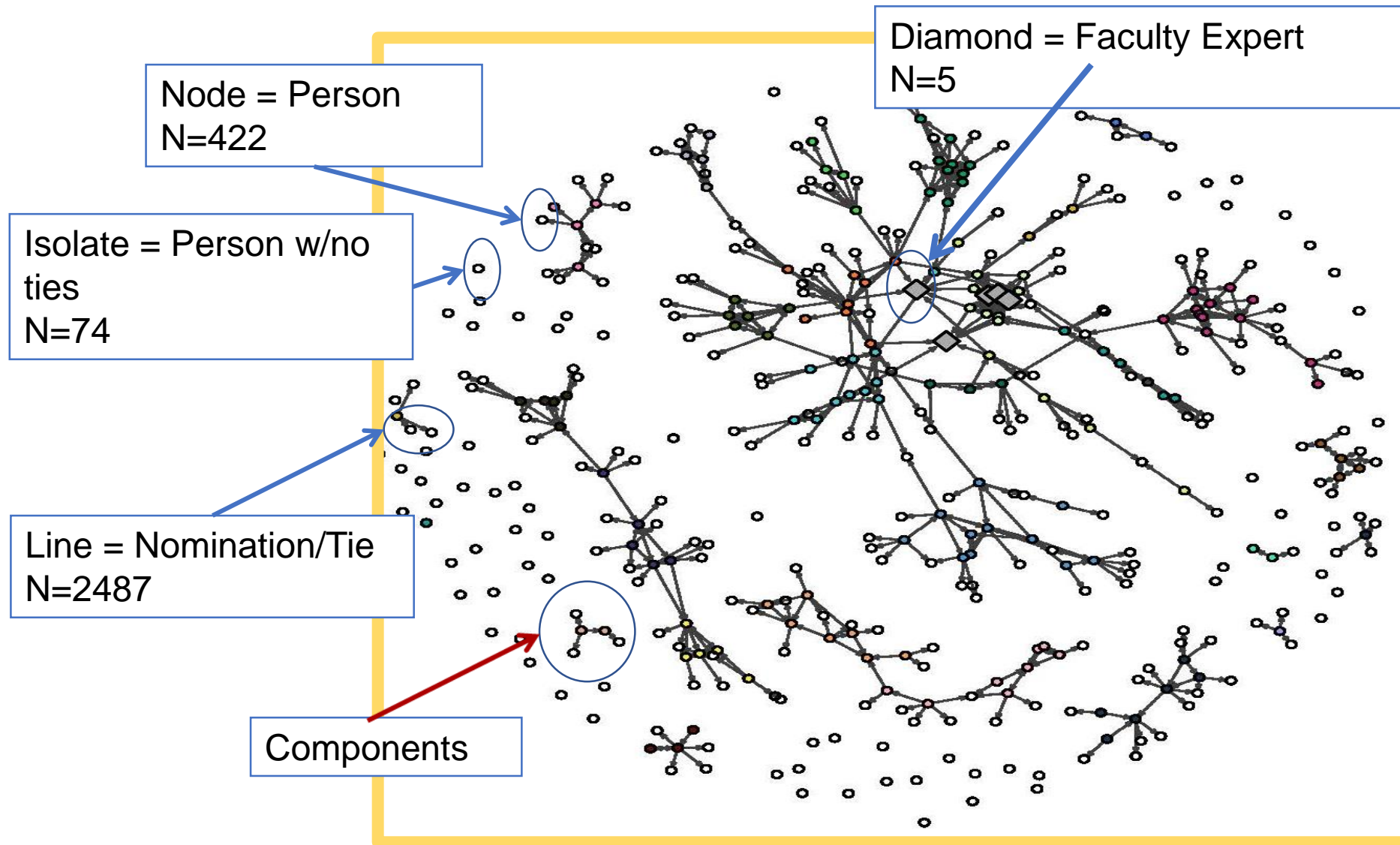| Actors	Mental health clinicians
Boundary	Employees in organizations that are going to adopt TF-CBT
Ties	General advice, TF-CBT specific advice. Directed (who do you turn to?)
Theory	Social influence
Design	Cross-Sectional (baseline)

Ego-Networks

- Clinicians turned to an average of **3.9** individuals for advice
- 72% were peers at their home agency
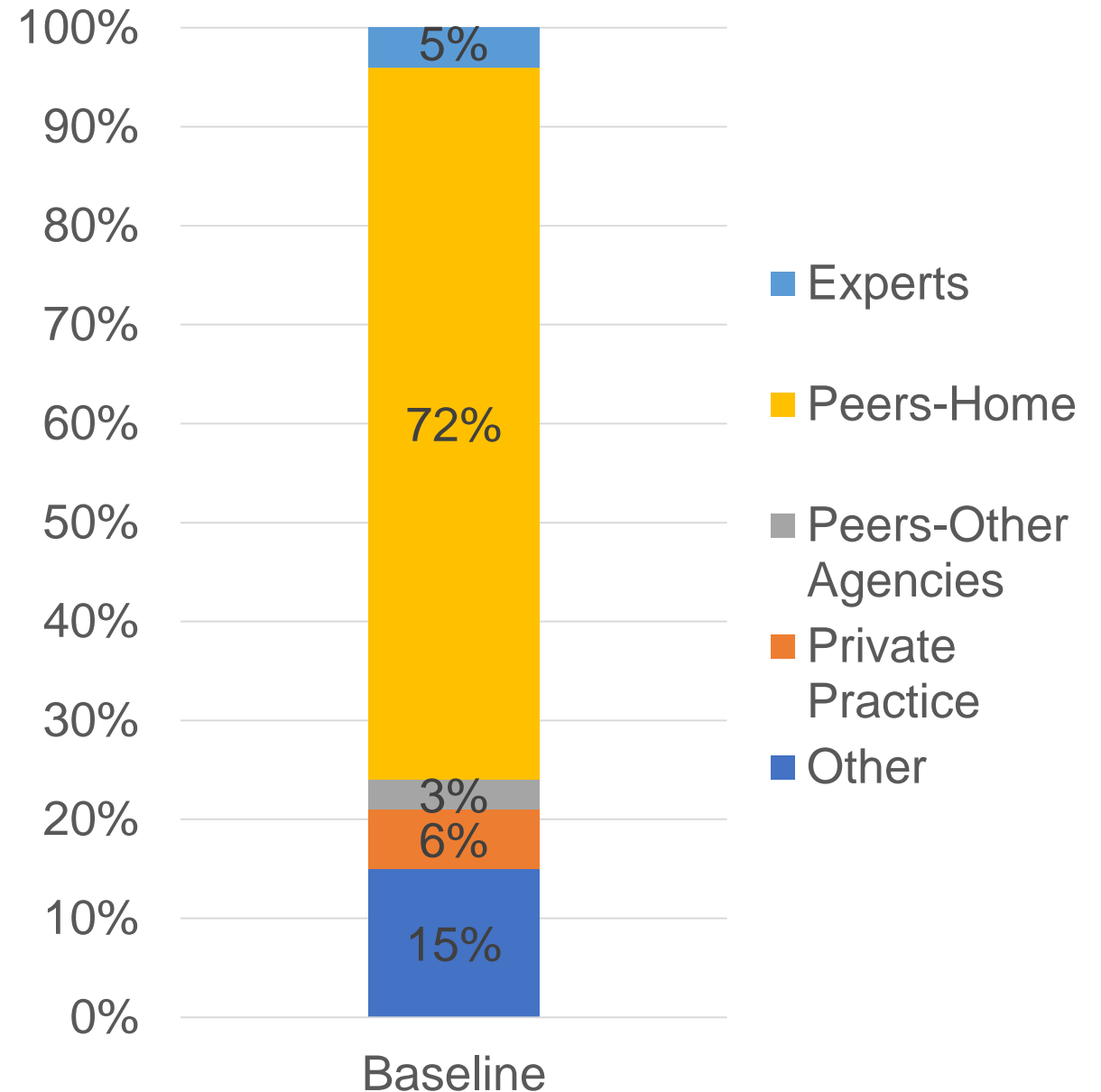
Legend:
- Experts
- Peers-Home
- Peers-Other Agencies
- Private Practice
- Other

Chart (Baseline):
- 5% Experts
- 72% Peers-Home
- 3% Peers-Other Agencies
- 6% Private Practice
- 15% Other

Whole Network Structure

Node = Person
N=422

Isolate = Person w/no ties
N=74

Line = Nomination/Tie
N=2487

Components

Diamond = Faculty Expert
N=5

Density	**0.014**
Centralization (in-degree)	**0.097**
Clustering (weighted)	**0.293**
Reciprocity	**0.164**
Weighted Reciprocity	**0.188**
Agency Homophily	**89.08**

2. Network Evolution and Change
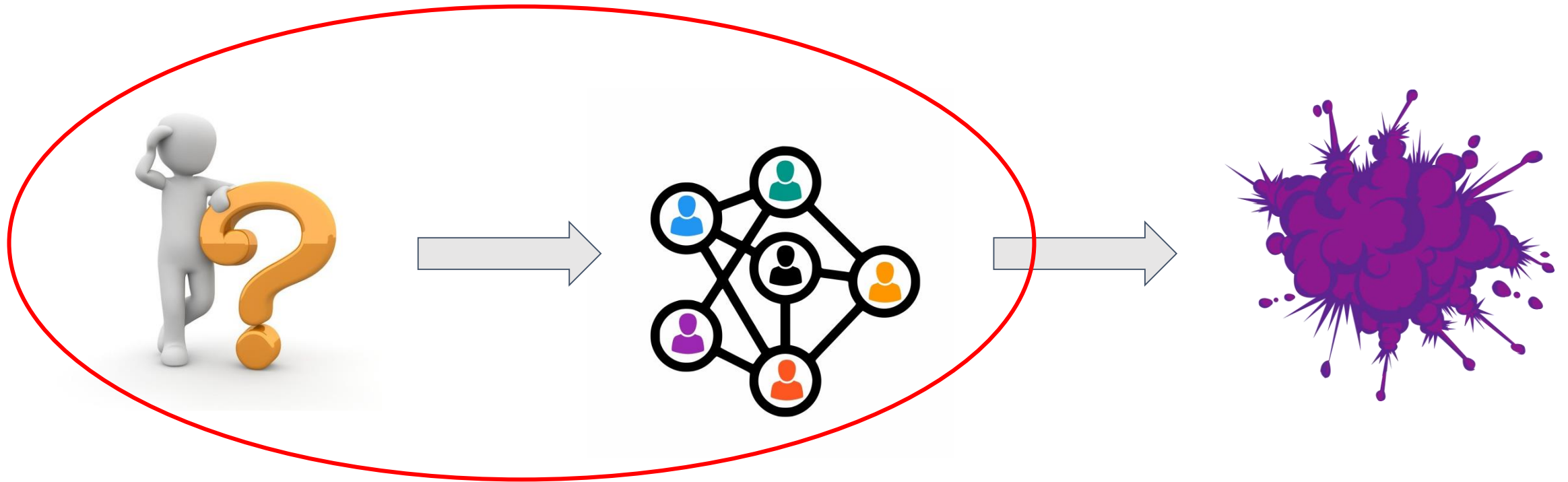
How and Why Do Networks Change During A Learning Collaborative?

Actors	Mental health clinicians
Implementation Strategies	Learning Collaboratives
Boundary	Employees participating in a LC to implement TF-CBT
Ties	General advice, TF-CBT specific advice. Directed (who do you turn to?)
Theory	Social influence, Transactive Memory Systems
Design	Pre-Post (8-10 months)

How did the network change?

Key Takeaways:
- More isolates
- More centralized
- Stronger relationships
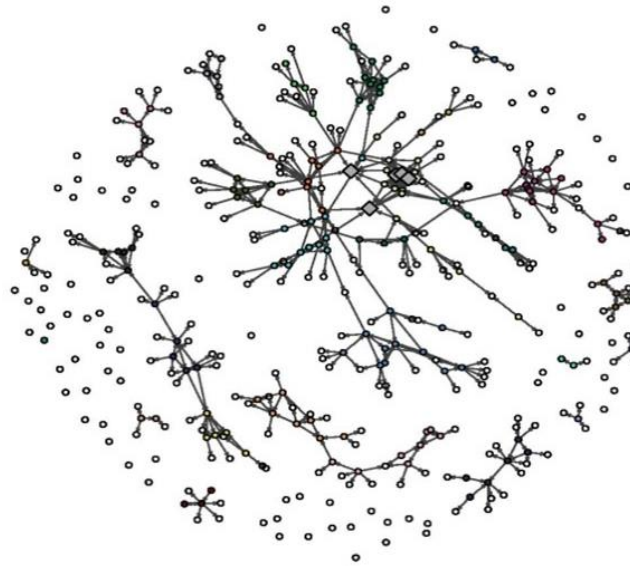
	Learning Session 1
N	422
Isolates	74
Density	0.014
Centralization (in-degree)	**0.097**
Clustering (weighted)	**0.293**
Reciprocity	**0.164**
Weighted Reciprocity	**0.188**

Bunger, A. C., Hanson, R. F., Doogan, N. J., Powell, B. J., Cao, Y., & Dunn, J. (2016). Can learning collaboratives support implementation by rewiring professional networks?. *Administration and Policy in Mental Health and Mental Health Services Research*, *43*(1), 79-92.

How Do Clinicians Decide Who to Turn To For Advice During Implementation?

Table 3 ERGM results––factors associated with formation and maintenance of advice-seeking ties

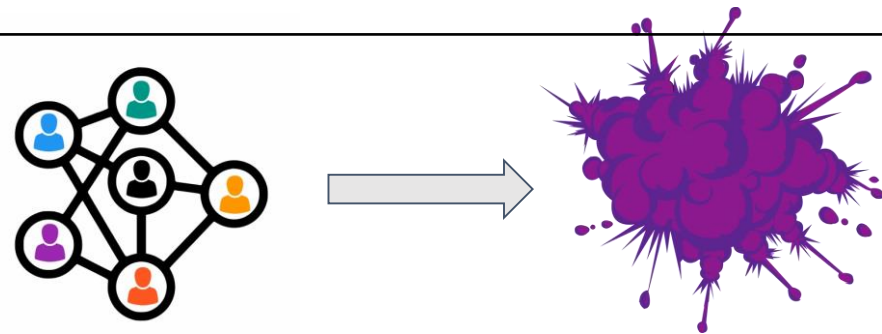| Characteristic	Feature of	General advice-seeking		Specific advice-seeking	
		est	se	est	se
Expertise quality (H1)					
Senior lead	Advice source	0.321	(0.301)	0.187	(0.370)
Supervisor	Advice source	0.822*	(0.226)	1.092*	(0.223)
Faculty expert	Advice source	4.185*	(0.305)	4.242*	(0.305)
Prior training	Advice source	0.146	(0.210)	0.170	(0.193)
Alter higher experience	Dyad	0.245	(0.234)	0.644*	(0.208)
Accessibility (H2)					
Same agency	Dyad	2.818*	(0.249)	2.683*	(0.273)
Same cohort	Dyad	0.265	(0.194)	0.256	(0.215)
Same field	Dyad	0.329*	(0.166)	0.372*	(0.187)
Expertise need (H3)					
Senior leader	Advice seeker	−0.381	(0.306)	−0.288	(0.306)
Supervisor	Advice seeker	−0.072	(0.233)	0.075	(0.226)
Prior training	Advice seeker	−0.293	(0.174)	−0.200	(0.181)
Experience	Advice seeker	0.116	(0.098)	0.053	(0.106)
Existing relationships (H4)					
General ties lag	Dyad	1.996*	(0.244)	1.515*	(0.259)
Specific ties lag	Dyad	0.817*	(0.213)	1.379*	(0.340)
Reciprocity	Dyad	2.083*	(0.353)	1.213*	(0.420)
Transitivity	Triad	0.624	(0.636)	0.991*	(0.119)
gwesp.alpha	Triad	2.164*	(0.149)	0.847*	(0.115)
3-cycles	Triad	−0.988*	(0.274)	−0.876*	(0.266)
Edges (density)		−7.078*	(0.497)	−6.887*	(0.520)

Key Takeaways:

- Expertise Quality is Important – faculty experts and supervisors.

- Accessibility is key – same organization, same discipline

- We build on prior relationships

- Role didn't matter

Bunger, A. C., Doogan, N., Hanson, R. F., & Birken, S. A. (2018). Advice-seeking during implementation: a network study of clinicians participating in a learning collaborative. *Implementation Science, 13*(1), 1-12.

2. Impact of Networks
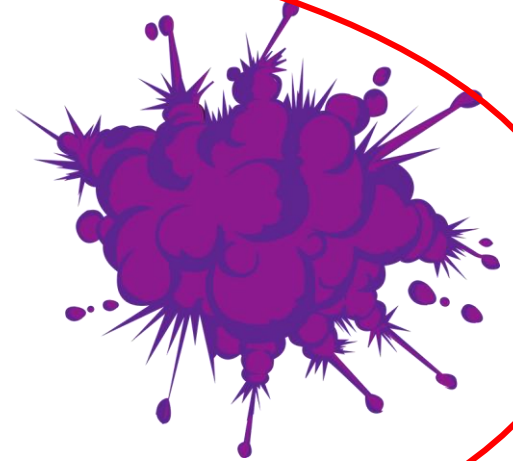
How does exposure to peers' attitudes in the workplace shape clinicians' own attitudes toward measurement-based care?

Actors	Mental health clinicians
Boundary	Employees at an organization implementing MBC
Ties	Advice sharing, discussion, friendship (binary, undirected)
Theory	Social influence
Design	Cross-Sectional (baseline)

Bunger, A.C., Navarro, E.I. & Lewis, C.C. (2021) How Do Peers Shape Mental Health Clinicians' Attitudes Toward New Treatments? *Adm Policy Ment Health* 48, 440–449. https://doi.org/10.1007/s10488-020-01096-1

Which types of interactions are most powerful for shaping attitudes?

Workplace relationships:

1. Advice Seeking - highly influential, technical information
2. Informal Discussion - common, day-to-day
3. Friendship - strong, positive and negative views

Analysis: Linear network autocorrelation model (LNAM)

DV: attitudes

IV: Exposure (peers' attitudes); ties

Clinicians tended to have more positive attitudes with greater exposure to peers with positive attitudes through advice-sharing and informal workplace discussions, but not through friendships.

Bunger, A.C., Navarro, E.I. & Lewis, C.C. (2021) How Do Peers Shape Mental Health Clinicians' Attitudes Toward New Treatments? *Adm Policy Ment Health* 48, 440–449.
https://doi.org/10.1007/s10488-020-01096-1

3. Network Interventions for Implementation

We Can Build Networks

- **Network Interventions**: "Purposeful efforts to use social networks or social network data" (Valente, 2012, p. 49)

Individuals	**Segmentation**	**Induction**	****Alteration**
• Identify champions to promote behavior change	• Identify groups/communities that will change at the same time.	• Depends on networks to stimulate interactions, and promote diffusion	• Change the network (add/delete nodes, links, or rewire links)

Implementation Strategies Change Networks

| Build a coalition | Create new teams |
| Promote network weaving | Create a learning collaborative |
| Develop academic partnerships | Develop Resource Sharing Agreements |

THE NETWORK ENVIRONMENT

ACTOR

Actor-Based Strategies
4. Change Skills (social skills training)
5. Change Knowledge (network maps)
6. Change Prominence (designate champion)
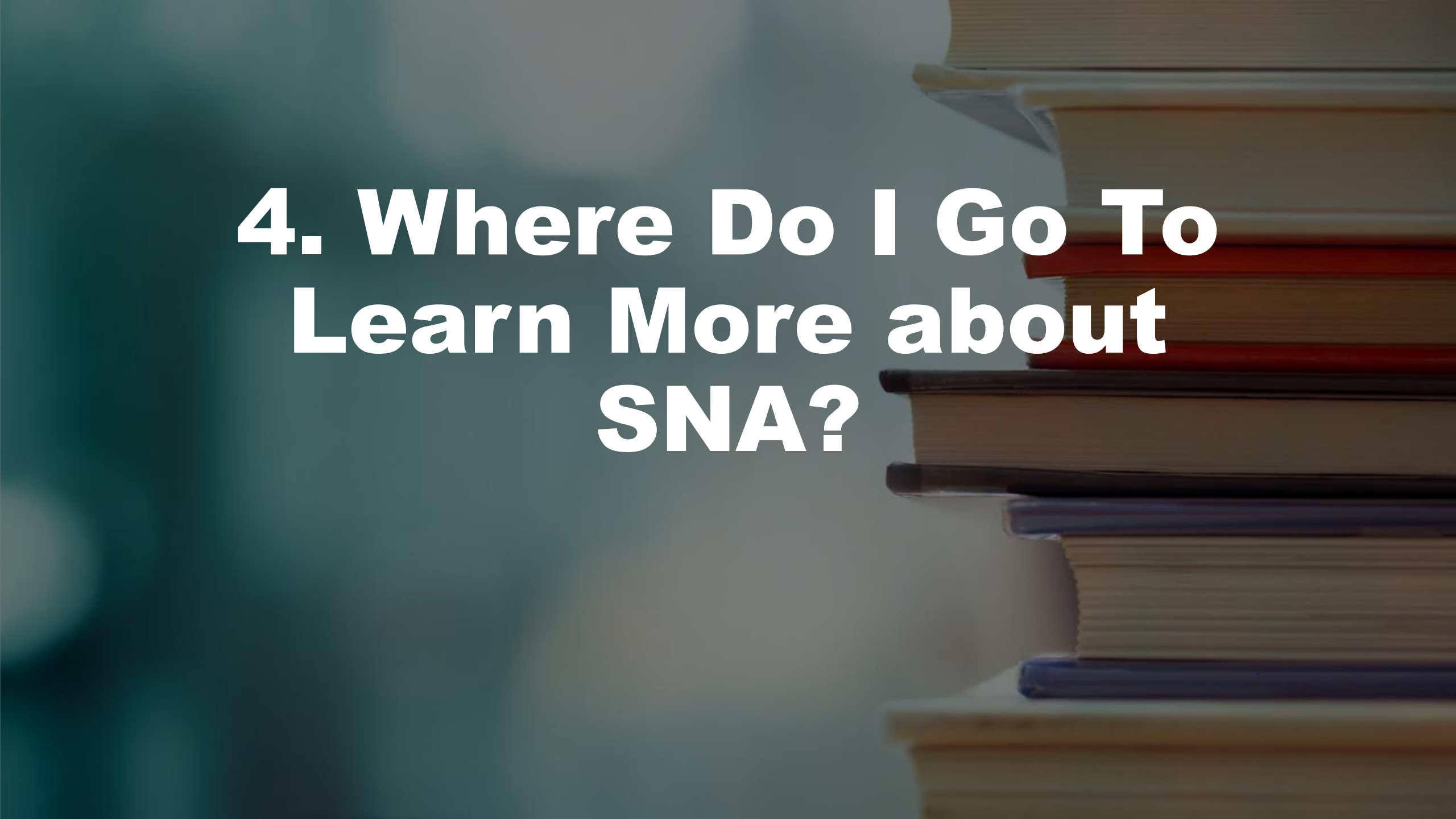7. Change Motivation (incentive)

Context-Based Strategies
1. Create Groups (e.g, coalition)
2. Change the Environment (community need)
3. Change the Composition (introduce a mentor)

TIE
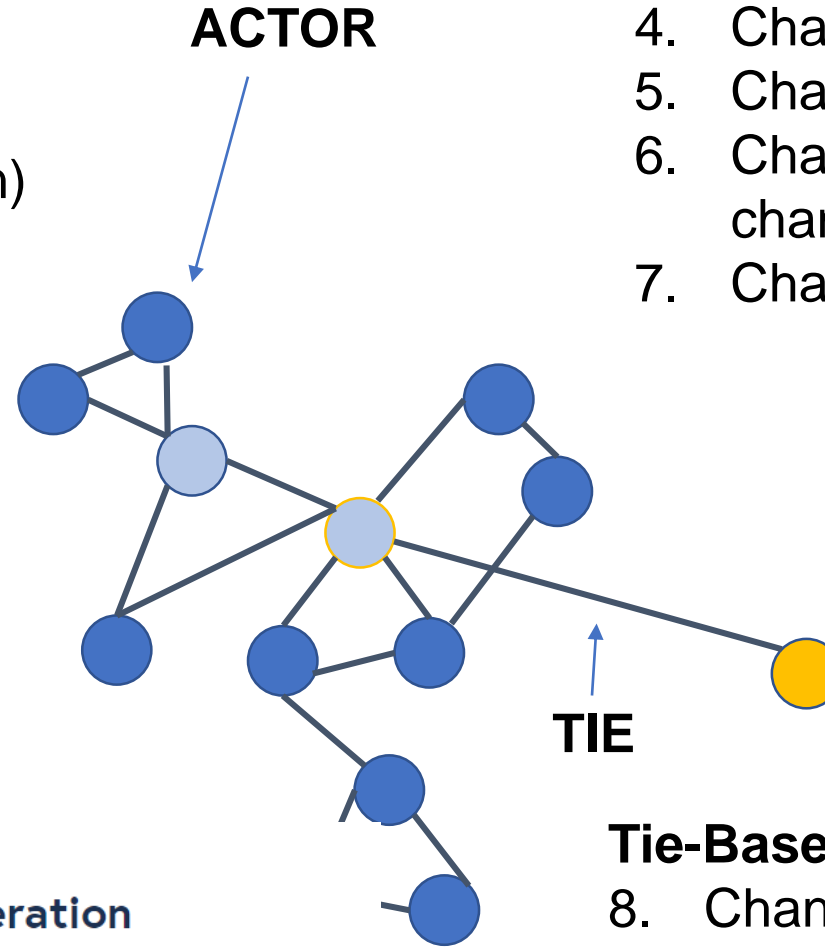
Tie-Based Strategies
8. Change Specific pairwise tie or type of relationship (broker, pair-up)

Developing a typology of network alteration strategies for implementation: a scoping review and iterative synthesis

Alicia C. Bunger ✉, Reza Yousefi-Nooraie, Keith Warren, Qiuchang Cao, Porooshat Dadgostar & Tatiana E. Bustos

4. Where Do I Go To Learn More about SNA?

Helpful Resources (not an endorsement)

Online

Visible Network Labs – Social Network Analysis 101: Ultimate Guide
https://visiblenetworklabs.com/guides/social-network-analysis-101/

Introduction to Social Network Methods (Hanneman & Riddle):
http://www.faculty.ucr.edu/~hanneman/nettext/

Software

Gephi – Visualization (free)

Ucinet – Visualization, description, some hypothesis testing (modest fee)

R/Statnet – network modeling (free)

Thanks!