

**A Network Analysis of the ‘Haves’ and the ‘Have-Nots’ in Litigation**Anthony Potts<sup>1</sup><sup>1</sup>University of Georgia

Legal theoreticians for decades have proposed and tested theories that explain how litigants function in the court system; yet, none have analyzed networks of litigants. In particular, the theory of ‘Haves’ and ‘Have-Nots’ describes the existence of a power differential that dichotomizes litigants into separate groups—one group that possesses the resources and organizational capacity to be successful, and another that is under-equipped in both regards and is more often unsuccessful. Although widely acknowledged and accepted, empirical tests of this theory lack in one essential regard; they do not directly test the implications of litigants’ positional structure relative to the positional structure of their opposition. Using a dataset of 1038 Appellate Court cases from 1997 – 2007 in which nodes are litigant types, ties represent adversarial appearance of litigant types in a case, and self-ties represent a litigant type suing the same litigant type, this research investigates whether a network-defined classification of litigant types can predict success. For the purposes of this research, litigants were grouped into eight separate categories: individuals, private organizations/associations, three separate government types (federal, state, and sub-state), and three separate business types (local, intermediate, and national/multinational). The empirical validity of the following three research questions regarding the effect that positional structure has on success in courts was tested. The three questions were as follows: 1) Do structurally unique blocks of litigant types exist? 2) Does the network of litigant types have an identifiable core-periphery structure? And, 3) Is there a spectrum of litigant type strength? An analysis of the data confirmed each of these speculations and indicated that networks may play a potentially influential role in litigant outcomes. First, the blockmodel revealed five blocks of litigant types. Second, a core was identified, with many connections to both litigant types on the periphery and to itself, while the periphery had very few connections to itself. Third, each of the five blocks were able to be sorted into a spectrum according to litigant type strength and this spectrum matched the theoretically-justified model. Importantly, this study confirmed that a litigant type’s network position can indicate case success. Consequently, there is strong support for a network-based approach to redefining and further testing theories about the ‘Haves’ and ‘Have-Nots’.

**A Typology on Facebook Groups: A large-scale case study of measuring network age, network size, gender and topics**Jiyoung Ydun Kim<sup>1</sup>, Anja Bechmann<sup>1</sup><sup>1</sup>Aarhus University

Facebook groups provide a place where users have the possibility of being exposed to information from topic-related or network-related, stronger or weaker ties. Facebook groups are increasing in popularity, and not just among users. Facebook news feed algorithm has changed to give priority to groups over Facebook pages. Despite the overwhelming number of users of Facebook Groups, we know very little if anything on how are people actually using the groups for. How does this differ according to group privacy settings (open, closed and secret) and demographics such as gender? The aim of this article is to broaden our understanding of the characteristics of Facebook groups to provide a typology on Facebook groups, generally by analyzing group age, network size of groups, gender ratio of group members, group communication(posts, comments, like, share)in open, closed and secret Facebook groups. The main research questions are what the typical characteristics of open closed and secret group based on the network size, and how are the network size in such groups correlated with the group age, gender ratio of the members in the

group and group topics? The aim of this study is to understand the characteristics of Facebook Groups by generating descriptive statistics and network analysis. To conduct this research, a broad sample of 1,000 users mirroring the demographics of the Danish Facebook population was recruited with informed consent opening up for the study of the groups they were members of. A total of 14,608 groups were collected in April 2014. The data collected consisted of metadata on the groups (including privacy settings, description, title) together with activities such as likes, posts, and comments from when the group was established from the group creation date to the collection data. The retrieved total number of active communicating users in the groups are 9,081,025 in all 14,608 groups. And the gender of those active users by comparing with official name lists by the Danish statistical office. Gender assigned to users whose "actor\_name" on Facebook either begin with or include Danish names is  $P(x_m, x_f) > 0.8$ . This method assigned gender to 7,496,327 users' names.

The result shows that the closed groups (45.42%) are the most popular privacy setting on the Facebook group followed by open groups (39.53%) and secret groups (21.32%). The mean of the group age is 20.9 months in general. Interestingly There was also no difference in the average network size among the three privacy levels and the more privacy groups were guaranteed, the higher all communication took place (the number of total post and comments, the number of unique users who post and comment, the number of like,) but only the degree of sharing was the opposite. The contribution of this article is isolated to suggest a typology for Facebook groups and preliminary network structures based on privacy and gender exemplified in a large-scale longitudinal case study.

### **Alter-Centered Therapy: The effects of homophilous therapy utilization within adolescent peer networks**

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Major mental health issues, such as depression and anxiety, often arise during adolescent development. A crucial need to optimize current therapies exists as behavioral change is associated with an increased likelihood of favorable mental health outcomes later in life. Additionally, mental wellbeing is associated with reduced risk taking behavior and improved social standing. Unfortunately, only about 36% of children and adolescents for whom therapy is recommended utilize mental health resources. Many economic and psychosocial factors contribute to this phenomenon including concerns regarding the efficacy, confidentiality, and possible social stigmatization associated with therapy. It is unknown whether encouragement from peers would prompt utilization of mental health services. Thus, the current project seeks to address the impact of social connectivity on therapeutic engagement and success.

The three aims of this project are: 1) to evaluate whether adolescent friendship networks are clustered by therapy 2) to assess the extent to which therapy is associated with improved social connectivity, and 3) to investigate the effect of homophilous therapy utilization on treatment outcomes. The analyses will be performed on friendship and emotional support networks of adolescents using whole-network data from two high schools in the National Longitudinal Study of Adolescent to Adult Health (ADD Health) database, in which participants nominated up to 5 male and 5 female friends. An ANOVA density model and other ego-alter similarity methods will be used to determine whether therapy utilization is more frequent among connected actors. To assess whether therapy use (visiting a counselor within the past 12 months) improves social connectivity, repeated measures t-tests will compare data collected on 9th-11th graders at wave 1 to follow-up data collected one year later. T-tests will compare change in tie reciprocity, incoming ties, and network centrality among those accessing mental health services. Finally, for

each individual receiving therapy in the network, homophily indices of therapy utilization will be computed for reciprocated and incoming emotional support and friendship ties. These will then be correlated with changes in mental health and risky behavior indices to evaluate if therapeutic efficacy is enhanced by the shared experiences of friends. We predict that therapy utilization will be clustered among adolescent friendship networks, that therapy may improve social connectivity, and that homophilous utilization of therapeutic services in friendship groups will improve adolescent mental health outcomes.

### **An Investigation of the Relationship Between Organizational Structure, Tie Strength and Tacit Knowledge Sharing**

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The importance of knowledge, how it is stored and shared in an organization has become an important topic of exploration, as researchers have uncovered the influence knowledge management has on business performance. The structure of relationships in terms of tie strength must be examined as it creates the environment for the flow of the resources. However, how these relationships initially form is contingent upon the organization's structure. The interdependence among organizational structure, tie strength and knowledge sharing has not been particularly studied in literature. With the aim of understanding their influence on organizational performance, this paper investigated impact organizational structure has on the formation of relationships and tacit knowledge sharing, through understanding networks and the role of tie strength. This took place by studying the organization's network across boundaries, through examining interpersonal relationships spanning both intra-organizational and inter-organizational networks.

A single case study on a local advertising and communication agency in Beirut, Lebanon was carried out. Using a mixed method approach, social network analysis technique coupled with qualitative information gathering was used for data collection through interviews. The types of relationships formed were explored based on their strength, categorized as strong or weak, and their correlation to the types of knowledge shared whether procedural or experiential was determined.

Results obtained proved a correlation between the two factors of tie strength and knowledge sharing in both internal and external settings. Findings emphasized the need to include other factors such as organizational structure and actors' role in a project when examining this relation. Findings uncovered the role organizational structure has on defining tie strength and its influence on network abilities such as relationship formation and resource flows, particularly when regarded as a social phenomenon including individuals and authority relationships. The importance knowledge transfer has on organizational effectiveness with emphasis on knowledge management was further signified.

This research advanced literature by identifying the interdependence between the three elements from a holistic approach, in addition to assessing the interference organizational structure has on network abilities. Contributions were made regarding network definitions such as tie strength considering tie existence rather than strength as essential. Additionally, the importance of considering organizational structure in a structural analysis of a firm is suggested as it can impact tie strength. Overall, this research showed the need to revisit the: definition of strength, the significance of organizational structure in networks and its impact on knowledge sharing and utilization are essential.

Highlighting the impact organizational structure has on knowledge sharing provides practical implications for management to revise their structure to suit their knowledge management

objectives. This will help organizations improve effectiveness by enhancing their problem-solving capabilities, enhancing value delivery for clients through retaining knowledge and improving the organization's learning curve. Instilling governance also appeared to ensure that knowledge is not only shared but utilized, a pivotal aspect for management to consider when evaluating whether external expert knowledge is being diffused into the organization.

### **Applying Network Analysis to Taiwan Technology Foresight Research for Shaping Technology Strategic Planning**

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Identifying the future scenarios can be a useful tool to support policy-making of national future development. However, it's highly affected by complicated interconnections among different issues on aspects of society, technology, economy, environment, and politics, and quite difficult to present the shape of future. For instance, the aging society will promote new technologies development, such as automatic vehicle and smart home, but it also bring out future's problems of labor shortage, lager spending on social welfare, and so on. Therefore, although the future scenarios shaping have many advantages for policy-making, it is facing a lot of challenges of clarifying the relationship among different issues.

In order to prefigure future trends of the world, World Economic Forum's (WEF) Global Risks Report has provided an annual analysis of the risks that are shaping the coming world. In that report, survey and network analysis of connections was undertaken to highlight some interesting constellations of global risks. South Korea's the Future Preparatory Committee, formed by the Ministry of Science, also analyzed from a dynamic point of view to discover the interconnection between future issues and relationship between these issues and key technologies through network analysis. The Korea Future Issues 2015 had selected 28 issues to analyze in the fields of economy, society, environment, and politics based on database for national policy research. Both WEF and South Korea's researches emphasized the relation among different issues in shaping future risks or scenarios, and applied social network analysis (SNA) to search out.

To explore future scenarios could help a nation think risks and opportunities, and make proper policies in various aspects for technology development. This study aims to explore the future scenarios of Taiwan in 2035, and then expect to inspire some important stakeholders by Taiwan's future development for shaping technology strategic planning. In terms of implementation, it has converged from future global trends first, then integrated with the social demands of Taiwan through survey research and the interrelatedness of future risks through SNA. By the result of SNA, this study tries to consolidate deferent issues to be main factors for explore future scenarios.

### **Are powerful children more accurate in network perception? The relationship between social verticality and network perception accuracy**

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The social world is a complex web of relationships between multiple individuals. People make judgments about the self, others, the social structure, and their positions within the social structure; these judgments, collectively referred to as interpersonal accuracy, impact how individuals make various social decisions. There is a particular type of interpersonal accuracy that has received relatively less attention but is particularly important when trying to examine how

people physically navigate the social world: accurate perception of social network structures (hereinafter referred to as *network perception accuracy*).

The current study examines the predictors of preadolescents' network perception accuracy. Specifically, the study explores how various types of social verticality (Hall et al., 2015; Aran et al., 2011) predict network perception accuracy. Social verticality refers to the structure of interpersonal relations positioned in a low-to-high continuum; constructs related to social verticality include power, status, dominance, leadership, and other related concepts (Aran et al., 2011).

Examination of both network-level (i.e., network size, density) and individual-level predictors (i.e., gender, grade, centrality measures) revealed that students in a higher grade and in smaller classrooms were more accurate in their network perception than their peers who were younger and in larger classrooms (Cappella et al., 2012; Neal et al., 2014). Degree centrality and popularity, a proxy for power and prestige, were additional positive predictors of network perception accuracy (Neal et al., 2016). The current study explores the following question: do various trait-based and network-based verticality positively predict preadolescents' network perception accuracy?

To address this question, network data and peer-nomination data was collected from four-hundred 3rd, 4th and 5th grade students from three rural elementary schools. We examined how various trait-based (i.e., influence, leadership, popularity, and social acceptance) and network-based verticality constructs (i.e., degree, eigenvector, and betweenness centrality) are related to children's network perception accuracy. To assess accuracy, students were instructed to nominate "who hangs out with who." These responses were then aggregated and dichotomized based on a cut-off criteria determined by the researcher; the aggregated and dichotomized matrix was then compared with each individual students' matrices using QAP correlations on UCINET software (Borgatti, Everett, & Freeman, 2002).

Results of the Pearson's correlation indicated that there was a significant positive relationship between network perception accuracy and social acceptance ( $r(400) = .21, p < .01$ ), popularity ( $r(400) = .27, p < .01$ ), leadership ( $r(400) = .26, p < .01$ ), and degree centrality ( $r(400) = .295, p < .01$ ). Furthermore, girls ( $M = 0.31, SD = 0.16$ ) demonstrated significantly better network perception accuracy than boys ( $M = .21, SD = 0.16$ ) ( $F(1, 398) = 10.74, p < .001$ ). There was a significant difference between the three grades in network perception accuracy ( $F(2, 397)=4.84, p < .01$ ); post-hoc testing revealed a significant difference between the third and fourth graders' network perception accuracy, with fourth graders ( $M = .31, SD = .17$ ) demonstrating significantly better network accuracy than the third graders ( $M = 0.25, SD = 0.15$ ).

### **Biosociability and the Citizen Science Practice in social networks**

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The focus of this paper is on social networks and the new relationships engendered by this communicational model in what concerns science. The conceptual, methodological and empirical scope is made in the health area, in discussions of treatment of diseases and disorders and as the new media, that is, social networks that have found forms and developed ways to deal with this area in a social scope of direct and indirect form, both for patients and their physicians, and for researchers looking for developments in health science. In this approach, authors such as Nikolas Rose, Paul Rabinow, Sheila Jasanoff, Zygmunt Bauman, Anthony Giddens, Ulrich Beck, Veena Das, Manuel Castells, Bruno Latour, etc. can be conceptually correlated. From the proposed object, we intend to analyze the HealthUnlocked social network, which exemplifies how the relationship of thematic groups of online discussions on health vis-à-vis the notion of biosociability. Thus,

ways are opened to analyze the controversial areas created by networks in which medical issues are openly discussed. This is not just a meeting of lay people, but a gathering of actors who can contribute to changes in medicine. Hence, it is hypothesized that such groups of online discussions, which fit into what is called biosociability, are also involved in contributing to the production of knowledge, therefore, with science (citizen science).

The digital terrain created by the HealthUnlocked social network comes with mutual support among users, be they patients, caregivers or stakeholders about discussions in each community and the health condition they cover. Information is considered to be reliable because it is monitored by health organizations, and also by artificial intelligence algorithms, which catalog data and assist users in their network experiences, which are posting and discussing their own experiences, symptoms, treatments and services. In addition, the anonymity and security offered by the network and its peer support environment have encouraged more people to socialize their struggles and challenges in managing their health. In addition to the social function of peer support, the network has provided data for various researchers and surveys. The company, its own founding members and employees, is part of a number of initiatives, articles and surveys made through its own data and through partnerships with universities and scientific journals.

Therefore, the existence of this social network, the developments and expansions of functionalities carried out by it, can confirm the hypothesis raised in the thesis, which affirms that online biosociability and its thematic groups of discussion assist science in a participatory and collaborative way. Such processes extend the hypothesis raised to imagine a new way of making Citizen Science.

#### **Building Bridges and Optimizing Team Collaboration in Healthcare**

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Both clinical research and complex care require input and coordination across disciplines to ensure information flows across traditional organizational boundaries. Measuring communication patterns of healthcare teams, and recognizing bridges, brokers and boundary spanners, are important steps to optimize team collaboration and improve the flow of information between isolated clusters, or professional “tribes” in need of connectivity.

This study was conducted within a large academic health system in an urban setting, and involved a group of healthcare professionals working in various divisions and roles, including physicians, nurses, social workers, pharmacists, administration, and leadership.

We conducted an initial survey to map four different social networks: 1) advice network to solve patient-related problems; 2) advice network to solve process-related problems; 3) communication network using various media, and 4) friendship network. We also sent out an “ecosystem assessment” survey to map out the current resources available and receive input to drive actionable improvement. About 60 individuals provided feedback to both surveys (80% response rate). Focused interviews were also conducted with patients and health care providers to build a journey map and to help them reflect on their experiences regarding quality of care, team structure, performance, vision, and future of the program.

Self-awareness was encouraged by following the process of Virtual Mirroring, which is based on measuring communication patterns through social network analysis, and mirroring them back to the individuals. The goal is to demonstrate that self-reflection can trigger a change in communication behaviors, which can lead to increased performance. In this study, Virtual Mirroring was delivered through an all-day workshop followed by individual meetings.

Preliminary results indicate a strong correlation between friendship network and advice network, which is aligned with previous studies as well with the findings of the focused interviews. We also found no correlation between tenure within the hospital and centrality in the advice network. Results show some fragmentation points among divisions, with clusters built around central players or divisions. The analysis was conducted by controlling for roles, divisions, scope of work (inpatient vs outpatient), tenure and gender.

We found that in both the communication and advice sharing networks physicians were not the only boundary spanners or experts able to provide advice on patient issues or process related problems. Important gatekeepers emerged among non-physician and non-clinical staff, such as nurse practitioners, clinical program managers, echo-tech and social workers. By leveraging their personal networks and expertise, the senior leadership team could help bridge the gaps and pull in untapped expertise.

In three months we will conduct a similar survey and monitor changes produced by Virtual Mirroring on the network structure. We would expect improved effectiveness, increased self-awareness, reduced ambiguity, and the establishment of meaningful relationships within and across organizational boundaries.

### **Building International Innovation Networks in the Biotechnology Sector**

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Emerging technologies are new technologies which promise much for firms, industries, and economies. As one of the well-recognized emerging sectors, the biotechnology industry has received longitudinal policy and development attention since the 1970s. Gathering international collaboration data regarding joint publication, co-patenting, clinical trials, and commercialization activities (marketing) from multiple sources along the innovation value chain to examine the international collaborations between Taiwan, China, and the U.S., this paper aims to analyze the dynamic structures of the global innovation networks in the biotechnology sector in order to study the role of policies in enabling the international engagement of the biotechnology sector of Taiwan. Particular attention will be paid to the role that technology policies play in the transformation of scientific knowledge into commercial technologies across continents to observe the trend of shifting global technological power over the past three decades. The findings show that in the biotechnology sectors, the leading technological power has remained in the U.S. and has not shifted to East Asia, though East Asian countries have tried hard to promote biotechnology sectors through international engagement. The co-evolution of the vertical and horizontal policy instruments is crucial to support the development of emerging sectors. Active R&D collaborations between Taiwan, China, and the U.S. only started in the past ten years. In the context of the biotechnology industry in Taiwan, several important policies were implemented rather late. In particular, policies aimed at enhancing the global engagement of emerging technology sectors are still rare. While facing the rise of China, firms and institutes in Taiwan have to strengthen their engagement with foreign technology resources. In fact, compared to the

manufacturing sector, Taiwanese actors and Chinese actors in the biotechnology sector have built their own respective international networks, which means the Taiwanese actors are less dependent on the Chinese economy while establishing emerging sectors. While emerging technologies are mostly science-based and originally came from Western countries, policies for enhancing international technology transfer from technology frontier to the technology followers stage should be implemented earlier to shape the structure of the emerging industries at an earlier stage. Only then can the effects of the policy implementation be more efficient in enhancing the development of emerging technologies.

### **Characterizing Familial Caregiver Networks of Breast Cancer Patients in a Public Hospital at Mexico City**

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#### **Introduction.**

Breast cancer is the leading cause of death from neoplasia in adult women in the world and in Mexico as well, with 57 new cases detected each working day, representing the second cause of attention to gynecological diseases in the public health system, and consequently a high burden on social spending for their attention.

In this country, as in most nations at the developing world with a collectivist cultural orientation, the bulk of the support when a person falls ill is bear from her family and her informal help network, and not from institutions or formal caregivers. However, in the present socio-political context this form of social arrangement is not publicly recognized, and is understudied scientifically, despite its strong contributions to collective well-being, to the national economy, to the recovery of the patient's health (when this is possible) and to the understanding of critical psychosocial processes (stress, emotions and social resilience).

Informal caregiving implies all types of social support, but also potential familial discrepancies with the institutional requirements, with the medical treatment and regarding each family member's resource contribution/allocations, but above all, the stress, anxiety and conflict among the members of the patient's network, which in turn can generate further distress and chronic illness.

#### **Aim.**

Therefore, the objective of this report is to evaluate, characterize and correlate the support networks of women who currently care for one breast cancer familial patient, at different care process stage, in a governmental public hospital in Mexico City, to gaining insight about how these caring networks evolve and impacts health.

#### **Method.**

29 Ego networks are being obtained with a name generator, asking also the relationships between alteri, and will be structurally characterized with indicators of size, centralization and subgroups (cliqués and k-cores, employing Ucinet vers. 6). These indicators will be correlated with (a) disease and healthcare stages, and levels of (b) caring contributions, (c) perceived trust, communication and family support, (d) well-being, stress and personal anxiety of the caregiver. (c & d) were measured with standardized instruments, applied independently, person by person.

#### **Results.**

Because we are in the data collection phase, we can only anticipate that we plan to show statistical results and typical graphs, and also qualitatively to identify some interesting cases with respect to what is expected conceptually.

According to the previous literature, we hypothesize that there will be differences in the network structure among caregivers, lowering its length and cohesion as time of caring elapses, and whose central positions will be formed mainly by women, in which stress and anxiety will be less with greater support and network densities.

### **Conclusions.**

We conclude by noting that, in addition to helping to characterize the phenomenon of cancer health care, this study aims to measure the disease impact at the levels of caregivers and families, as well as understanding the contribution of networks in the sociomedical management of health, their often locally neglected public policy dimension, and the macro collective effects of this way of functioning of human being into groups.

## **Cognitive Frame of Networking Actions: Why and When do People Feel Bad About Networking?**

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Networking behaviors refer to proactive and purposeful efforts made by individuals to create, maintain, and leverage relationships that can provide them with valuable resources for their work and career. Past research has shown how beneficial networking is: It allows people to reach better positions in their network, and fosters career success through promotion, salary progression, and satisfaction. It improves learning and knowledge acquisition, favors economic exchanges, and help people secure jobs.

Even if they acknowledge the benefits of networking, people do not naturally engage in those behaviors, and only do so reluctantly. People often have negative attitudes toward networking that prevent them from undertaking such activity. They can find the idea of networking uncomfortable or intimidating, or view networking as selfish or unfair. They report general discomfort, feelings of “moral impurity” and “dirtiness”, or perception of being “fake”, “artificial”, or “manipulative” when networking, which in turn decreases their engagement in networking activities.

So far however, the exact processes and emotions underpinning those feelings have not been identified, and we still ignore what exactly about networking makes people feel uncomfortable. Better understanding the kind of emotions networking triggers, as well as the reasons why people experience those emotions when networking, is a necessary condition to discover boundary conditions to this discomfort and propose solutions to help people overcome their aversion to network.

In the present paper, we investigate the origin of people’s discomfort when networking. We show that people construe, that is perceive and interpret, networking behaviors as the objectification of others, and therefore as a violation of the social norm that people should not be treated as means to an end. We then show that this violation threatens people’s feelings of integrity, by creating a misalignment between their actions and norms of proper behavior. Finally, we show that this decrease in integrity leads to a greater sense of guilt.

With a better understanding of how people construe networking behavior, we propose boundary conditions to this relationship. Since the objectification of others makes networking problematic to people, we hypothesize that people need either circumstances justifying the objectification of others, or to reframe networking behaviors as an opportunity to build meaningful reciprocal relationships with others. On the one hand, we show that circumstances that justify the objectification of others (e.g., having negative interpersonal affect toward the interaction partner, or networking for prosocial reasons) can reduce feelings of guilt people experience when networking. On the other hand, we show that people who frame networking activity as an

opportunity to give to or find common interests with others do not feel that they objectify others when networking, which eliminates feelings of guilt.

Ultimately, our findings directly contribute to the emerging field of research on networking behaviors, explain why people might *not* engage in networking activities in spite of its numerous benefits, and suggest boundary conditions and interventions to mitigate this effect.

### **Cyber Aggression Towards Black and Latinx Women: A Network Topic Analysis**

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Cyber aggression is a growing issue because of its vast prevalence, potential for anonymity, and the easy distribution of harassing and aggressive messages. Furthermore, aggression on social media platforms, such as Twitter, represents a serious problem that can victimize women of color, in particular. One of the main goals of this research is to raise the awareness and the visibility of this social problem. Another goal is to encourage both individual internet users and social media platforms to explore additional ways of reducing harmful, online aggression.

Although cyberaggression on Twitter has begun to receive attention, little research has systematically explored the common themes found in hostile messages on this social media platform. Understanding the thematic content of cyberaggression is of particular interest since there may be differences in the content based on the characteristics of the victims. Furthermore, the topics that are used to attack individuals are important to study because they may be unique to certain groups. In this project, we focus on cyber aggression directed towards women of color. We apply topic analysis, and semantic network methodology, to the issue of cyberbullying, or cyber aggression, on the social media platform Twitter. Semantic network analysis is a technique to uncover semantic structures in text. This methodology is especially useful because it allows researchers to examine not only the content of these aggressive words and their usage, but also the connectivity and other structural characteristics of phrases and concepts within messages placed on Twitter. Using a semantic network approach allows for the extraction of meaningful ideas by identifying emergent clusters of concepts rather than analyzing frequencies of isolated words. Therefore, analyzing online social media with the use of this method can enhance our understanding of complex aggression.

In this research, we begin by examining the occurrence of aggressive, harmful Twitter messages that are directed towards several groups of women of color in the United States, including Hispanic/Latinx women and Black women, in a sample of 18,893 tweets. Next, we discuss common themes that emerge within these types of communications based on the semantic network analysis.

Our results illustrate the central role that stereotyping and context play in aggressive content on Twitter. For example, in our sample of aggressive tweets that target blacks, promiscuity was one common theme that emerged, with messages implying black women are overly sexual. In messages containing Latinx slurs, on the other hand, the current political climate in the United States was a recurring theme. However, in a few cases we also found evidence of constructive Twitter online interactions. In such instances, individuals appeared to attempt to empower underprivileged groups of women by “reclaiming” a typical racist and/or sexist slur, and using that term in a positive manner. In conclusion, although there are exceptions, our overall findings reveal that aggressive online messages aimed at women of color tend to attack their targets systematically, by enforcing traditional, negative race and gender stereotypes.

**Detecting Personality in Email Subject Lines: A Reliable and Valid API Based Empirical Test**

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The surge of warehoused digital communications data available to researchers in recent years has led to the subsequent development of new technologies designed to investigate said data. Known as application program interfaces (API's), these web based algorithmic processes can detect demographic, affective, and personality differences purely from text. While undoubtedly useful, many of these API's have been designed and tested using public sources of communication data such as Twitter, or in laboratory based settings which lack external validity. As such, current API's that assess personality variables, for example, have not been validated against industry standard inventories such as the Big 5, and their relevance to assessing and diagnosing organizational processes is unknown.

We present evidence that demographic and personality factors can be reliably and accurately predicted from the most commonly found source of digital communication records: email data. Further, we demonstrate that personality and demographic variables can be reliably assessed using only email subject line data. From a human resource management perspective, using only the data contained in the email subject header is particularly useful as significant privacy issues are avoided. We use a unique dataset of email message subject lines to measure employee scores on a key component of the Big 5 Personality Inventory--extraversion--and compare our scores to scores of those same employees as assessed by the traditional Big 5 Personality Inventory. We find significant correlations between our email subject line API assessed employee extraversion scores, and the scores of those same employees as assessed by the Big 5 Personality Inventory ( $r = 0.11$  and  $r = 0.08$  for each sample year).

These results suggest that even fragmented digital communication records are sufficient to predict a key personality variable of the email sender. Concerns about privacy and email network analysis can be partially reduced by using only email subject lines, and not more sensitive email bodies. Further, the findings of API based classifier analysis can be mapped onto communication network structure which provides a strikingly detailed map of the types of people communicating, and who they are communicating with. Ultimately, our work can help pave the way for real-time, automated analysis of employee relevant factors such as sentiment, personality, and satisfaction. In short, API based analysis of demographic, affective, and personality variables has significant potential to revolutionize the world of human resource management.

**Diffusion of Innovation in Family Size Preferences and Acceptability of Contraceptive Use between Urban Migrants and Non-Migrants in Rural Senegal**

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Fertility and fertility preferences of rural-urban migrants are often lower than for non-migrants in the origin population. This has been at least partially attributed to adaptation of migrants' preferences and behaviors to those prevalent in urban areas. From this it has been hypothesized that the fertility and fertility preferences of members of origin populations may be influenced by lower fertility and fertility preferences of returned migrants through social diffusion mechanisms. Prior attempts to identify such mechanisms have relied largely on estimates of the associations between aggregate rates of return migration or simple measures of social association (such as having migrants in the immediate family) and non-migrants' fertility. Yet the absence of network

data with alter characteristics has made it difficult to disentangle diffusion processes from other confounding mechanisms or to control for network endogeneity.

This paper uses a unique and extensive social network survey data from a high-fertility, rural Senegalese population linked to an ongoing demographic surveillance system to directly test for potential diffusion of fertility preferences from returned and contemporary urban migrants to non-migrants. The Niakhar Social Networks and Health Project is composed of a large representative sample of the entire rural population under continuous demographic surveillance (n=902) as well as complete enumeration for the entire population of one village (n=1310) within the surveillance catchment area. The network component of the survey elicited an unconstrained number of social network alters (40 named alters per respondent on average) over 15 name generators (including ties to those not currently resident in the population) as well as extensive information on tie strength and affective proximity of alters. Place of residence for each alter cited was established and linked to complete migration histories over the prior 30 years in the surveillance system.

We first model the fertility preferences (operationalized as ideal family size (IFS) and acceptability of contraceptive use) of those without urban migration experience in the general population as a function of the number of alters with prior or current urban migration experience, and the affective proximity of migrants with urban migration experience relative to those without, to ego. In all models we control for network endogeneity with measures of respondents' own characteristics. To identify independent network effects net of the broader social context, we further specify models including measures of the aggregate proportions of individuals within both egos' villages and residential compounds with urban migration experience.

We then estimate the same models for the population of the village in which all residents were surveyed, additionally modelling respondents' fertility preferences as a function of the preferences of those with and without urban migration experience within their social networks, as well as the measures of the structural position of migrants within respondents' social.

Preliminary results indicate a positive independent effect of network migrant experience on numeric IFS. Migrant experience in the network also positively correlates with the probability of giving a numeric response to IFS and the acceptability of contraceptive use, although both effects are partially mediated by network migrants' own characteristics.

### **Do egocentric network relationships impact whole network centrality? A case study using a college sorority**

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**Background:** The positive impact of social connectedness is well documented in the literature. Studies show that being socially connected offers people protection from mental health disorders, introduction to new behaviors and ideas, support in times of trauma or crisis, and even a longer lifespan. Therefore, a primary objective in both individual-level and community-level health work is fostering social connections and support among people. Further, within specific networks, being more socially connected can lead to power, prestige, and opportunities not available to those less connected. College students are particularly impacted by their social connections and position in their networks due to the social nature of college. While many studies investigate individual, behavioral, and environmental factors related to social position within networks, few have investigated how egocentric network relationships might impact connectedness within specified sociocentric networks. Using a sorority from a university as a case study, the purpose of this study was to determine if social relationships within egocentric networks impact the centrality scores of women within their sororities (a whole network).

**Methods:** Sorority members (n=208, 87% White, 39.1% freshmen) provided whole network and egocentric network data by completing paper surveys. The whole network was created by asking each participant to list the five people they felt closest to in their sorority. Each participant was provided a complete roster in order to maintain the boundaries of the whole network. Then, participants provided initials of the five people they feel closest to in their life, and indicated their relationship to that person (i.e., parent, sibling, etc.), as well as each person's gender and whether that person made the ego feel good about themselves. Centrality scores were created using whole network data in UCINET, and composition scores were created using egocentric data in ENET software. Composition of ego networks based on relationship, gender, and "good feelings" were regressed on degree centrality scores.

**Results:** Regression analysis revealed a significant model predicting degree centrality ( $R^2=.106$ ,  $p=.027$ ). Being closely connected to a significant other was negatively related to degree centrality ( $\beta=-.368$ ,  $p=.003$ ), while having heterogeneity in gender across egonetworks was positively related to degree centrality in this sample ( $\beta=.180$ ,  $p=.049$ ).

**Conclusions:** Findings suggest that egonetwork relationships can impact the position of an individual within a closed network. Specifically, in this study, having a significant other kept women from being more connected in their sorority, while having a mix of male and female egonetwork connections increased their degree centrality within the sorority. Reduced degree centrality could be due to the time commitment a significant other requires, especially in college. The sorority member might be unable to invest in relationships the same way her single counterparts can within the sorority. On the contrary, having male and female friends within egonetworks might facilitate increased opportunity to connect in an all-female group, considering there could be less "competition" with close female friends outside of the sorority. Future research should consider how external relationships might impact the position and patterns within sociocentric networks.

### **Egocentric Social Networks Moderate the Effect of Functional Impairment on Social Activity in Late Adulthood**

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**Background:** Adults with disabilities face a higher risk of experiencing poor health and social isolation in later life. Prior research has shown that social factors such as supportive relationships can modify disablement trajectories and reduce the likelihood of negative outcomes. Although research has considered the *functional* benefits of relationships through examining mechanisms like social support provision, the effects of social network *structure* on the disablement process are not well understood. This study examines multiple social network mechanisms to explain the links between disability, health, and social activity among older adults. **Research Question:** Do social network characteristics mediate or moderate the effect of functional impairment on health and social participation in late adulthood? **Data and Methods:** We analyze longitudinal panel data from the National Social Life, Health, and Aging Project 2005 & 2010, including 2,261 adults aged 57-85. In response to several name generators, respondents named 9,587 network members in 2005 (average network size = 4.2). We model several indicators of health and social participation at 5-year follow-up using prior functional impairment and social network characteristics, including support provision (e.g., health discussion) and structure (e.g., network size, density, and brokerage). **Results:** Larger, more dense, and more supportive networks are associated with better health and more frequent social activity at 5-year follow-up. We find that network structure mediates the relationship between functional impairment and health, but moderates the effect of impairment on social participation. For example, participants with more dense

networks are more likely to maintain high social activity at follow-up, even at relatively high levels of functional impairment. *Implications:* Functional impairments are not inherently disabling. Instead, personal and social resources can be leveraged to reduce the potential negative impacts of impairment on individuals' lives. This study adds to existing research on the social context of disability through demonstrating that not only supportive resources but also the structure of social networks are associated with the course of disablement following functional impairment. This study demonstrates how vulnerable older adults may have the most to gain from network interventions.

### **Exploring Impacts of Deliberation Methods on the Interplay between Discourse Similarity and Social Relationships in a Mini-Public Context**

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Conventional deliberative methods in which deliberations are led by rules of order and held in the presence of all deliberators during the whole deliberation period have been for decades the dominant model for public participation in debates. Critics of this model have questioned the possibility for such debates to be inclusive of a diversity of voices and proposed alternative deliberative methods where deliberations are held alternatively with the whole group and in small subgroups often supported by structured activities.

Both methods share the common goal of favouring the meeting of different opinions in order to reach a common decision, but they differ in how they orient and structure the network of exchanges. Given that social networks have been shown to influence participation and opinion formation it is expected that different settings would affect this influence process.

Scholars have used a socio-semantic perspective to understand how social networks and discourse are linked and shown that similarity and change in people's discourse were related to their social relationships. The study presented in this paper compares the links between social networks and participants' discourse construed as a network for the two deliberation methods.

Conventional deliberation ensures that an individual voicing his or her opinion is heard by all at all time while alternative deliberation offers, through the use of small subgroups, more time for people to voice their opinions with less people. As starting point of our exploration of the interplay between social networks and participants' discourse in these contexts, we hypothesized that the correlation between centrality in social network and centrality in discourse similarity networks would be stronger (and positive) for conventional deliberation than for alternative deliberation. To verify this hypothesis, 95 people were gathered for a one-day experiment during which the two types of deliberative methods (conventional and alternative) were used. We devised various instruments to collect both discursive and social network data: online questionnaires, notes taken by participants within personal notebook; paper tablecloths on which participants wrote during small subgroups sessions; stickers exchanged by participants when discussing with one another and a series of proposals written by participants. The general hypothesis posing that conventional and alternative deliberation methods affect differently the link between centrality in social network and discourse similarity was supported. However, the difference is not in the direction anticipated. Indeed, as expected, we found a positive correlation between social network centrality and discourse similarity for the conventional deliberation method but this correlation was negative for the alternative methods. Our experiment therefore gives credit to the claim that alternative methods might be more inclusive of a diversity of voices since that with the

conventional deliberative method the discourse of the most central individual resembled more that of the other deliberators, while it was the opposite with the alternative deliberative method.

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### **Hermitian Centrality Score as an Alternative to Google's PageRank**

Keita Sugihara<sup>1</sup>

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This presentation highlights an alternative centrality measure using complex numbers to score a node for a directed graph, which overcomes the challenges faced by Google's PageRank. It is organized under the following scheme.

First, the presenter looks at Google's PageRank, a widely used algorithm for internet search engines that scores a page under three characteristics: (a) a page receives a high score when it has an inlink from a node with a high score: - (b) a page receives a high score when it has many inlinks: and - (c) a page receives a high score when it has an inlink from a node with few outlinks. Google uses the adjacency matrix in PageRank to describe hyperlink relations among internet web sites.

Second, the presenter focuses on the damping factor and the problems it causes, in Google's PageRank. Google needs the damping factor, because PageRank should define an adjacency matrix for a strongly connected graph, which real hyperlink relations on the internet do not realize. In other words, the damping factor transforms these real hyperlink relations into a presupposed strongly connected graph. In PageRank, we can choose an arbitrary value of the factor from 0 to 1, leading to three complexities: (a) the choice of a damping factor value is eminently empirical, and in most cases, the value of 0.85 is used: - (b) a network has inconsistent rankings when using different damping factor values: - and (c) a specific damping factor value could be used to create spam against a search engine.

Third, the presenter introduces Hermitian centrality score using the Hermitian adjacency matrix. Guo defines the matrix using the imaginary unit  $i$  (the square root of -1) as follows: - for a digraph  $X=(V, E)$ , the Hermitian adjacency matrix  $H$  is a matrix with entries  $H_{uv} = 1$  if  $uv$  and  $vu$  are in  $E$ ,  $i$  if  $uv$  is in  $E$  and  $vu$  is not in  $E$ ,  $-i$  if  $uv$  is not in  $E$  and  $vu$  is in  $E$ , and 0 otherwise. The presenter uses the complex plane to calculate the score of a node in the graph. Whereas the method only requests a weakly connected network, its application could be expanded to encompass real hyperlink relation among web sites on the internet. Therefore the Hermitian centrality score does not require a damping factor, making it independent of the three problems of PageRank.

Fourth, the presenter shows that Hermitian centrality score can reproduce the three characteristics attributed Google's PageRank.

Fifth, the presenter discusses how a Hermitian centrality score method can be developed for a desired score of a node in a network.

Moreover, this presentation includes patent pending ideas.

### **High-risk anal HPV-genotype transmission networks of young Black men who have sex with men in Houston: Support for assortative mixing based on HPV types 16 and 45**

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**Background:** Young Black men who have sex with men (YBMSM) bear a disproportionate HIV infection rate in the United States and accordingly research has been conducted to examine

racial/ethnic disparity in structural/contextual factors associated high HIV infection. However, less is known about the prevalence of high-risk genotypes of human papillomavirus (HPV) infection and associated diseases, as well as factors associated with prevalence among this population. One exception is our previous study that estimated approximately three out of four predominantly young Black MSM aged 18-29 (with 87% being Black race and 53% being HIV infected), recruited through peer referral recruitment chains, had at least one high-risk HPV type and 39% of HIV-positive men harbored HPV-16 based on a specimen of self-collected exfoliated cells from the anal canal. Our current study extends this previous study in order to identify relational characteristics of the HPV transmission network of the same sample.

**Methods:** Data were collected from 2014 to 2017 as part of a multisite longitudinal network study, known as the “Young Men’s Affiliation Project (YMAP).” Our sample was restricted to 140 young Black MSM participants who engage in longer referral chains, for a total of 6 chains, each including more than 6 participants (mean: 24.5 persons/chain, SD: 22; range 7-64 persons/chain). Out of these 140 participants, our final analytic sample was 131. Our network dataset was constructed by combining three sources of relational information: (1) peer-referral network, (2) social partnership, and (3) sexual partnership, and maximally symmetrized edges. We estimated exponential random graph models to model the observed endogenous HPV transmission network structure by taking into account the dependencies among aggregated peer-referral/sexual/social network ties (i.e., social partners) as well as the dependencies between network ties and infection status of each high-risk HPV genotype, and other sociodemographic and risk behavioral covariates.

**Results:** Individuals had a tendency to be connected to social partners with the same high-risk HPV genotype of 45 and 16, respectively. However, HIV positivity did not have a significant interaction effect with these homophily findings, indicating that there was no tendency for social ties between a pair of individuals who are co-infected as compared with randomly generated edges in the network. Additionally, there was a tendency to choose social partners with a similar number of sex partners. Considering network endogenous parameters, a pair of individuals tended to choose common social partners (indicated by a positive geometrically weighted edgewise shared partner (GWESP) parameter) and isolated individuals tended to not be connected to others in HPV transmission network (indicated by a negative degree-zero statistic).

**Conclusions:** Understanding more about the social and sexual networks of young Black MSM, and subsequent transmission of HPV, might prove useful in developing HPV vaccine interventions for these men.

### **How depressive disorder patients perceive and treat the depression: Semantic network analysis of patients-centered data**

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<sup>1</sup>Sungkyunkwan University, <sup>2</sup>Sungkyunkwan University

Analyzing patients-centered data including conditions, symptoms and treatments is getting more significant in health care industry. Especially in the field of mental illness, patients-centered data explain the actual symptoms and emotions patients feel in their real life. Comparison with clinical data focused on placebo effect, patients-centered data explain in detail what happens around the daily life of depressive disorder patients and what conditions they feel. Focusing on depression, this study analyzes how depressive disorder patients explain their symptoms and treatments in online health community. Data are crawled from patients like me.com, which is the patients-centered real-time social platform providing description of symptoms and treatments for more than 2,800 conditions. Semantic network analysis is used as the methodology. Relevant software including UCINET, Wordij, and LIWC are used for the analysis.

Keywords: Depressive disorder, Online health community, Patients-centered data, Semantic network analysis

### **How online platform influences on people's reviews: A case study of Amazon.com and Airbnb.com**

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<sup>1</sup>Department of Interaction Science, Sungkyunkwan University

This study examines how formative surroundings of online platforms influence the content and style of comments within. Online platforms are trying to encourage users to post comments or comments. Most platforms induce consumers to leave comments through diverse types of compensation. However, it is impossible to prevent insincere comments that barely meet the conditions that a platform presents. The study hypothesized that the way which a platform users leave comments on each platform is influenced by the environment of comments on each platform, and that comments on the same platform are written in a similar manner. Past studies overlooked the influence of formative aspects of each platform and blindly tracked the patterns from unstructured data from each platform. They were not interested in "why" people behave differently in each online platform. In this study, we observe the length of the comments and the order of the topics revealed from Latent Dirichlet allocation (LDA). LDA is used for classifying the topics within the comments, and visualizing them through network analysis. Comments from Amazon.com and Airbnb.com were examined and the different formative aspects of each website is jointly analyzed. The results suggest that users affect their behavior with each other online through text, and the developers should consider not only compensating users for their active comment-building activities, but also creating a better environment for comments or formative surroundings. Suggestions for future research were addressed.

### **IMPACT OF INATTENTION AND HYPERACTIVITY-IMPULSIVITY ON PEER DISLIKE: POTENTIAL MEDIATORS FOR THE RELATIONSHIP**

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Attention-deficit/hyperactivity disorder (ADHD) is a disorder characterized by persistent inattention and/or hyperactivity-impulsivity which results in impairment across multiple domains. One such area of impairment associated with ADHD is a tendency towards being rejected by one's peers during school aged years.

Whereas the relationship between ADHD and peer difficulties is clearly well established, the primary symptoms associated with ADHD (i.e., inattention and hyperactivity-impulsivity), measured dimensionally, are also significant predictors for peer difficulties. The poor peer relations seen in the ADHD population lend the group a tendency towards peer rejection.

However, inattention and hyperactivity-impulsivity may also be indirectly related to peer difficulties through an association with other problem behaviors, such as social withdrawal and aggression. These associated problem behaviors have been shown to be related to peer difficulties. Therefore, it is possible that the relationship between inattention and hyperactivity-impulsivity with peer difficulties is mediated by these often-co-occurring problem behaviors of social withdrawal and aggression. Adding to prior research, which has relied on third-party raters or used aggregated peer nominations, we will use Quadratic Assignment Procedure (QAP) correlations to examine concordance in peer nomination patterns.

The following questions guided this study: (a) Are children who are perceived as inattentive also perceived as socially withdrawn and are children who are perceived as hyperactive-impulsive also

perceived as exhibiting aggression? (b) Are perceptions of inattention, hyperactivity-impulsivity, and their associated problem behaviors directly tied to nominations for dislike and a lack of nominations for liking? (c) Is the tie between perceived inattention and peer nominated dislike mediated or moderated by the tie between perceived social withdrawal and peer nominated dislike and is the tie between perceived hyperactivity-impulsivity and peer nominated dislike mediated or moderated by the tie between perceived aggression and peer nominated dislike?

Participants (387 fourth and fifth graders from 21 general education classrooms) nominated classmates for three behaviors related to the core symptoms of ADHD, three associated problem behaviors, and two items related to social status (i.e., liking and disliking). Ties between these nominations will be examined using QAP correlation in UCINET 6.6320. Using the R package Metafor, QAP correlations obtained from all 21 classrooms will be analyzed as a whole. The Metafor package conducts meta-analyses on a variety of different effect sizes and will determine the “true” effect size of the QAP correlations coefficients across all classrooms. Finally, multiple regression analyses will be used to determine whether a child’s nominations of a peer for behaviors related to social withdrawal and/or aggression mediates the relationship between that same peer’s nominations for inattention and/or impulsivity and nominations for disliking.

Preliminary analyses of the core symptoms of ADHD and nominations for liking and dislike have revealed QAP correlations for at least one problem behavior as significantly tied with dislike within 81% of classrooms; nominations for these behaviors have not been tied with liking. QAP correlations between socially withdrawn and aggressive behaviors and peer liking and dislike will be conducted in the near future, followed by the Metafor analyses and the tests for mediation.

### **In-group research interests and their returns on career outcomes for PhDs**

Lanu Kim<sup>1</sup>, Bas Hofstra<sup>1</sup>, Daniel McFarland<sup>1</sup>

<sup>1</sup>Stanford University

As diverse individuals enter academe they will likely study their own groups and diversify the topics science addresses. But does such study enable these underrepresented groups to acquire faculty jobs, or do they place them in competition with one another for the same positions? To answer this, we use a database of 1.2M doctoral students from the United States and follow them from 1980-2015. We study whether PhDs from minority groups (race/ethnicity/gender) are more likely to study their own identity in their dissertations than are majority groups. In addition, we examine whether minority groups studying their own identities have an advantage or disadvantage in early career outcomes. By analyzing these patterns across disciplines, we ascertain whether different relations between minority groups and research topics vary by field. We find there is a strong positive relationship between race/ethnicity/gender and the choice of research topics in race/ethnicity/gender across fields. However, there is no positive career returns for minorities who study their own identity. Only Females studying gender topics and Asians studying Asian topics have lower probabilities of acquiring a faculty job; this trend attenuates over time for Asians but strengthens for females.

### **Influence and interactions of infectious and cancer diseases from Wikipedia networks**

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We use the Google matrix analysis of the English Wikipedia articles network to infer influence of diseases on countries and to infer interactions between diseases and drugs. Nowadays, the free online encyclopedia supersedes old ones such as Encyclopedia Britanica in volume and in quality of articles devoted to scientific topics. For instance, articles devoted to biomolecules are actively maintained by scholars of the domain. The Google matrix analysis, associated to the PageRank

algorithm initially invented by Sergey Brin and Larry Page to efficiently rank pages of the WWW, allows to probe the network of Wikipedia articles in order to measure the influence of every articles. Recently, using parallels with quantum scattering in nuclear physics, mesoscopic physics, and quantum chaos, we have suggested a novel methodology, called Googlomics, for the structural analysis of directed biological networks using spectral analysis of their Google matrices. Moreover we used the new reduced Google matrix method which allows to infer hidden interactions between a set of nodes selected from a huge network. We successfully applied this method for the regulatory biological networks and demonstrate how its computation allows inferring hidden causal relations between the members of a signaling pathway or a functionally related group of genes. Here we study diseases through their entries in the English Wikipedia edition. In particular we focus: - on the set of articles devoted to infectious diseases and the set of articles devoted to countries, in order to measure the influence of different diseases on different countries. Also the reduced network of infectious diseases is built showing direct and hidden relations between diseases, - on the set of articles devoted to cancer types and the set of articles devoted to drugs for cancer treatment, in order to measure possible hidden interactions between drugs and cancers.

### **Migratory Links between the Cities of Hidalgo, Mexico**

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In Mexico, the main migratory flows during most of the 20th century had rural origin. These movements were directed towards the main cities of the country, especially to the capital, located in the central region. In contrast, changes in the behavior of internal migration have been observed at the end of the 20th century and the beginning of the 21st century. On the one hand, the volume and intensity of migrations to the capital of the country were reduced. On the other hand, migration increased towards new urban destinations, including not only rural-urban movements, but also migrations between cities. These migratory flows have been little studied.

The objective of the paper is to carry out an approximation exercise of the Social Network Analysis (SNA) for the study of migrations 2005-2010, registered by the population census in 2010, among the 15 cities of the state of Hidalgo, located in the central region of Mexico. Traditionally, this was a state that expelled population, but in the last decades it became more attractive to migrants and expanded the number of urban localities that are migratory destinations.

Starting from a socio-demographic approach, for the application exercise of Social Network Analysis, migrations are considered as links between the nodes constituted by the cities of the state of Hidalgo, with the possibility of studying a complete network, Mode 1, while the relations or migratory links between all the cities of the state of Hidalgo are analyzed.

The main results are, 1) the analysis of the structure of this network of cities and some SNA measures; 2) a reflection is made on the conceptual and methodological approach of the SNA to the study of this demographic behavior.

**Net.Create: open source software tool to support network capta and interpretive collaborative network data entry**

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Starting from the digital humanities concept of capta, where data are “taken not given, constructed as an interpretation of the phenomenal world, not inherent in it” (Drucker, Graphesis, 2014, p 128), the Net.Create team has developed a new collaborative data collection platform that aids researchers and analysts in making explicit their criteria for what properly comprises a network tie coded from archival or observational data.

Net.Create is a new open source software tool that allows for simultaneous data entry and inspection from multiple sources. Developed specifically for use in history classroom instruction (but useful in others where simultaneous or team-based network data entry is needed), Net.Create allows students to enter information about actors, concepts, and the relationships among them while seeing the results of their work and classmates work in visualized as sociograms immediately. This immediacy and collaborative effort facilitates discovery, discussion, and reading comprehension in students in an interactive and engaging way. In addition, analysis options available to students allow them to see basic network analysis concepts (centrality, communities) emerge from the data to confirm and challenge preconceptions about a historical event or era.

This poster will highlight the features of Net.Create, and some preliminary results from two pilot administrations in large classroom settings undertaken over the course of two 75-minute sessions each in a midwestern university history class. Preliminary results suggest that student comprehension of the historical text improves with the use of the collaborative classroom activity using Net.Create. In addition, we will discuss how simultaneous network data entry supports reading comprehension and the identification of historical significance.

We will also highlight other possible applications or development of the tool for other settings like team-based computational journalism, coding audio-visual recordings for network interactions, and other archival network data.

**Network analysis of heroes cooperation in Dota 2 competitive scene**

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Dota2 is one of two main e-Sports disciplines according to statistics of players and tournaments views at Twitch.tv. High level of competition which is on par with traditional sports nowadays, professional management and strategic approaches dramatically built up sponsors’ interest to the game. The most famous and prestigious Dota2 tournament – The International 2018 – offered \$25.5m US prize pool. Winner took \$11.2m US in a final vs PSG.LGD, which was formerly LGD who partnered earlier in 2018 with a football team PSG.

Like in any other MOBA (multiplayer online battle arena), the game of Dota2 consists of two stages: the draft phase and the game itself. Both of those contribute to the total win probability of a team involved in a match. The state of Dota2 today is about making right decisions of which heroes should compete against each other. This gives some stable matchings of counter measures to nullify the strengths of choice A of team A by strengths of choice B of team B. Eliminating those counters to specific hero picks gives the latter more power and freedom resulting in a complete advantage gain over rival.

Previous researches were mainly focused on win rate and draft's contribution towards it. They were all concerned on hypothetical matches knowing no background of an opponent.

Our goal is to determine preference patterns of specific teams to understand their key heroes, strengths and weaknesses, win probability with different approaches and plans for the game. In particular, we want to prepare a descriptive model helping a team or stats men to understand which hero should be restricted first against a specific rival, what are their most picked (signature) heroes, which hero should be restricted after particular hero is picked. Such data should be useful to any professional team competing in the pro-scene. Knowing the weak point of an opponent may be the most effective way to outplay them. We want to overcome existing understanding of draft stage at the scientific level. This may be useful to any MOBA game as they all have hero drafting stage.

Our research will use network analysis because the goal is to determine the strongest points of the known target team drafts/strategies and eliminate them. Initial dataset being used for research has all recent tournament matches' consolidated data such as: game version, tournament, match ID, teams, match duration, winner, heroes picked, heroes banned, draft order, team factions, player statistics. All of these are accessible with API and may be used for any research.

Application of SNA method to the specific match versus the specific opponent is more appropriate than using some general algorithms because it is real-world applicable. The research would be based on data of the most used hero pairs and bigger clusters of picked and banned heroes of the most successful teams in a time range of recent Dota2 patches.

### **Network Perspective on Natural Resources Governance: Longitudinal Evolution of Bridging and Bonding Ties within a Participatory Modeling Process**

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Participatory modeling processes have grown in popularity as a stakeholder engagement and decision-making technique, in particular because of the ability of these processes to create cohesion between diverse interests. Through joint problem framing, stakeholders in these processes begin to see other group members as "us" and people outside the process as "them". This cohesion is the foundation of the benefits attributed to participatory processes; cohesiveness allows stakeholders to develop and work off of a common platform to integrate multiple sources of knowledge, to address potential future conflicts early, and to work towards acceptable solutions. Limited work, however, has quantitatively assessed cohesion during these processes, in particular, how cohesion changes over the course of participation in participatory modeling processes; the increase in cohesion between participants during participatory processes has been presumed, but not demonstrated.

We used longitudinal social network analysis to examine cohesion during a participatory modeling process. Stakeholders' advice networks were measured over the course of nine OysterFutures workshops, a two-year, facilitated participatory modeling process in the Choptank River Complex, Maryland that was focused on creating consensus recommendations for oyster management. Advice networks were used because they are conduits for the exchange of work-relevant information and knowledge. Presumed changes in stakeholder cohesion were examined using network concepts of bridging and bonding ties. Cohesion was assessed on two levels - the Whole

Network (including OysterFutures workshop participants and people they nominated who did not participate in the workshops) and the Workshop Network (including only OysterFutures workshop participants, divided by stakeholder group). Examining the advice network on two levels provided a more complete understanding of changes in cohesion.

Over nine workshops, on the Whole Network Level, we saw a decrease in reliance on external-OysterFutures members and an increase in reliance on internal-OysterFutures members. This suggests growing internal cohesion of the advice network, a shift from a network mainly comprised of bridging ties (to external experts) to bonding ties (ties among OysterFutures participants). This shift in advice reliance is also demonstrated through the increased isolation of external-OysterFutures nodes and the increased number of ties between internal-OysterFutures nodes. On the Workshop Network Level, we saw an increase in the overall number of ties, a decreased prevalence of brokers, and increased network density. Although the number of bridging ties (ties between stakeholder groups) on this level did not significantly change over time, the increase of the number of ties at the Workshop level and the persistence of those ties that “bridge” stakeholder groups suggests that these ties are no longer acting as bridging ties. Instead at the end, ties are acting as bonding ties, cementing together the advice relationships between stakeholder groups within the OysterFutures process.

The transition of the network structure reflects hypothesized changes to group cohesion during participatory, collaborative processes; OysterFutures led to a change in network structure and function. Strong bridging and bonding ties developed between stakeholders within the process; simultaneously, ties to external experts weakened. This combination drove the creation of group cohesion, with stakeholders relying on each other more.

### **One for all, and all for one? Analysing the micro foundations of technology adoption within a consortium.**

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Networks built around inter-organizational linkages in the form of partnerships, alliances, and consortia have been increasingly formed among firms, laboratories, universities, and governments to take advantage of the benefits of collaboration. Networks act as channels, in which organizations bring their resources and competencies and leverage on them through their direct interactions and through the interaction of their partners with other actors. Benefits of network collaboration include shared resources, risks, competencies, group problem solving, multiple sources of learning and collaborative development. These benefits are pivotal for firms in conditions of high uncertainty, such as technology adoption, in which a quick access to resources and competencies that may reside outside the firm, as well as collaborative efforts, may influence the decision, as well as the adoption process.

This study aims to deepen our knowledge of the micro foundations of technology adoption process, by looking at the role of the network in which organizations are embedded. We specifically aim to verify whether any institutional pressure arises within the network of collaborative relationships, and if any social mechanisms is institutionalized, impacting on member firms’ behaviour towards technological adoption.

To do so, we focus on networks relations, mechanisms, and the conditions used by the network to thrive. We build on data collected through a series of interviews with members of a consortium within agri-food, to conduct an in-depth analysis of its governance and social mechanisms that are in place to solve problems of adaptation, coordination, and safeguarding.

**Perceived weight norms in the personal networks of low-income mothers, and links to overweight**

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In the U.S., 40% of adults and 19% of youth are classified as obese and certain populations, such as racial/ethnic minorities and low-income individuals, face an even greater risk (Hales et al, 2018). Consequently, public health professionals have shifted their focus towards addressing the high rate of obesity and the persistence of these health disparities by examining the complex behavioral, social, and environmental systems that drive excess weight.

A decade of research has highlighted the important role that social influence plays in the spread of obesity. A recent review finds that individuals tend to share the same weight status and weight-related behaviors with important members of their social network, due to both homophily (social selection) and social influence (Zhang et al., 2018). Although these studies have examined weight associations between individuals and their friends, they have typically not examined this association within a broader social network context. Although a strength of previous studies is the use of weight data (e.g., Body Mass Index; BMI) from network members, there is a paucity of data concerning the individual's perception of their network members' weight status. This is an important gap because weight perceptions are commonly misconstrued according to social norms [(e.g., individuals exposed to high rates of obesity may underestimate excess weight (Ali et al., 2011)], and weight-loss efforts can be influenced by one's perception of their peers' weight (Chandler-Laney et al., 2009).

The current study investigates the personal (egocentric) social networks of low-income, predominantly minority women, and explores how their perceived weight norms vary across the different sub-communities (defined by social roles, emotional closeness, and proximity) in their social network. The aim is to examine the relationship between the participant's weight status and their perceptions of the weight status and weight-related behaviors of their network members.

This study analyzes baseline data from an ongoing childhood obesity prevention trial. The intervention is administered through a Home Visiting Program in Los Angeles County that provides services to low-income mothers for the first five years of their child's life. Trained staff measured mothers' height and weight (to compute BMI), and administered surveys to assess mothers' diet, activity, and personal social networks. The network survey measured alters' social role, home location, emotional closeness to ego, health behaviors, and weight status (using a validated figure silhouette scale). We compute weight and behavior norms for participant's entire personal network, and norms for the different sub-communities of interest. We will present preliminary analyses of 50 participants, with the final participation rate expected to be 300 participants.

In light of previous studies (Christakis & Fowler, 2007), we hypothesize that there will be strong associations between participant's weight status and their perceived weight and behavioral norms in their social network, and that the network sub-communities with the strongest associations will be same-sex friends, and biological family members who are living in the same home who share the same genetic and micro-environmental risks. The results will provide information that is valuable when designing network-based intervention strategies for obesity prevention initiatives.

**96 - Practicing Meaningful Interpretation of Impressions among the Classical Turkish Music Composers**Aykut BASARAN<sup>1</sup>, Derya FINDIK<sup>2</sup><sup>1</sup>Ankara Yıldırım Beyazıt University, <sup>2</sup>Ankara Yıldırım Beyazıt University

Composers are important figures in the society. Their works are admired and give excitement to the people who enjoy listening to music. In this paper, we focus on practicing meaningful interpretation of impressions among the Classical Turkish Music composers. There is a common understanding that Classical Turkish Music, rooted in Ottoman Classical Music, is emerged and improved in Enderun-ı Humayun, Mehterhane-yi Humayun, Musika-i Humayun, Mevlevihane's, and music schools. Contrary to the features of Western Classical Music; Classical Turkish Music includes a different training technique, namely Meshk System. We use a novel dataset which is gathered from <http://www.notaarsivleri.com/> and "Encyclopedia of Great Turkish Music, Yılmaz Oztuna". These two websites are built by Remzi Oktar (TRT, Radio of Ankara Turkish Art Music, Vocal Artist) with the contribution of music lovers. This archive depends on TRT (Institution of Radio and Television of Turkey) sources. For the purpose of achieving better visualization and higher interpretation power, data of composers who were born before 1901 and have at least 12 works were used in this study. As a result, 99 unique composers have remained for network analysis. Also, unique maqams and 244 unique tempos are used by the composers in our data. From a methodological point of view, common network analysis techniques as Degree Centrality, Eigenvector Centrality, Betweenness Centrality, Average Weighted Degree, Modularity, and PageRank are applied in this study. As a social network analysis tool, Gephi Software is chosen to illustrate and visualize data. In addition to mentioned indicators, we also consider dates of birth, locations, schools, workplaces, nationalities, and musical productivity of the composers to have a further interpretation of the network. Moreover, relations of composers are measured through information that includes composer-teacher network and composer network, from "Encyclopedia of Great Turkish Music". Afterward, relations of composers are calculated through maqam, tempo, and the combination of maqam and tempo similarity to reveal impressions on each other. To measure maqam and tempo similarity, cosine similarity index is performed which maqam and tempo of the composers are thought as bags of words. Accordingly, the number of maqams and tempos performed by composers are taken into consideration to compute similarity. Data of composers are considered as bags of words. Maqam and tempo are important indicators since these are transferred from teacher to student through Meshk system that lies at the core of Education in the Classical Turkish Music. In the analysis, comparison and interpretation are implemented based on the information extracted from the Encyclopedia and values of maqam and tempo similarity. Based on the results of this study, important figures of Classical Turkish Music and areas where creativity occurs are revealed which will provide a broader perspective for people who will study in this area in the future.

**Probing Limits of Information Spread with Sequential Seeding**Jarosław Jankowski<sup>1</sup>, Bolesław K. Szymanski<sup>2</sup>, Przemysław Kazienko<sup>3</sup>, Radosław Michalski<sup>3</sup>, Piotr Bródka<sup>3</sup><sup>1</sup>Faculty of Computer Science and Information Technology, West Pomeranian University of Technology, 70-310, Szczecin, Poland, <sup>2</sup>Social and Cognitive Networks Academic Research Center and Department of Computer Science, Rensselaer Polytechnic Institute, Troy, NY, 12180, USA,

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We consider information spread which propagates with certain probability from nodes just activated to their not yet activated neighbors. Diffusion cascades can be triggered by activation of even a small set of nodes. Such activation is commonly performed in a single stage. A novel approach based on sequential seeding was introduced resulting in three fundamental contributions. First, we propose a coordinated execution of randomized choices to enable precise comparison of different algorithms in general. We apply it when the newly activated nodes at each stage of spreading attempt to activate their neighbors. Then, we prepared a formal proof that sequential seeding delivers at least as good spread coverage as the single stage seeding does. Moreover, we also show that, under modest assumptions, sequential seeding performs provably better than the single stage seeding using the same number of seeds and node ranking. Finally, we have performed experimental results comparing single stage and sequential approaches on directed and undirected graphs to the well-known greedy approach to provide the objective measure of the sequential seeding benefits. Surprisingly, applying sequential seeding to a simple degree-based selection leads to higher coverage than achieved by the computationally expensive greedy approach currently considered to be the best heuristic. Presented approach has several implications for practice. Instead of introducing the product to a large number of customers at the outset of the commercial campaign, a better strategy is seeding a small fraction of nodes and giving a chance to natural diffusion driven by social influence mechanisms to spread the content. Marketing budgets can be optimized if additional seeds are utilized only if the campaign fails and revival is needed. Moreover, the knowledge gained from the initial spreading may improve seed selection for revival. Increased coverage of spreading might be crucial for campaigns with limited budgets, such as spreading security information, or disease warnings and awareness. During massive campaigns habituation phenomenon can arise among customers resistant to marketed messages. It can be avoided by limiting the intensity of marketing activity. While campaigns with higher intensity can be perceived negatively as massive unsolicited communication, sequential strategies may avoid making such a negative impact on customers. Sequential seeding is a low-risk strategy with possible high gains because, as we proved, coverage will never be worse than the coverage of the corresponding single stage seeding. Another application, presented below, goes beyond the scope of our discussions here, nevertheless it shows additional benefits of sequential seeding. In social media, marketing content is often delivered to users with many connections hoping that they will share content within their networks by using platform-specific mechanisms (e.g., likes, retweets). Seeding can be beneficially delayed to avoid reaching nodes easily reachable from their social connections.

### **Pubertal Timing and Social Connectedness in Adolescence**

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Pubertal timing is associated with a variety of biological, environmental, and psychological changes. Early pubertal timing in females increases the likelihood of psychological and behavioral difficulties such as depression, anxiety, maladaptive eating behaviors, and risky decision-making. One explanation for this effect is that the developmental changes associated with puberty draw increased attention and social expectations, for which early maturing girls may not be developmentally prepared. This social role adjustment during early puberty may increase the risk of psychological distress and engagement in risky behaviors relative to their same-aged peers. Using social network analysis, we will assess the validity of this theory by analyzing social

connectivity as it relates to menarchal timing and early adoption of risky behaviors relative to peers.

To determine whether menarchal timing can predict the development of social relationships and early adoption of risky behaviors (e.g., unprotected sex, fighting, drinking, and drug use) in adolescent females, we will analyze whole-networks of separate high schools in the National Longitudinal Study of Adolescent to Adult Health (ADD Health), in which participants nominated up to 5 male and 5 female friends. We will analyze the proportion of incoming and outgoing ties to male actors and their association with earlier menarche to address the possibility that early physical development draws unrequited attention measured by lower reciprocity of male friendships. We will also evaluate whether risky behaviors, including drinking, disordered eating behavior, and risky sexual behaviors are associated with higher incoming ties from men and reduced rates of reciprocity. Finally, we will analyze whether individuals who experienced early menarche nominate alters who engage in a greater number of risky behaviors relative to peers, and whether age of menarche is correlated with a lower adoption threshold of risky behaviors.

### **Retired NFL players' personal networks and relation to general health metrics**

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Football players who retire experience changes to their social life due to a transition away from a team environment. In this study, we characterized the personal networks of retired NFL football players who are part of the Harvard Football Players Health Study using an online personal network protocol. Our aim was to characterize the personal networks as compared to an age-matched control group, and to examine associations with player-reported neuropsychiatric, physical, and cognitive health. We used the PROMIS Global Health 10 short form to assess neuropsychiatric and physical health. We used NeuroQOL Applied Cognition Bank to assess cognitive health. 280 players responded to the survey with an average age of 58. 76% were White, 20% Black, and 4% Other. 94% were College educated. The average network size was 9.0, density was 0.72, percent kin in the network was 42%, and percent of persons who did not exercise regularly was 32%. These characteristics were not significantly different from an age-matched cohort that took the same survey. Network size was correlated with PROMIS neuropsychiatric function (Spearman  $\rho=0.14$ ,  $p=0.03$ ) and PROMIS physical function (Spearman  $\rho=0.14$ ,  $p=0.03$ ). Network size was not correlated with the NeuroQOL cognitive bank (Spearman  $\rho=0.08$ ,  $p=0.29$ ). After adjustment for age and race, network size remained associated with PROMIS neuropsychiatric function (Beta=0.28, SE=0.14,  $p=0.04$ ). In conclusion, participants, on average, had personal networks comparable to age-matched controls and network size was related to neuropsychiatric, but not physical or cognitive, function.

### **Small Network Properties and Implications for Organizations**

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Although much of human activity occurs in very small groups and organizations, we tend to focus our social science on large scale organizations. Reviewing literature on familial and kin structures as well as small businesses and small organizations, I invoke network simulations to typologize relational structures typical to those of contemporary human enterprise. Results will provide explanations on the dynamic behavior of successful and unsuccessful organizations, and debunk mythologies surrounding small group power relations.

**Social Contacts of People who Inject Drugs in Ottawa Exhibit a Small-World Network**

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**Background:** The structure of both the social and risk-related contact (i.e. sharing needles) of people who inject drugs (PWID) networks are a key component in understanding the risk environment for members of hard-to-reach populations and also has important implications for diseases transmission and health behaviours. PWIDs egocentric information can provide two additional important aspects of network structure: clustering i.e. the number of possible individual within a group that would know each other) and average path lengths (the average number of contacts existing in the shortest chain connecting any two individuals within the network). Networks that have high clustering and short average path lengths are classified as a small-world network. Risk networks that are also small-world networks can lead to more redundant paths increases the likelihood of disease transmission and alters the relationship between concurrency and epidemic potential. However, small-world properties, clustering and short average path length, can also be used to make positive changes within risk networks. Identifying key individuals and/or groups for interventions can increase individual likelihoods of engaging in and spreading health-promoting behaviours.

**Objective:** The aim of this study was to identify an appropriate network structure, using social contacts and other information that would best reflect the disease transmission topology of people who inject drugs (PWID) in Ottawa.

**Methods:** Using a respondent-driven sample (RDS) of PWID in Ottawa in 2007, we used two different methods of calculating clustering, which includes the traditional clustering coefficient (CC) (for complete networks) and the other CC for incomplete networks, to assess whether the PWID network can be categorized as a small-world structure. Matlab was used to calculate average path length and the clustering coefficient by using the number of PWID each participant knows (alters), and the connections between them. We constructed 1,000 random graphs with the same number of nodes as the observed RDS network, with links joining participants and their alters randomly and compared it to the observed network.

**Results:** The network of PWID in Ottawa 2007 can be classified as a small world network rather than a random network which has implications for efficient interventions. Furthermore, the two different approaches to calculating CC provided similar results for quantifying small-worldness of the PWID network.

**Conclusion:** The traditional clustering coefficient associated with small-world networks was originally intended for complete networks. As networks constructed with RDS data are incomplete, this study demonstrates how social contacts of PWID RDS data can be used to determine the small-worldness of the network, with an appropriate clustering coefficient, and its implication in public health.

**Social selection and social influence on college students' maximum drinking days**

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Excessive alcohol use among college students is a pervasive problem associated with a host of adverse health consequences. Previous research among college students has found that there are certain behaviors that drive increased consumption, such as pre-gaming and playing drinking games. Recently, there has been an interest in examining the social factors that are associated with excessive alcohol use. For example, among males, drinking with other males is related to greater consumption compared to drinking with both female and male peers. However, more research is needed to examine how social networks facilitate or inhibit excessive alcohol use. The

main aim of the current study was to examine the stability of social network connections during days when college students use alcohol excessively. Specifically, stochastic actor-oriented models will be utilized to examine the extent to which 1) excessive drinking of peers influences one's own excessive drinking (e.g., social influence) and 2) college students select peers to drink with who drink excessively (e.g., social selection).

The dataset is from a longitudinal sociocentric social network study with an entire first-year class at a private, Northeastern university. Enrollment of the entire incoming first-year class took place in the fall of 2016. Students were assessed at three time points: one month into the fall semester of their first year, one month into the spring semester of their first year, and one month into the fall semester of their second year. Of the 1660 eligible students, 1342 (81%) consented online and complete the baseline survey. Follow-up rates were excellent: 98% (n = 1313) of the baseline sample completed the first follow-up, and 96% (n = 1295) completed the second follow-up.

At each time point, participants completed a battery of assessments, including a sociocentric network questionnaire, measures of alcohol use, and a network measure about their maximum drinking day. On the sociocentric network questionnaire, participants were presented with a drop-down list of all eligible first-year participants and were asked to select up to other first-year students at the University "who have been important to you in the past month, regardless of whether or not you liked them. These might be people you socialized with, studied with, or regularly had fun with". Participants then entered the first name, last initial of each person they selected and answered subsequent questions about each selected peer.

After completing the sociocentric network questionnaire, participants who self-reported drinking in the past month were reminded of the number of drinks they consumed on the day they drank the most. Participants were then presented with the instructions, "On the day that you drank the most, indicate which of the people you named in the sociocentric network questionnaire were there." They were shown the names of their nominated network members in a "check all that apply" fashion. This was the dataset used to assess network ties. Using RSiena, stochastic actor-oriented models we will be used to examine social selection and social influence.

### **Socially Anxious Men and Their Utility of Personal and Professional Social Networks**

Chase W. Herndon<sup>1</sup>

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In this paper we examine different disciplines of research to get a new perspective of social anxiety in men. There are three sections we examine in this paper: (i) Social anxiety for men and the differences in prevalence and severity as opposed to women. (ii) Evolutionary psychology perspective examining the potential utility and etiology of social anxiety and its unique characteristics. (iii) Social Network Analysis looks at the development and preferences of groups socially anxious men might prefer (weak ties vs. strong ties) in their social networks. Overall, we find support in the literature for sub-clinical levels of social anxiety disorder in men as a potential advantage within a professional work setting. Future studies and cautions with theory are also noted in the paper.

### **Stability of Popular Opinion Leaders Overtime within a Youth-Led Sexual Violence Prevention Initiative**

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Social network analysis is an increasingly popular method to identify popular opinion leaders (POLs) for preventative intervention programming and research. These POLs are nominated by

their peers, and may valuable intervention targets because they influence social norms and behaviors. Thus, by identifying POLs to target for programming, preventative interventions may be more effective in the broader community. However, POLs may change over time, which may affect programming and research for preventative interventions. Some research shows that social networks, including POLs, are stable over time. However, adolescence is a time of shifting values, beliefs, and relationships. Thus, it may be that POLs may shift during this period. In the current presentation, we examine: 1) stability of POLs in a study of middle and high school students, and 2) demographic, attitudinal, and behavioral predictors of POL stability.

These data come from an ongoing, CDC-funded project in which social network analysis was used to identify POLs among middle and high schools students. These POLs were part of a youth summit in the summer of 2018 which is followed by the roll-out of youth-led SV prevention working groups; the programming initiative is called Youth VIP (Voices in Prevention). In fall 2017 and spring 2018, over 2,300 youth (~20% Native American) in grades 7 to 10 in a school district in the Great Plains region of the U.S. completed baseline surveys that inquired about SV attitudes and experiences as well as surveys that assessed risk (e.g., alcohol use) and protective (e.g., bystander action) factors for SV experiences. The current presentation uses data from the first wave, and from the third wave that occurred one year later.

In the current presentation, we will report stability of POLs across one year (aim 1). We will then use multiple regression analysis to explore demographic (age, sex, race, ethnicity, sexual orientation, and socioeconomic status), attitudinal (social norms, mattering, youth empowerment, acceptance of diversity), and behavioral (healthy coping, alcohol use, dating behavior, bystander behavior, sexual assault perpetration and victimization) predictors of POL stability. This research will inform programming and research that utilizes POLs in preventative interventions to enact behavioral change in a community.

### **Sustainability of Collaborative Project Networks in Australian Agriculture**

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This poster reports on Phase One of a two-phase study examining the sustainability of collaborative project networks using social network analysis (SNA). Phase One findings offer a way to think about sustainability that may better assure the future of collaborative network projects. The study examines the social, network and contextual infrastructure that supported or hindered the sustainability beyond initial project funding of three collaborative projects within the two-year \$14M Australian Government Farming Together Program (FTP). The FTP, launched in 2016, arose from initiatives aimed at addressing significant and complex societal problems via funding of collaborative project networks. Specifically, the FTP sought to tackle issues related to trading practices in the supply chain in Australian agriculture through the development, by farming groups, of innovative collaborative business models within collaborative project networks.

While funding of such networks is on the increase, they are prone to failing to sustain effects beyond funding and, despite a burgeoning body of research, there remains a knowledge deficit on how to sustain collaborative project networks for their ongoing impact.

The study uses an embedded case study approach, examining three farmer collaborations for two years after project inception using a combination of SNA and thematic analysis of project documentation. A network linkage survey was used to capture information on the level of connectivity for each of the three collaborations as a 'whole', based on variables reflecting the types of linkage activities deemed necessary for collective enterprise to develop including: advice giving; shared information; shared resources; joint projects; exchange of goods and services; shared money; and, support. This survey was sent to all members of the collaborations at two

points in time, six months apart. The thematic analysis informed network maps and metrics, providing information about network contexts, and the processes used by each network to work towards sustainability. The network analysis visually mapped and empirically measured connectivity, ties and knowledge flows of the collaborations longitudinally, showing how the structure and function of each network inhibited or facilitated sustainability over time.

Analysis in Phase One generated a topology of the sets of relationships and level of connectivity affording a more nuanced understanding of dynamics and effects of network interaction leading to sustainability. Some preliminary indicators of sustainability identified include: an administrative core network of three to four members; multiplexity where network members were connected by several different types of exchanges; the existence of prior relationships that fast-tracked the formation phase and expedited project operation; and, integration mechanisms such as cooperative arrangements or joint ventures that provided supplementary cohesion for projects. Phase One findings suggest that sustainability should be considered from project outset as a complex and dynamic multi-layered and multi-dimensional process to inform the allocation of project funding as well as project network development.

Further longitudinal research is needed to examine characteristics of those collaborative project networks that are sustained beyond initial funding and Phase two will examine the progression of the three networks after cessation of funding to develop additional sustainability indicators.

### **The Communities We Create: Exploring the Chinese-Food-Nets of First and Second Generation Chinese Immigrants in Toronto**

Celia Huang<sup>1</sup>

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Very little social network analysis research has examined how immigrants create their communities in Toronto through understanding the role of food sharing in their community building. Inspired by the conventional ego-nets approach, I use a novel approach, “Chinese-food-nets”, defined as the personal networks that include a set of people with whom a Chinese immigrant shares Chinese food. I’m interested in mapping the changing structure and content of communal relations when they eat Chinese food together by comparing the first and second generations of Chinese immigrants in Toronto. This analysis is conducted based on data collected from 20 semi-structured face-to-face interviews for 21 research participants who are self-identified as Chinese living in Toronto, over 18 years old, and have experience with eating Chinese food either at home or restaurants. They provided information for 209 people (up to 12 people for each research participant) in their Chinese-food-nets. The interviews were conducted in Mandarin for 13 first generation Chinese immigrants, and in English for 8 second generation Chinese immigrants. The ages range from 26 to 84 with a median age of 35. The annual personal income ranges from 0 to more than 100,000 Canadian dollars. While the research participants are all Chinese immigrants living in Toronto’s census metropolitan area, the people listed in their Chinese-food-nets come from diverse cultural backgrounds including Malaysia, Philippines, Vietnam, Korea, Iran, America, Scotland, England, the Netherlands, France, Poland, Russia, and Jamaica. The preliminary findings indicate that (1) younger Chinese immigrants (both first and second generation) have more diverse Chinese-food-nets in terms of ethnicity than older Chinese immigrants, (2) second generation immigrants earn higher incomes in the labour market and face fewer cultural barriers in Canadian society, (3) in the social relationships of both first and second generation immigrants, more financial support is provided by family members, while emotional support and practical information are exchanged between both family and friends within their Chinese-food-nets. I will present more detailed findings of their Chinese-food-nets as the data is currently being analyzed. Using social network analysis to map the Chinese-food-nets is the first

step in exploring how shared meanings are constructed in their communities in Toronto, and is part of a larger project that aims to understand the cultural meanings and values of food sharing in their social relationships from the perspectives of first and second generation Chinese immigrants in Canada.

### **The Duality between Shared System of Beliefs about State and Symbolic Disobedience: Using Relational Class Analysis to Understand the Practice of Brazilian Jeitinho**

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Jeitinho is a ubiquitous Brazilian social practice to solve a problem, difficult or prohibited situation, whether in the form of a cheat to some law, whether in the form of conciliation, cleverness, or ability. Although the confrontation is not used, Brazilian Jeitinho is an act of symbolic disobedience, since it seeks to subvert the dominant logic of the State without the use of the force. Its foundations are settled on the belief in the State authoritarianism and the excessive formalism: a huge discrepancy between what is prescribed by Brazilian law with what is effectively accomplished as a real practice. Despite ubiquitous, the feelings that Brazilians have about the Jeitinho, as well as the styles and strategies they use for bypass the laws may vary according to the system of beliefs about the State. But the fundamental problem is that, even if the citizen has different opinions about the state, it does not mean that he disagreed with which elements are significant for his appreciation of the context from which the Jeitinho operates. To cope with the heterogeneity of belief systems about the State, we propose the use of relational class analysis (RCA), a graph-based method that identifies groups of individuals who share the same structure of meaning, even if they disagree in answers. Three subsamples of relational classes were identified, each one referring to different ways of organizing the systems of beliefs about the State. Then, using both the multiple correspondence analysis and the logistic regression methods, we analyzed the duality between styles and feelings about the Jeitinho with each one of the relational classes. Our results indicated that different relational classes refers to the different styles and strategies of use of the Brazilian Jeitinho, as well as demonstrate that the emotional response of obtaining or not success in the use of the Jeitinho varies according to each classes.

### **The Echo Chambers of Value Homophily and Network Sentiments in Social Media**

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The phenomenal growth in social media engagement around the world has transformed the nature of political discourse. Online social media and associated social networks are an increasingly important forum for public debate and are known to influence individual attitudes and behaviors. Some research suggested that the Internet and social media has increased citizens' exposure to political discussion and contributed to the heterogeneity of political discussion networks. Others have argued that the Internet and social media enables individuals to selectively interact with others who share similar political views, potentially damaging deliberative participation. Furthermore, political homophily produces shared political attitudes which can result in political polarization. This study aims at investigating echo chamber phenomenon of the largest bulletin board system (PTT BBS) in Taiwan and measuring the interaction effects of value homophily and network sentiments in this discussion forum. Social network analyses (by NodeXL) and semantic analyses (by CVAW, developed by Yuan Ze University Big Data Innovation Center) are employed in this study to examine the patterns of echo chamber

in different sentimental discussion networks. The main purposes of this study includes: (1) to explore whether sentiment homophily fosters echo chambers effect; and (2) to explore the interaction effects of different political attitudes in positive/negative sentimental discussion networks. So far our finding suggest that in positive discussion network, string groups with positive sentiment are more likely to interact with those with similar sentiment, while in negative discussion network, groups with negative sentiment are more likely to interact with those with opposite sentiments. That is, in selected political event, the echo chamber of positive sentiment is more likely to be found in a discussion network with positive discussion strings. Active interaction among groups with mixed sentiments is more likely to be found in negative discussion networks. This finding suggests structural features and sentiment of discussion networks play an increasing important role in shaping public engagement. A further examination of users' political attitude toward selected political issues and their interaction between positive/negative network sentiments will be analyzed in the second part of study to measure the echo chamber effects.

### **The Effect of Social Networks and Social Constructions on HIV Risk Perceptions among High-Risk Heterosexuals**

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Intro: Roughly 1 in 7 people living with HIV in the United States is unaware of their sero-status, which may be attributed in part to low HIV risk perceptions. Many studies have linked low HIV risk perceptions to socio-demographic factors, risk behaviors and socio-cognitive processes. However, few studies have explored the role of interpersonal relationships in shaping self-perceived HIV risk, as well as perceptions of associates' HIV risk. The present analysis examines individual, interpersonal and network influences on perceptions of HIV risk among heterosexuals at risk for HIV.

Methods: Data come from "Project 90," a CDC-funded study of the influence of network structure on the dynamics of HIV transmission in a community of high-risk heterosexuals. Data were collected between 1988 and 1992 in Colorado Springs, CO. Two analyses were conducted at (1) the ego- and (2) tie-level to identify predictors of self-perceived HIV risk, as well as perceived HIV risk of a respondent's alters. In the first analysis, we used a partial proportional odds regression model to regress respondents' self-perceived HIV risk on socio-demographics, HIV risk related behaviors, network effects and their associated interactions. For the second analysis, we used Generalized Estimating Equations (GEE) to regress respondents' perceptions of their alters' HIV risk on socio-demographics, risk behaviors, and relational and network characteristics.

Results: Our analyses found that interpersonal characteristics such as perceptions of associates' HIV risk (AOR 7.7, 95% CI 4.36-13.62), racial homophily (AOR 1.45; 95% CI 0.77-7.72), and engagement in multiplexity (co-occurrence of drug-use, needle sharing and sex within relationships; AOR 1.69; 95% CI 1.08-2.67) were significantly associated with respondents' self-perceived HIV risk. Factors associated with perceptions of associates' HIV risk include self-perceived HIV risk (AOR 2.2, 95% CI 1.73-2.74), emotional closeness within relationships, measured by frequency of interaction (AOR 0.69; 95% CI 0.59-0.80) and strength of relationship (AOR 0.91; 95% CI 0.87-0.95), and density of drug ties (AOR 1.47, 95% CI 1.19-1.83).

Discussion: Findings indicate that HIV risk perception is the product of not only individual-level factors, but also interpersonal and social network processes, such as homophily and multiplexity. A key finding from our analysis is the reciprocal relationship between an individual's perception of their own risk, and the perceived HIV risk of their associates. This and other related findings highlight the need to view risk perception as a function of an individual's network embeddedness as well as the construction and perception of their HIV risk environment.

**The Impact of Peer Networks on Police Performance**

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A string of high-profile incidents between citizens and the police in Chicago, Indianapolis, New York City, Los Angeles, Baton Rouge, Philadelphia, Falcon Heights, Minnesota, and many other areas has led to a greater awareness of police behavior, and particularly, the prevalence of police misconduct. Current explanations of police misconduct and discussions about policy reform are typically focused on officer-level characteristics as well as larger organizational patterns. The proposed project shifts the analytical lens to the 'middle-level' of explanation, namely the formal and informal associations among officers. The study grows out of research conducted by the authors that examined how violence spread across officer misconduct networks within a police department. Specifically, it aims to foreground this issue by addressing one of the main limits of the study: a lack of data on the full network in which the officers were embedded and from which the behavior emerged. The primary data source for the study will be surveys of full-time sworn patrol officers and street-level proactive investigators (e.g., narcotics, gang, crime suppression units) employed in one of the largest departments in the US. The survey asks officers about their 'formal' networks – the colleagues they worked or trained with – and their 'informal' networks – the colleagues they go to for advice or social support. We highlight results from the pilot study, which examines the formal and informal structure of officer networks, and the role these networks play in the social transmission of officer behavior, including misconduct and other indicators of police performance. The study is designed to inform meaningful prevention initiatives to decrease officer-involved violence and related misconduct.

**The Indiana University Precision Health Grand Challenge Person to Person Health Interview Study: Creating a Representative Multi-Level Public Health Data Set for Health Promotion and Disease Prevention**

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The goal of the Person to Person Health Interview Study (P2P) is to better understand how the social and physical environments, culture, behaviors and genetic traits may put a person at risk for certain diseases and impact their ability to respond and recover. The study will be conducted with a random sample of 2,000 or more residents of Indiana balanced with respect to age, ethnicity, urbanicity, and gender. The study will generate a unique multi-level data set linking cutting-edge data on genetics, biology, and the sociocultural and physical environment to expand our knowledge about the factors that shape diseases and disease risk, how it affects treatment outcomes and the ways individuals respond. In addition to demographics the study will collect information on a broad range of health behaviors and attitudes (including mental health), service utilization and attitudes toward those services, employment history, environmental exposure through work and home, an ego-centered network panel that assesses a range of relationships and social support. Basic biometric information (height, weight, blood pressure, adiposity and BMI), and saliva samples for DNA sequencing will also be collected. In collaboration with The Regenstrief Institute, the study will also link respondent data to electronic health records where possible. Anticipating longitudinal follow up and future studies, respondents will be consented for future contact, creating a rich, longitudinal, multi-level data set for future research on health and health behaviors. The Person to Person Health Interview study is primarily a modified health

behavior survey. In addition to standard survey approaches, the study also includes a social network battery, a section for the collection of biometric measurements and a section for collecting a saliva sample for DNA extraction, and several open-ended qualitative questions. Study design and content were developed with input from key stakeholders including leadership of four disease research clusters, the Indiana Clinical and Translational Sciences Institute, and the Indiana University research faculty. This poster presents the study and some very preliminary findings with respect to data collection, participation, and initial survey findings.

### **The relations between group tie strength and travel patterns in the city**

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As the use of internet and Smartphone applications grow, our social networks no longer reside within the confines of family ties, neighbors, or school mates. Virtual groups and communication applications allow us to build up both our individual net of social ties, as well as group-based associated connections. Thus, our daily schedule intertwines between different types of meetings and groups. In such an environment, the role of smart, integrated transport becomes important; however, it is not yet fully understood, how the triangle of social network, transport means and intelligent communication and management systems may synchronize into one.

The study is rooted within two theoretical frameworks. The first is Scott Feld's "Foci" which is defined by Feld (1981) as an entity, either physical or social, which generates joint activities. According to which, group activities are based in relation to a physical or temporal focus, thus individuals are connected via events, locations, or activities. Feld's theory contradicts a tradition known as "the balance theory", by which relations are based on psychological components, such as similarity, proximity, and membership. Second theoretical framework is the concept of fragmented activities, as coined by both Alexander et al. (2011) as well as Neutens et Al. (2011). As proposed by the authors, recent developments in data analytics allow us to define better Hägerstrand Time/Space Prism (1970) and enable us to treat activities in fragmented manner and divide them into several small subtasks, performed at different times and locations. This research relates to a growing multidisciplinary field at which leisure travel is analyzed via aspects of communication, travel behavior and social networks. All studies conducted thus far are based upon Wellman's theoretical framework, known as the "Network Individualism". By relating both Feld's Foci theory and the concept of fragmented time-frame, it is the purpose of this study to understand the way meetings (between friends, colleagues, or family members) are taking place in the city and their related aspects of spatial arrangement and travel behavior patterns.

To do so, the study has traced the travel and spatial behavior patterns of groups (i.e. three and more) who live and/or work in Tel Aviv, Israel. Using online questionnaires, the study focused on the fragment of meetings: how they were formed, and in what ways their formation relates to socio-demographic parameters and the city's structure. The questionnaires were structured upon three parts, the first portrayed aspects related to the formation of the meeting, its location, and transport mode; the second defined the type and strength of ties among the participants; and the third depicted the respondent's socio-demographic characteristics. The 200 responds were then geo-located based on Tel Aviv municipality GIS services.

Two emerging patterns were revealed through multi-regression models: The first supports findings from current studies which identified the link between travel efforts and the strength of the social tie. According to which travel effort correlates positively with strong ties. The second model relates meeting locations with tie strength and demonstrates that higher walkability measures correlates positively with stronger ties.

### **The Systemic Barriers for Building Innovation Networks in the Emerging Biotechnology Industry**

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Literature maintains that in an emerging sector, firms rely heavily on external knowledge to improve the internal R&D capabilities. During the process, firms constantly encounter barriers to the process of technology transfer. However, how do systematic barriers influence the way firms acquire external knowledge during the innovation process is still unclear in the literature. Combining social network analysis and 38 elite interviews on a longitudinal dataset gathered from financial reports of 185 firms who have initial public offering (IPO), this paper, through studying the biotechnology sector in Taiwan, explores barriers that firms encounter while acquiring technology from external resources. The finding shows while firms rely heavily on external knowledge, enhancing financial support, improving human capital, strengthening local knowledge base, and expanding the potential market would be the most important enhancements to help firms overcome systematic barriers of knowledge transfer and enhance knowledge integration in the emerging sectors.

### **The Ties that Bind Climate Science and Practice in Coastal Adaptive Comanagement**

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Sustainability science literature has elevated the role of stakeholder participation in climate adaptation decision-making and in overall governance. Inclusive and just participation of different stakeholder groups in adaptive comanagement (ACM) of climate adaptation can enable social learning. The collaborative creation of new knowledge as an offspring of scientific and local knowledge is a valuable and desirable outcome of ACM. However, measuring learning outcomes presents challenges. Perception-based approaches, which rely on self-reported stakeholder perceptions toward participatory process and outcomes, have shown appealing, albeit limited, results. The aim of this study is to investigate the extent relational ties between information producers (scientists) and users (practitioners) in collaborative networks are associated with their perceptions about the collaborative quality, learning experiences, and risk perceptions to further the understanding of perception-based ACM measurements through a social network analysis (SNA) perspective. We test whether collaborations ties among stakeholders predict perceptions of learning and the production of new knowledge.

We draw from Social Contagion Theory to frame the anticipated effect from relational ties in shaping individual perceptions (i.e., social influence). We use a case-study approach to investigate an empirical collaboration network of stakeholders working on climate adaptation projects in Maryland, USA. A questionnaire was delivered to participants gathering perception data of (1) collaboration quality, (2) overall satisfaction, (3) learning experiences, and (4) risk. Network autocorrelation models were used to measure the network effect on different perceptions, and stochastic actor-oriented models (SAOMs) were built for a cross-sectional network to compute the probability of actors to establish ties based on perception values.

Results suggest collaboration networks can predict perceptions of collaborative quality (i.e., participants are satisfied with the quality of collaboration) and learning experiences (i.e., participants perceive collaboration ties facilitate learning). Moreover, risk perceptions are

inversely associated with the quality of collaboration. In conclusion, this study posits a network-based approach to measuring ACM effectiveness through stakeholder perceptions.

This study may help researchers and practitioners structure ACM networks in ways that are likely to improve the perception of ACM process and outcomes and as a result, monitor the progress towards a more resilience community.

### **Trusters vs. information seekers; separate paths of information seeking in candidates of cataract surgery**

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Rationale: to study the sources of information for patients candidating for cataract surgery, and the association between information source and patient's knowledge and attitude toward surgery.

Methods: patients eligible for cataract surgery in a mixed urban-rural region in a northern province of Iran were invited to complete a survey before surgery, in which they identified the importance of different resources in informing them about the disease and surgery; including: surgeon, other doctors, nurses and other personnel, mass media, internet, and friends/family/acquaintances. They also indicated their agreement with statements regarding self-perceived knowledgeability of the disease and surgery, attitude towards the surgeon and other personnel, and attitude towards recovery after surgery. Results: Ninety nine patients responded to the survey. Their average (SD) age was 64 (10) years; 56% were female; 69% were illiterate; 60% lived with a partner; and 78% were either unemployed, retired, or stayed home. We developed a structural equation model to assess the association between information sources and constructs of knowledge and attitude. In the measurement model we developed three latent variables of knowledgeability, attitude towards health care providers, and attitude towards surgery. The structural model showed that the only information sources that were significantly associated with knowledge and attitude constructs were the surgeon and friends/family/acquaintances. Internet and books were not mentioned by anyone, and were removed from the model. All information sources significantly covaried, except friends/family/acquaintances, which did not associate with any other information source. Among respondents who expressed some degree of effects for the role of friends/family/acquaintances, 80% relied on kin, 21% on neighbors, and 7% on extended family. Of the friends/family/acquaintances, 86% themselves had a history of cataract surgery. Discussion: it seems that there is a distinct subgroup of patients who rely more on personal social networks (mostly the ones with the history of surgery), rather than clinical information sources and mass media. This tendency could be due to an intrinsic reliance on bonding social networks or a consequence of limited opportunity to access clinical information sources. Nevertheless it positively affects the perception of knowledgeability and attitude towards medical staff, and recovery after surgery. On the other hand, the information seekers turn to a variety of sources such as the surgeon, other doctors, and personnel, as well as mass media.

**Using Digital Trace Data to Generate Autism Support Team Networks**

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**Background:** A few online tools to facilitate communication and resource sharing among treatment and education team members working with children with autism have been developed. To date, no studies have investigated how these interfaces affect collaboration among users. There are no standard ways of measuring team interaction on digital interfaces. Rigorous measurement of these interactions will provide new knowledge about the impact that digital interfaces have on care coordination and outcomes. We developed, using R programming, a method to map digital social networks as a promising approach for studying team dynamics on digital interfaces for individuals with autism.

**Objectives:** To demonstrate how networks of communication and resource sharing can be inferred from measurements of electronic activity of team members, and how reports about that communication can be built to support team interactions.

**Methods:** As part of the pilot of a larger, multi-site HRSA study, we asked autism support teams to use a social networking application designed to facilitate communication between teachers and parents. We asked teams to use the tool during the implementation of two interventions: 1) a school transition support intervention implemented before, during, and after the child's transition between schools and 2) diagnosis to treatment intervention, implemented post diagnosis for families without services. Data was collected from the application and then, using R, transformed to describe activity and communication on each of the teams. These variables were then built into reports delivered to study coordinators.

**Results:** By using the application, members of the support teams were able to create and share calendar events, links, documents, pictures, and resources that work for the child. We experienced some challenges getting the data out of the application but once we did, the data provided a clear picture of real time, actual communication of teams. Using R, data from these teams were used to build hover reports, describing communication and activity of those teams. These reports were then given to site administrators to help them understand what team members at their sites were doing. For the pilot, we successfully extracted the data from the app and computed average counts of different types of interaction (e.g. posting a link to the team), as well as the average number of roles present on each team.

**Conclusions:** Online tools present an opportunity for teams providing support to children with autism spectrum disorder to communicate and share resources and knowledge. Researchers and other entities can hover over communication in these online tools to measure actual collaboration within these teams to both measure them and to provide feedback that can better focus or guide future intervention.

**Using Network Analysis to Estimate Bilingual L1 and L2 Lexical Interconnectedness**

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Bilingualism requires management of multiple co-activated languages; however, the mechanisms underlying language control remain unclear. The Adaptive Control Hypothesis (ACH) suggests that mixed usage of languages across social contexts incurs competition and demands greater control. However, valid, quantitative measures of social context are lacking. In this preliminary study, we are working to remedy this shortcoming by using network analysis to estimate whether the

interconnectedness of the first (L1) vs. the second (L2) language bilingual lexicon relate to independent measures of language control.

One hundred and twenty-two bilingual adults (L1 English or French, mean age 21, SD = 3) completed a survey followed by cognitive tasks. The survey assessed language use across social contexts of friends, school, work, family, and home. Within each context, participants indicated the languages they used to speak about 21 topics, such as chit-chat, politics, culture, and gossip. As a first step, we determined whether conversational topics across social contexts for each language were similar or different using network size and average tie strength. Based on the ACH, we predicted that bilinguals with similar patterns of interconnectedness between the L1-L2 and greater overall tie strength will experience greater language competition and demands on control processes. Conversely, unique patterns of L1-L2 interconnectedness and weak tie strength will experience less language competition and decreased demand on control processes.

Thus far, we have computed topic networks based on responses in the L1 and L2 for each context and participant. First, we constructed adjacency matrices that coded whether two topics were both spoken about in the same language (e.g. if someone spoke about gossip and politics in L1, those nodes were connected, but if they spoke about gossip in the L1 and politics in the L2, those nodes were not connected.). Next, we averaged the matrices across social contexts, yielding one matrix per participant. Finally, we constructed networks from the adjacency matrices using the *igraph* package in R. The nodes corresponded to topics, and the weighted tie indicated average number of social contexts (1-5) that those topics were discussed in the same language

For each participant-level network we calculated six network measures, which will be correlated with behavioral data as next steps: L1 network size, L1 subnetwork size with a summed tie strength greater than one threshold, L1 average network tie strength, and the corresponding measures for L2. Overall network size was used to assess the lexical patterns for each language (i.e. conversational topic patterns), subnetwork size extended this measure by honing in on patterns that are used in more than one social context, and average tie strength indicated the overall compartmentalization or integration of topics across social contexts. The results look promising insofar as many participants have larger and stronger networks in the L1 vs. L2, suggesting unique lexical interconnectedness patterns. The next step is to correlate these network measures with each participant's estimate of cross-language competition and executive control ability measured by the lexical decision and executive control task.

### **Weighted Social Ties: the Effects of Network Formation on Weight Loss Outcomes in Adult Behavioral Interventions**

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Adult behavioral obesity interventions often show improved attendance and weight loss when delivered in a group, as opposed to individual, therapy format. While social support has been identified as a factor in this relationship, research on the exact mechanisms through which group therapy confers additional weight loss is lacking. Moreover, assessment of group benefits occurs almost exclusively through reliance on self-reported individual perceptions of group support, conflict, or cohesion, limiting the ability to evaluate the structure and reciprocation of social ties that form between individuals in group-based treatment. Recently, a few pediatric obesity interventions have conducted social network analysis to identify structural ties that may improve treatment outcomes; however, this research is limited, and studies have yet to be conducted in adult behavioral weight loss programs.

The current study is the first to our knowledge to evaluate social network formation in the context of an adult weight loss intervention. 4 standardized behavioral weight loss groups were

recruited for the study (N=65); participants who had discontinued treatment in the first 6 weeks were not recruited, yielding a 100% collection rate. A whole-network analysis was conducted to assess centrality of participants as it relates to weight loss and attendance. Networks assessed included advice-sharing, emotional support, interaction frequency, and popularity. Degree centrality and tie reciprocity was assessed in relation to baseline weight status, attendance, and weight loss after 16 weeks of treatment.

No significant correlations were observed for any outgoing tie networks regarding baseline weight, attendance, and weight loss (all  $p > 0.05$ ). Attendance was not significantly associated with any reciprocal or incoming ties. Individuals with higher baseline weight were less likely to be nominated by peers in advice networks ( $r(65) = -0.270$ ,  $p = 0.030$ ), and a similar but non-significant trend was observed regarding emotional support networks ( $r(65) = -0.242$ ,  $p = 0.053$ ). Individuals who lost more weight had a greater number of incoming ties in interaction frequency ( $r(65) = 0.284$ ,  $p = 0.022$ ) and popularity networks ( $r(65) = 0.272$ ,  $p = 0.029$ ). Additionally, weight loss was associated with reciprocity of popularity ties ( $r(65) = 0.256$ ,  $p = 0.040$ ) and marginally but not significantly related to interaction frequency reciprocity ( $r(65) = 0.232$ ,  $p = 0.063$ ).

These findings are a promising start to the evaluation of social networks in adult behavioral weight loss interventions. While attendance was not significantly associated with degree centrality, weight loss was correlated with incoming and reciprocal ties, suggesting that the effect of social integration on weight loss is not simply an effect of greater attendance (or participant availability), but rather due to a genuine formation of chosen relationships. Moreover, the importance of incoming and reciprocal ties in relation to weight loss points to the value of assessing whole networks in future intervention groups, as participants' (outgoing) perceptions of available support and relationships in their groups did not yield significant findings. Future directions will evaluate longitudinal network churn at 6 and 12-month assessments and their effect on weight loss outcomes. These results suggest that social relationships may enhance treatment outcomes in adult obesity interventions, and that a participant's actual connections to others, rather than those that they perceive, contributes to weight loss success.

### **Your friends are my friends: Gendered pathways from the peer group to attachment**

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Students who have strong, positive school attachment enjoy a wide range of beneficial social, academic, mental health and delinquency outcomes when compared to students whose ties to the school are weak, or even strained. Although the benefits of strong school attachment are well known, less is understood about the sources of attachment. Prior research has established that there is a robust association between the structure of peer networks and attachment. Further, previous qualitative research has found significant gender differences in friendship networks. Broadly speaking, girls have more exclusive and intense friendships, while boys have larger, less intimate friendships. In this paper we ask: Do boys and girls experience local friendship structures differently? We explore the association between school attachment and three facets of interpersonal agreement in the peer group. First, are one's friends also friends with each other? Second, is one's friendship group cohesive, or split into two more sub-groups? Third, is one included in their friends' friendships? All three are expected to be positively associated with attachment, but through different cognitive paths. The first measure captures the volume of ties amongst friends. Both boys and girls are likely to find it easier to navigate their social worlds when there are more friendships amongst the people they themselves consider friends. The second captures peer group cohesion, and the third captures exclusion. If girls have more intimate and

intense friendships, then more cohesive peer groups should be associated more strongly with high attachment among girls than among boys. Finally, being included in their friends' friends' friendships should be more strongly associated with attachment for girls than boys.

In this paper, we use one of the leading resources for adolescent researchers over the past several decades, the Add Health dataset, to examine the micro-structural processes leading to school attachment in 129 high schools. We employ measures of density, ego-centered transitivity, and alter cohesion to examine how these processes influence attachment. Density is comprised of the number of ties are present between alters, divided by the number of possible alter-alter ties. We define ego-centered transitivity as the number of friends-of-friends who extend a friendship nomination to ego, divided by the total number of friends' friends. Alter Cohesion is made up of the number of the respondent's friends that belong to the largest connected component of alter-alter ties, divided by their total number of friends. We find that school attachment is significantly influenced by micro-structural processes, and that this relationship is gendered. All three measures are associated with increased attachment. Female students in the sample generally report lower attachment but differences attenuate at higher levels of alter cohesion. These findings expand our understanding of how local network structures are most likely to foster or prohibit the important outcome of school attachment. More broadly, we advance research demonstrating the significant effects local network structures can have on affective response.