Social Networks and Interactions over the Life Course

Thomas W. Valente, PhD

Professor

Department of Population & Public Health Sciences

Director, Center for Applied Network Analysis

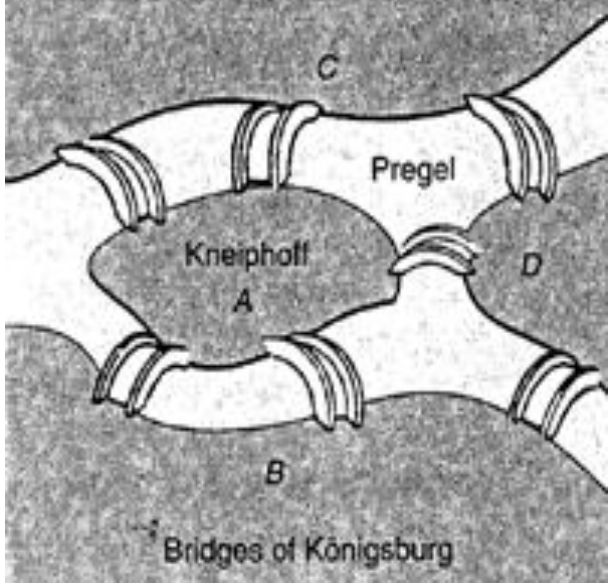
Keck School of Medicine

University of Southern California

tvalente@usc.edu

What is a Network?

- A set of relationships connecting units
  - Friendships in schools or online
  - Trading relations among countries
  - Exchanges between firms
  - Advice seeking within an organization
  - Joint participation in events/activities
  - Re-tweets on Twitter
  - Amazon book recommendations
  - ……


C
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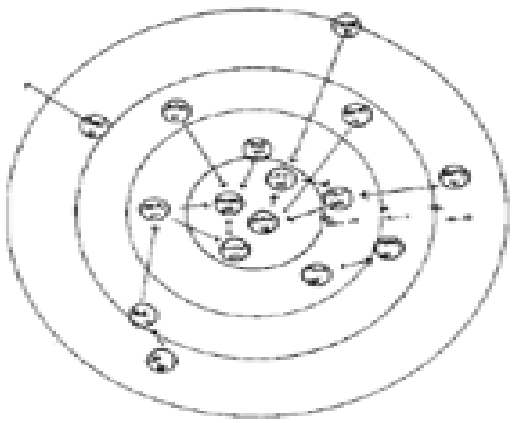
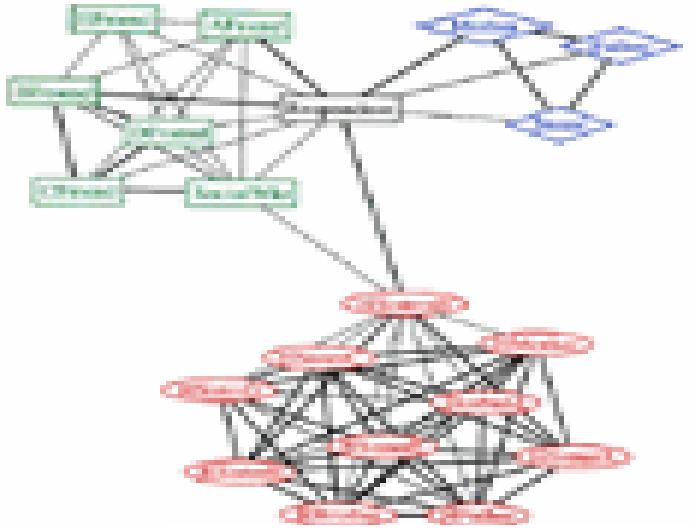
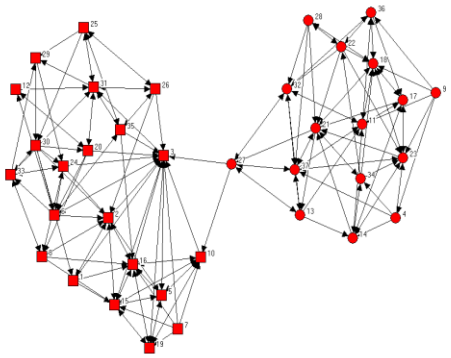
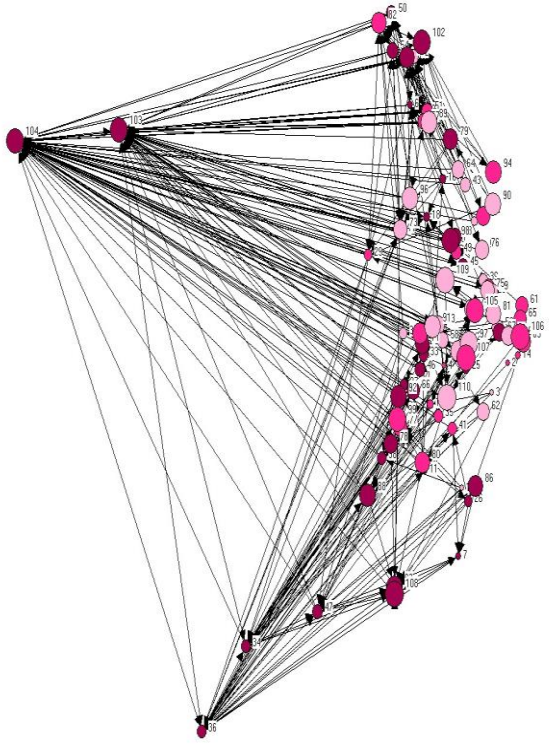
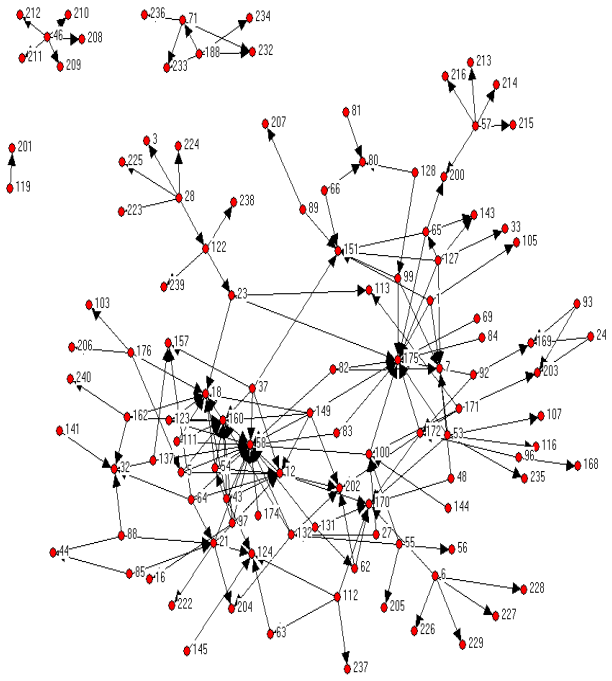
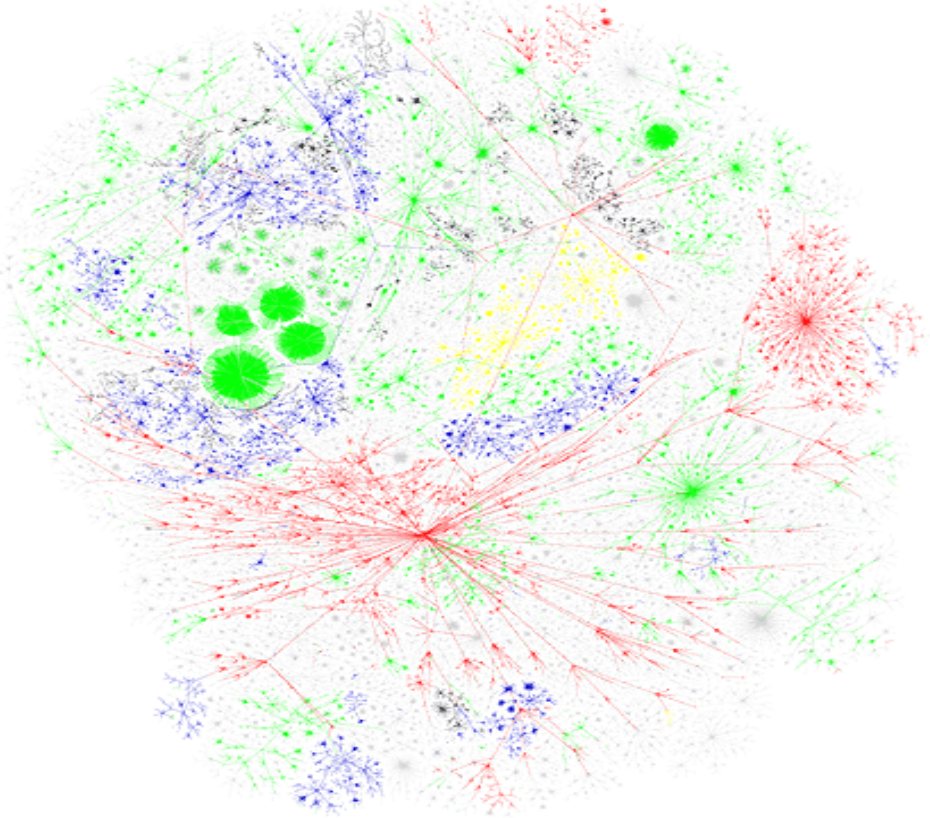




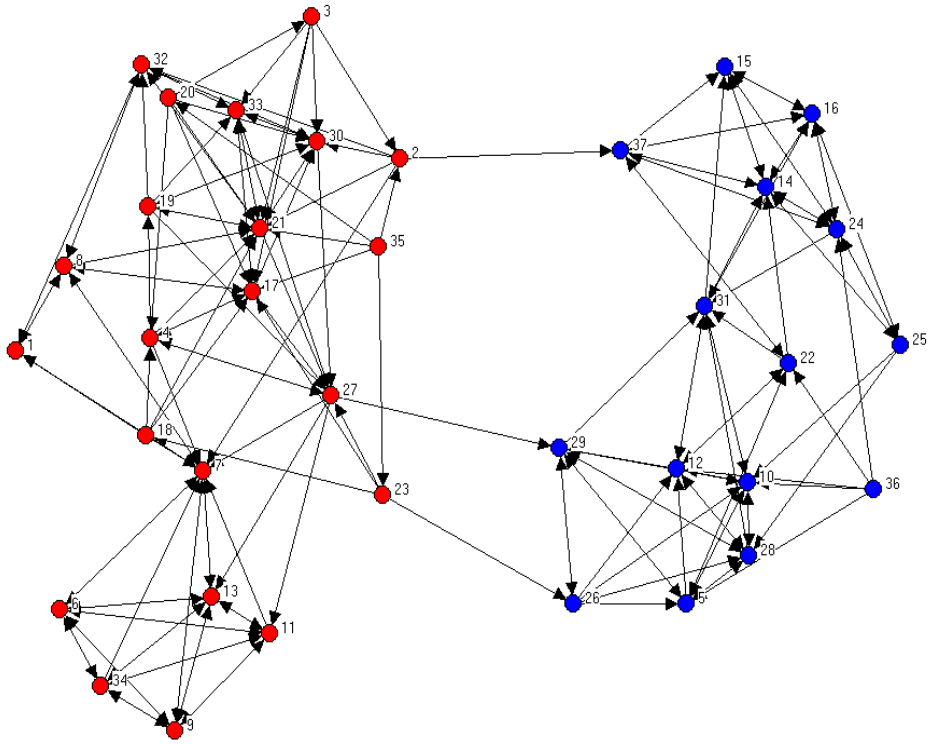


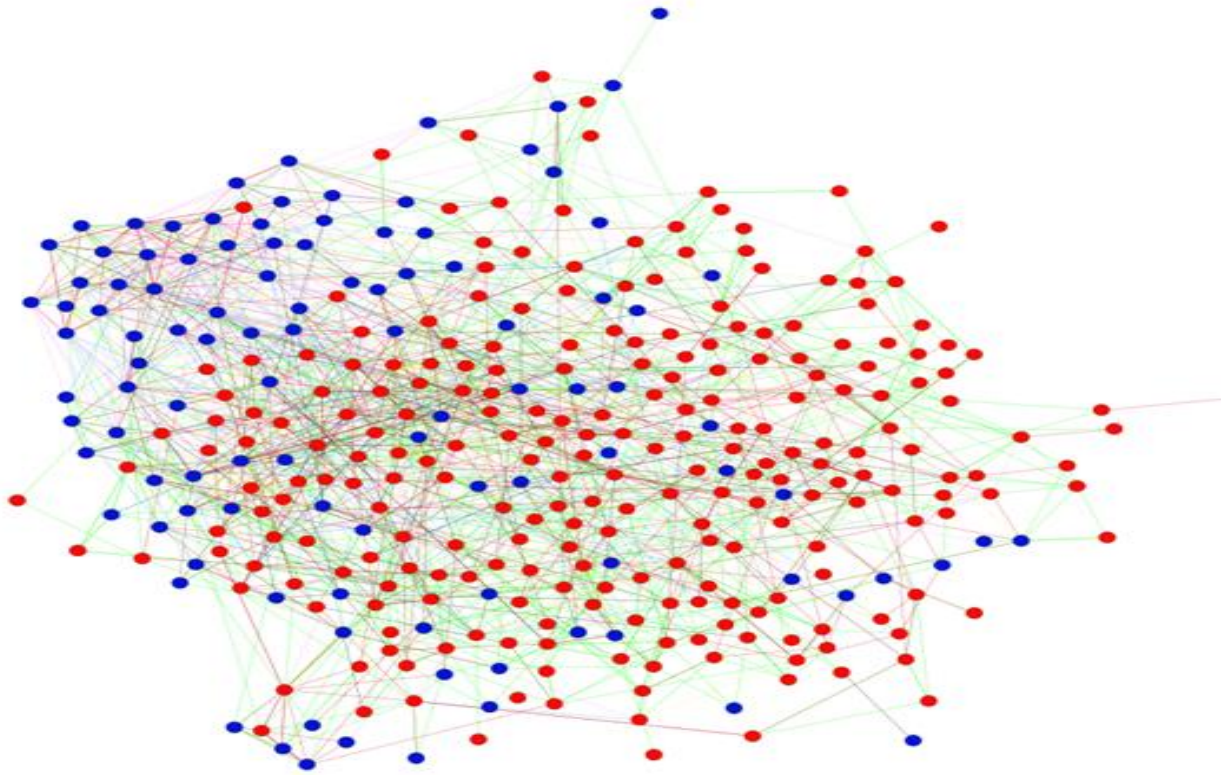






Friendships Among Students at 12 and 15 yrs.



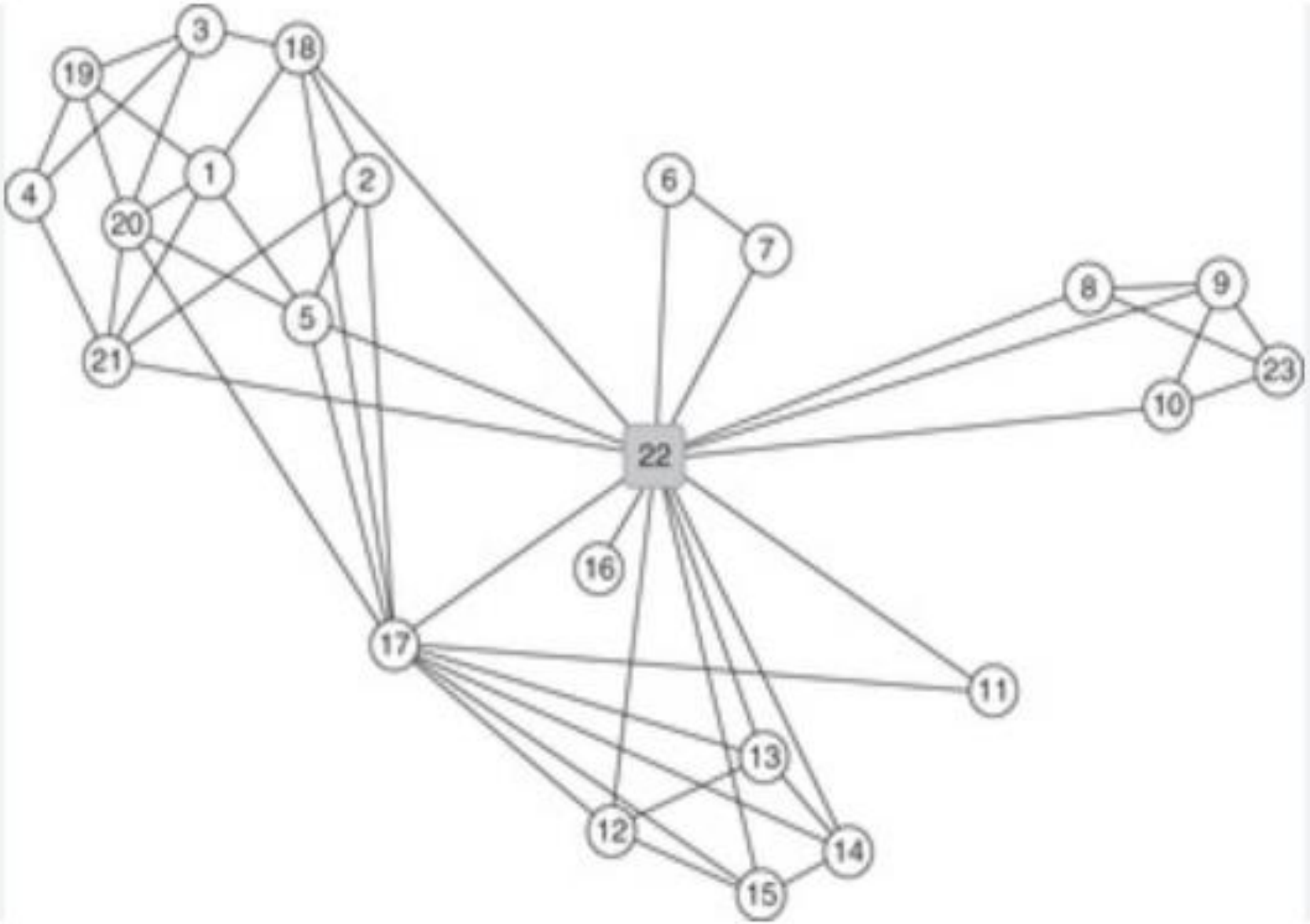


What do we know about human networks

1) Homophilous (like sorts with like)
2) Reciprocal (ties point in both directions)
3) Transitive (friends of my friends become friends)
4) Scale Free (some people are popular)
5) Clustered (groups form into communities)
6) Small World (overall (average) path distance is shorter than expected)

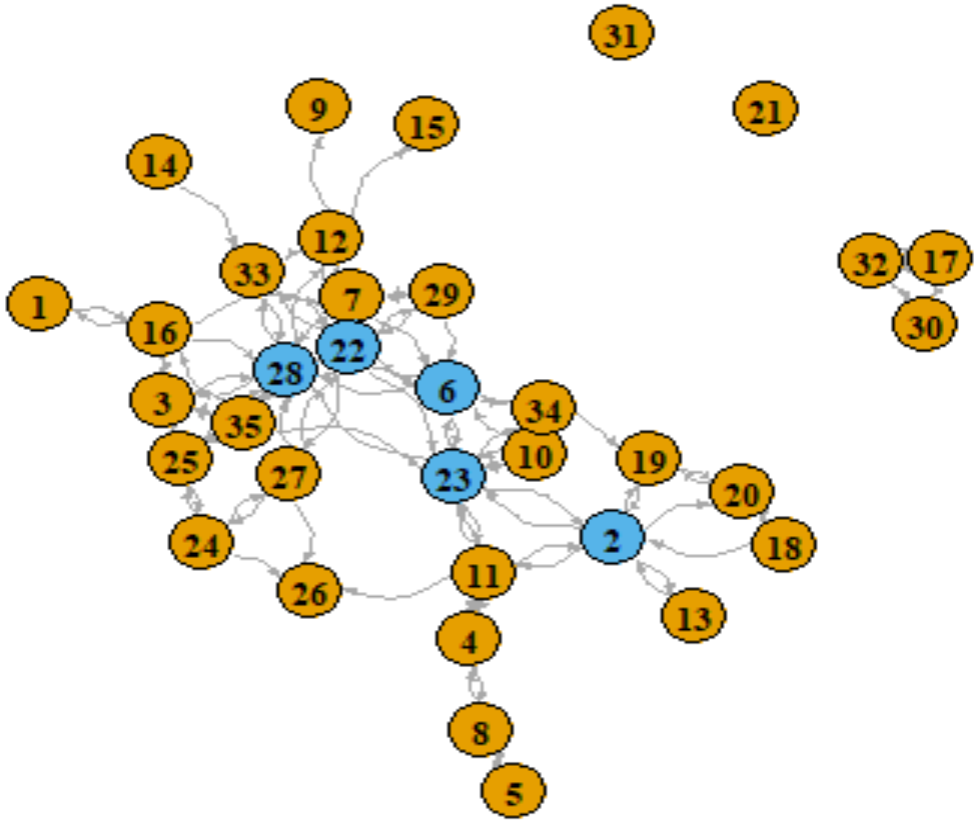
Network Analysis Data Collection Types

	A. General	B. Specific
1. Survey	Roles	Standard survey questions
2. Egocentric	Roles pre-determined	Name Generator
3. Sequenced	Random walk of alters	Snowball/RDS
4. Census	Nominations w/n a bounded community	Roster of community/org.
5. Two-mode (bipartite)	Joint participation in activities/events	Membership attendance lists



Ego-centric data collected from randomly sampled individuals. Perry et al., (2018). Egocentric network analysis: Foundations, methods, and models. Cambridge University Press.

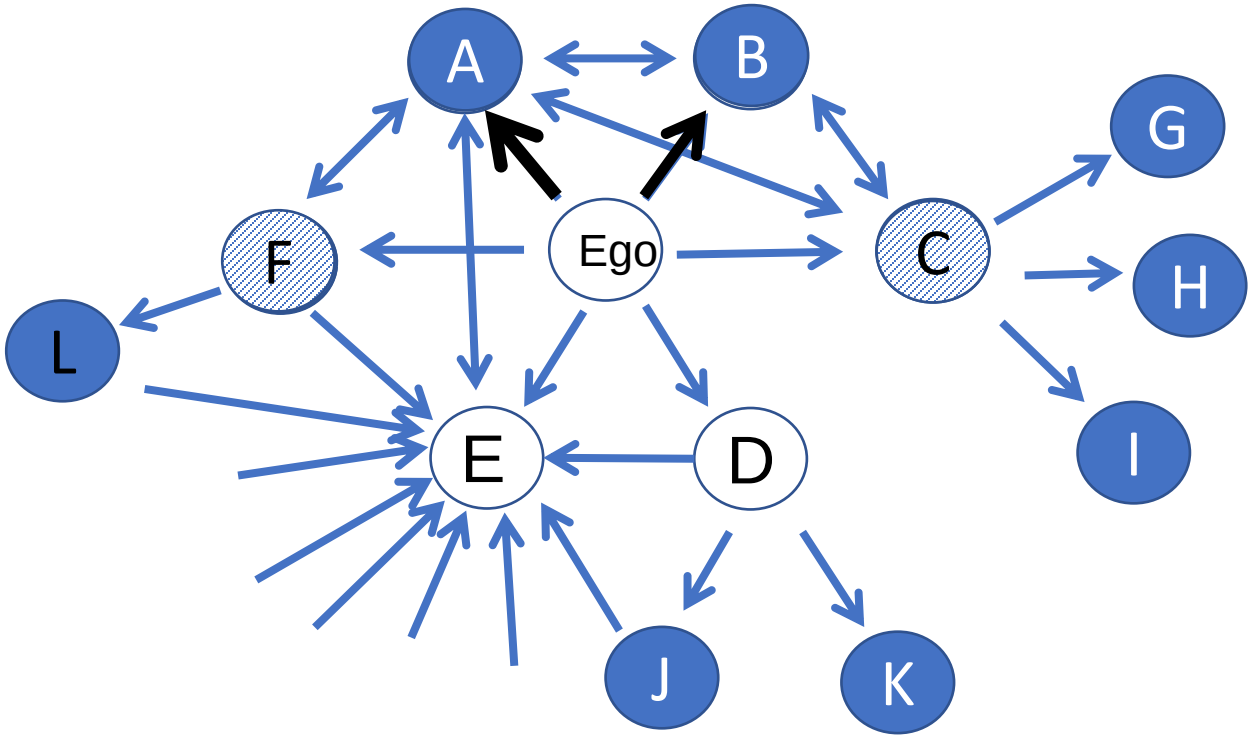
E.g., “who do you talk to about important matters”



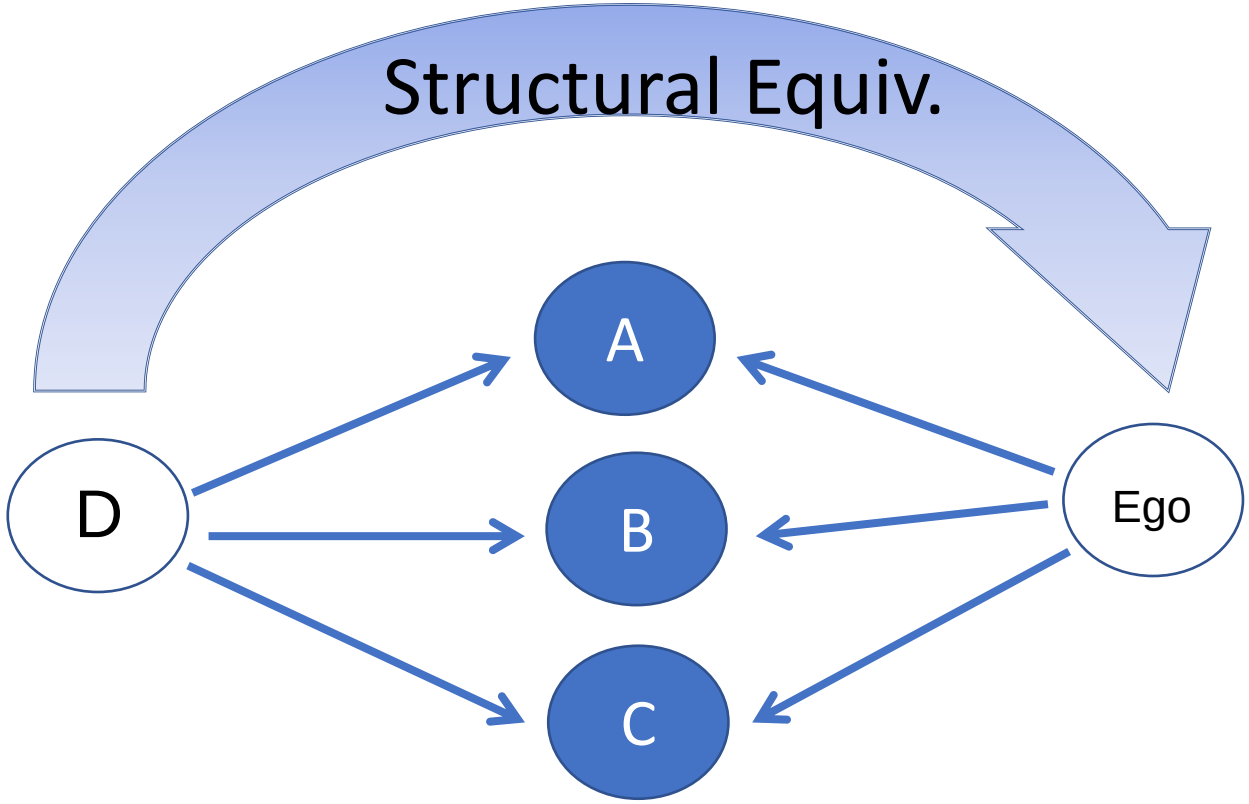
Sociometric data collected from a census within a closed community.

E.g., organizations, schools, small towns, electronic traces, etc.

Ego Network with 6 Alters

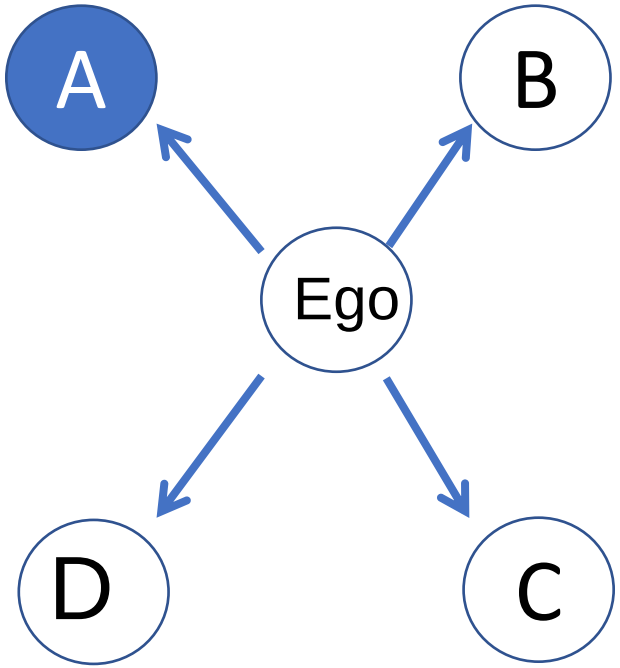


Structural Equivalence is Associated with Influence

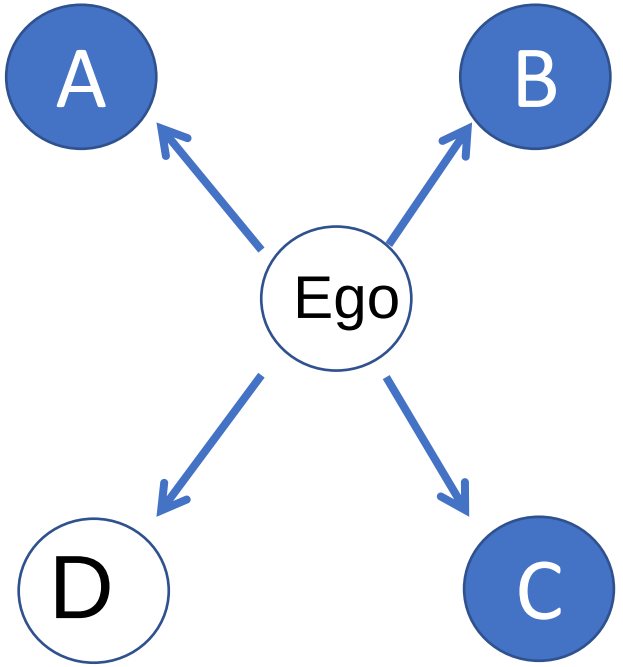


Individuals Have Varying Thresholds

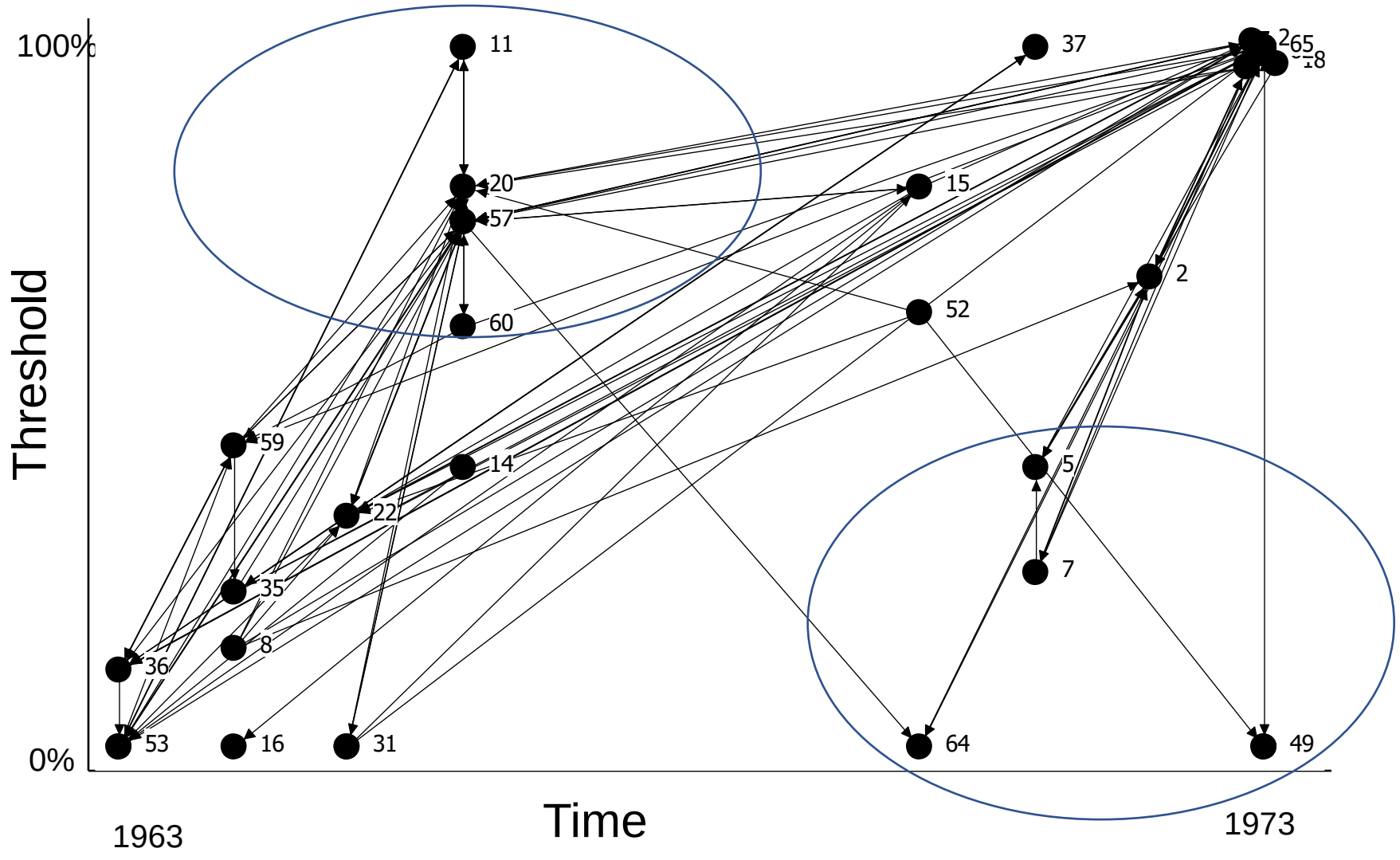
Low Threshold Adopter



High Threshold Adopter



Graph of Time of Adoption by Network Threshold



Evidence for Network Effects

- Adolescent substance use
  - Alexander et al., 2001; de la Haye et al., 2019
- Physician prescribing behavior
  - Gross et al. 2002; Iyengar et al., 2011
- Healthy eating and physical activity
  - Gesell et al., 2021
- Social media mis/information
  - Kim & Valente, 2021
- Suicide ideation & attempts
  - Wyman, et al., 2019
- Health policy adoption & implementation
  - Valente, et al., 2015; 2019
- Reproductive health
  - Doughtery, et al., 2018; Valente & Saba, 1998
- Body image
  - Pallotti, et al., 2018
- Sexual violence
  - Banyard et al., 2021
- And so on …

What's in the literature for networks and nutrition

- Several studies in rural developing countries. For example,

Moestue, H., Huttly, S., Sarella, L., & Galab, S. (2007). The bigger the better – mothers' social networks and child nutrition in Andhra Pradesh, Public Health Nutrition, 10, 1274-1282.

Jäckerin, L., Gödecke, H. & Wollni, M. (2019). Agricultural-nutrition linkages in farmers' communication networks, Agricultural Economics, September, 657-672.

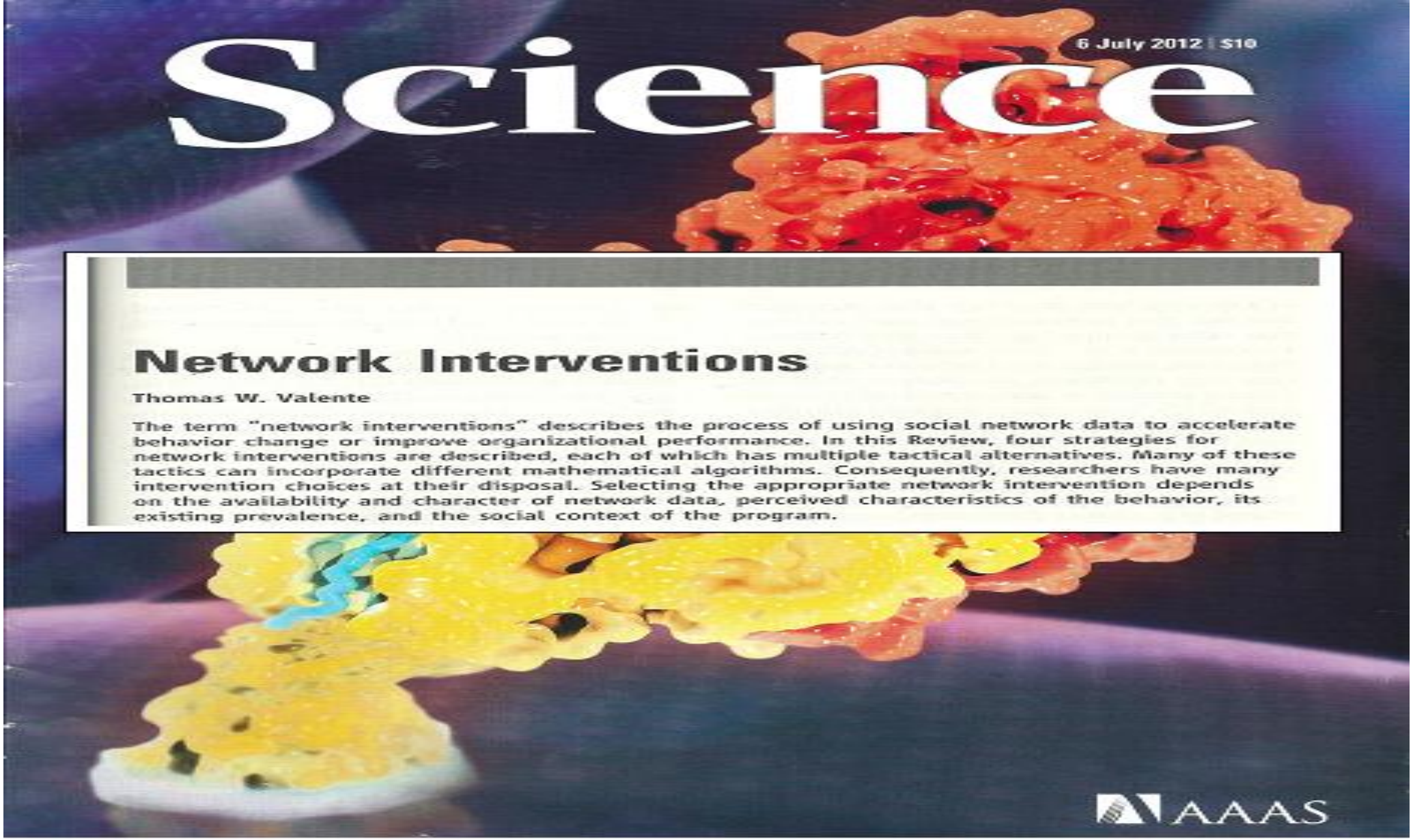
- Or a very old one among college students:

Hertzler, A. A., & Frary, R. B. (1995). College students' nutrition information networks, Family and Consumer Sciences, December, 191-202.

However, over 20 years ago Buller showed:

Buller, D., Buller, M. K., Larkey, L., Sennott-Miller, L., Taren, D., Aickin, M., Wentzel, T. M., & Morrill, C. (2000). Implementing a 5-a-day peer health educator program for public sector labor and trades employees. *Health Education & Behavior*, *27*, 232-240.

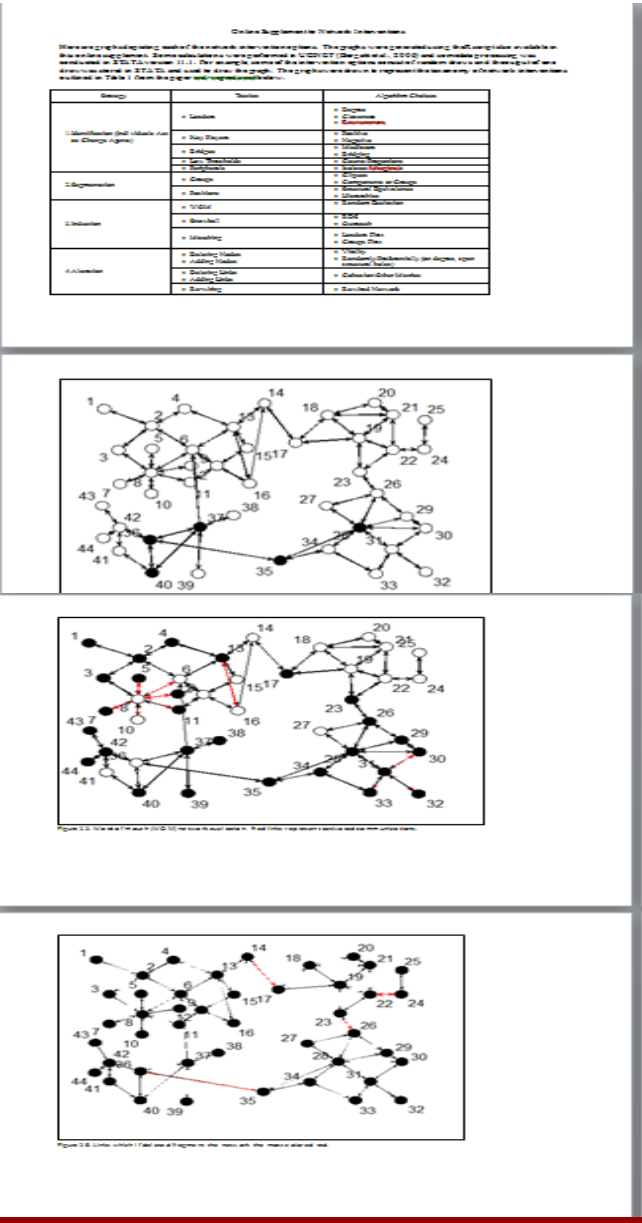
Buller, D. B., Morrill, C., Taren, D., Aickin, M., Sennott-Miller, L., Buller, M. K., Larkey, L., Alatorre, C., & Wentzel, T. M. (1999). Randomized trial testing the effect of a peer education at increasing fruit and vegetable intake. *Journal of theNational Cancer Institute*, *91*, 1491-1500.

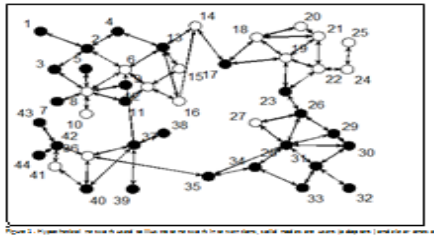

Science
6 July 2012 | $10
Network Interventions
Thomas W. Valente
The term "network interventions" describes the process of using social network data to accelerate behavior change or improve organizational performance. In this Review, four strategies for network interventions are described, each of which has multiple tactical alternatives. Many of these tactics can incorporate different mathematical algorithms. Consequently, researchers have many intervention choices at their disposal. Selecting the appropriate network intervention depends on the availability and character of network data, perceived characteristics of the behavior, its existing prevalence, and the social context of the program.
AAAS

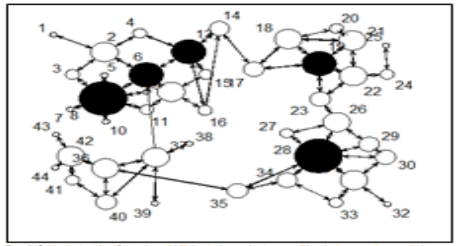
Network Interventions

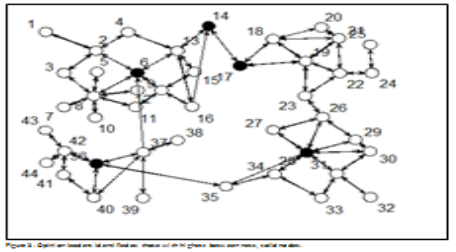
"Network interventions are purposeful efforts to use social networks or social network data to generate social influence, accelerate behavior change, improve performance, and/or achieve desirable outcomes among individuals, communities, organizations, or populations."

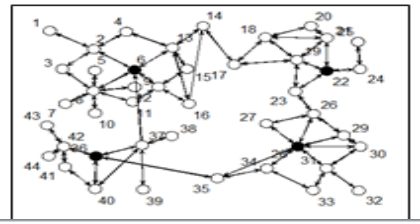
Strategy	Tactic	Operationalization
Identification	Leaders Bridges Key Players Peripherals Low Thresholds	Degree, Closeness, Betweenness, Power … Mediators, Bridges Positive, Negative Isolates, Marginals Proportions, Counts
Segmentation	Groups Positions	Components, Cliques, Communities Structural Equivalence, Hierarchies
Induction	WOM Snowball Matching	Random Excitation RDS, Outreach Leaders 1st, Groups 1st, Optimize Leaders & Groups
Alteration (Manipulation)	Deleting/Adding Nodes Deleting/Adding Links Rewiring	Vitality On Cohesion, Other Metrics On Network, On Behavior

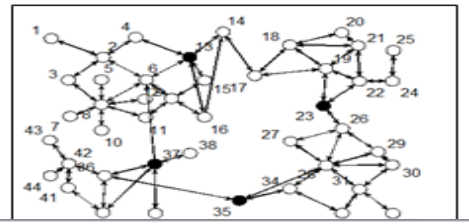


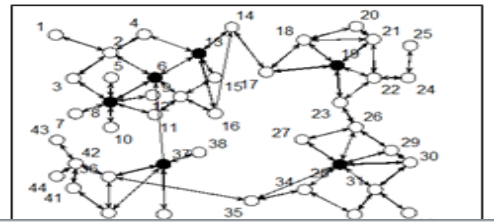


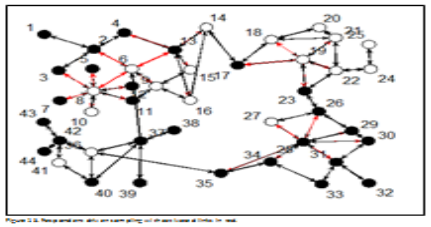


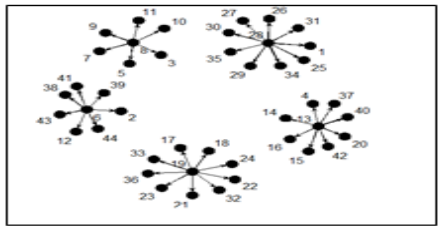


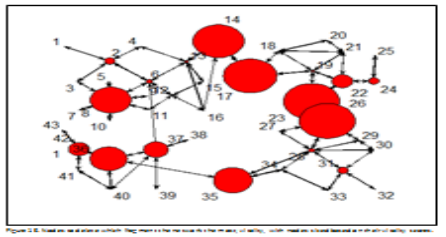


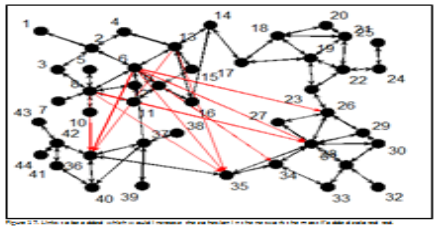


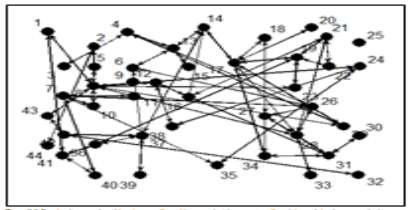












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Cochrane Review of OL Studies (Flodgren, et al., 2011)

- 18 trials
  - 5 trials OL vs. No Intervention, +0.09;
  - 2 trials OL vs. 1 Interventions, +0.14;
  - 4 trials OL vs. 2+ Interventions, +0.10; and
  - 10 trials OL+ vs. + Interventions, +0.10.
- Overall, the median adjusted RD was +0.12 representing **12% absolute increase in compliance**.

Network Influences and Changes across the Lifespan

Age Range	In Utero	0-5	5-12	12-18	18-25	25-65	65+
Network Influences & Constraints	Maternal Nutrition Behavior	Parental Influence and Control	Primary School and Basic Socialization Skills	Peer Friendships & Comparisons	Transition to adulthood New Network Opportunities.	Professional & Work-Related Networks	Networks Contract

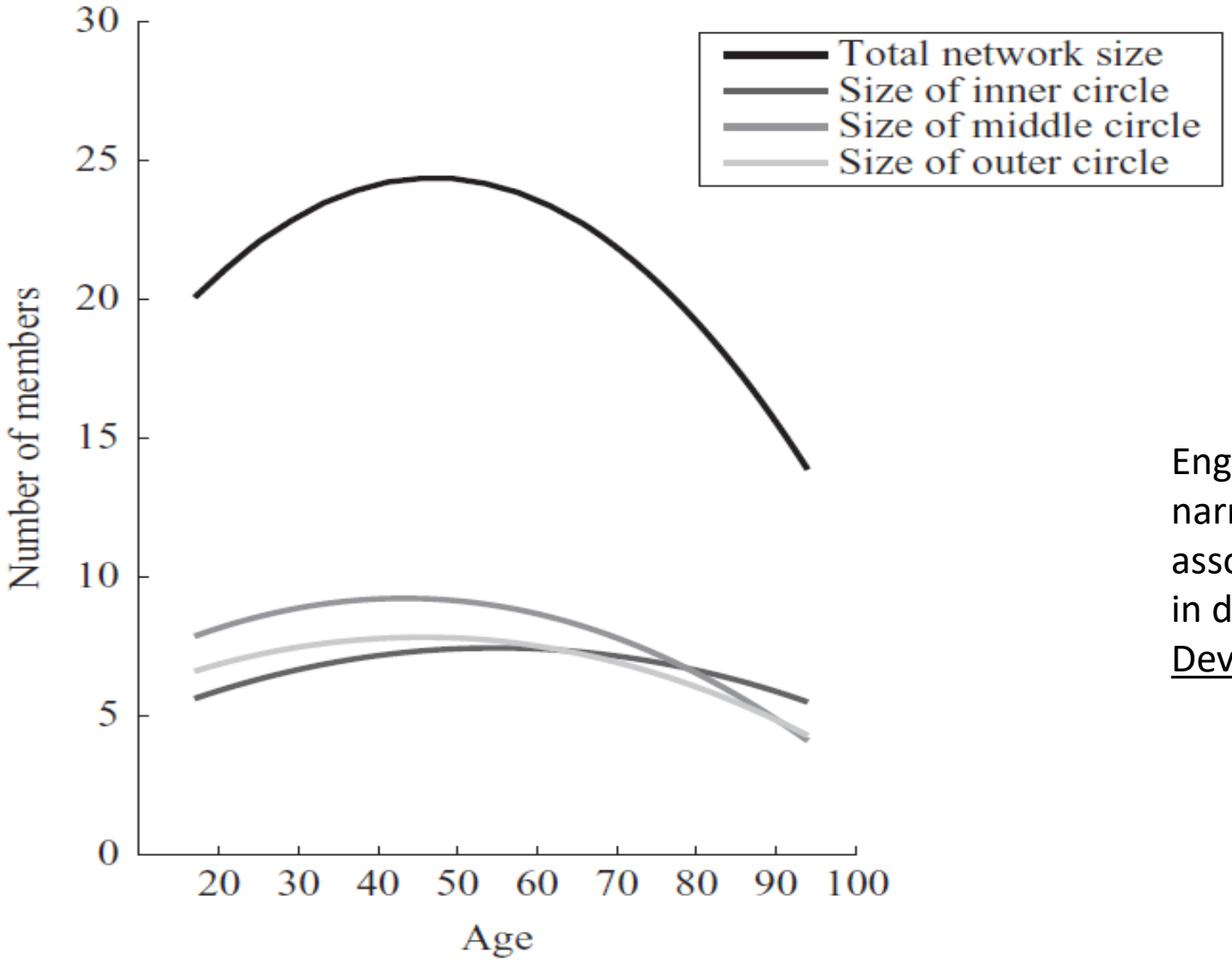
No Control

Lots of Potential Negative Influences

Greatest Opportunity To Intervene

No Time

Too Late



English, T & Carstensen, L. L. (2014). Selective narrowing of social networks across adulthood is associated with improved emotional experience in daily life. International Journal of Behavioral Development, 38, 195-202.

Network Statistical Models

- Exponential Random Graph Models (Robins, et al., 2007, Social Networks)

Exponential random graph models have the following form:

$$\Pr(\mathbf{Y} = \mathbf{y}) = \left(\frac{1}{\kappa}\right) \exp\left\{\sum_A \eta_A g_A(\mathbf{y})\right\} \qquad (1)$$

- Stochastic Actor Oriented Models (SIENA) (Snijders et al., 2010, Social Networks)

$$f_i^Z(\beta, x, z) = \sum_k \beta_k^Z s_{ki}^Z(x, z), \qquad (3)$$

Societies

- International Network for Social Network Analysis (INSNA)

https://www.insna.org

- Network Science Society

https://netscisociety.net