Journal of Social Structure: Special Issue on Networks and Health

Social Networks and Health: Micro Processes and Macro Structures

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Abstract

Since its nascency, the field of social network analysis has been intrinsically linked to human health and well-being. In fact, the very first empirical article ever published in *Sociometry* evaluated a psychiatric treatment to inter-personal distress that employed the spontaneous interactions unfolding in a triad of physician, patient, and proxy actors (Moreno, 1937). This was a first attempt in a research context to show that there may be direct effects that tie patterns of social relations to individual well-being in small groups. Moreno & Jennings (1938) also made the early and astute argument that the social structure observed through measurement of social relations is inseparable from biological and psychological frames of reference: they are all inherently interdependent. More than 80 years of research in this area has since been developed and yet the field is still flush with opportunities to learn about the interplay between social networks and health. In this special issue of the *Journal of Social Structure*, we highlight the work of leading scientists in this field.

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Format of this Issue

This special issue on networks and health represents a collection of papers by outstanding scholars invited by us to highlight novel, timely work in this increasingly large field. The idea for such an issue in the *Journal of Social Structure* grew out of proposals to use the journal to call attention to topical areas of social network analysis brought to the INSNA Business meeting of the 2015 Sunbelt meeting in Brighton, UK. We invited over a dozen researchers known to be leaders or emerging scholars doing work on a wide variety of health topics from various social network perspectives to submit abstracts and titles for consideration and review. The papers included here were reviewed by at least one of the contributing authors and two editors, as well as by one external reviewer when needed. The review process was single-blind, where the reviewers knew the names of the authors. Thus, papers in this collection should be referenced as peer-reviewed chapters.

In our consideration of whom to invite, we aimed for a breadth of both health topics and social network perspectives. For the former, we encouraged work that has interventional, experimental, or policy applications. Relevant health topics we received included network based childhood obesity interventions (de la Haye et al., this issue), network influences of clinician attitudes about electronic health records (Yuan et al., this issue), multiplex networks involved in HIV prevention engagement (Young et al., this issue), the co-evolution of friendship networks and mental health over time (Mundt & Zakletskaia, this issue), the diffusion of family health history knowledge (Hood et al., this issue), and finally the role of transitivity among infant-object-parent interactions in the risk for autism (Schleier et al., this issue). For the latter, the breadth of social network perspectives spanned the spectrum from entirely ego-centered to dyadic to triadic to whole network cross-sectional and longitudinal designs. The variability in the datasets and theoretical perspectives presented were complemented with equally varying analytic approaches, including network descriptives, generalized linear models, and stochastic actor oriented models. This is truly a holistic collection on health and social network research.

We also directly encouraged senior authors to submit research that their students, trainees, and other emerging scholars played a role in producing. Several of the submissions involved research on health disparity issues, including papers that focus on networks with ethnic, racial, gender and sexual minorities. Thus, the goals of this collection are aligned with those articulated by several key funding and professional organizations (e. g., National Institutes of Health, American Public Health Association) that seek to promote new areas of research on disadvantaged and minority populations in health while also providing opportunities for emerging Science, Technology, Engineering, and Math scholars to publish high quality research early in their careers.

Naturally, with such an expansive hot topic that networks and health has become, we could not reasonably represent every aspect of this impressive field. In addition to the few topics comprising this issue, we also note that there is important social network research being done elsewhere in the areas of disease contagion (Manfredi & d'Onofrio, 2013), big data (including EHR and health sensor data sources a la Lienert et al., 2017 and Zeng et al., 2017), peer influence (Wang et al. 2018), and health knowledge generation (Hagel et al., 2017) among much other work. In the balance of this editorial, we highlight the key themes and scientific

contributions, as well as identify several scientific priorities, that we have identified from the collection of papers in this issue.

Key Themes and Scientific Contributions

While rich in topical breadth, there were some unanticipated common themes among the contributed manuscripts. Foremost was the common use of mixed-methods research from very different perspectives. For instance, Hood et al. supplemented quantitative measurement and analysis of health communications in families with qualitative interview data describing the context of how and why certain health communication partners were preferred over others. Such approaches are becoming increasingly common in network analysis (Dominguez & Hollstein, 2014; Suitor et al., 2017), especially in the context of health, where there is a need to understand more fully the motivations for the processes involved in networks. Importantly, such processes cannot be revealed by simple structure alone, thus, such mixed methods approaches are critical if the goal is to activate interpersonal ties via intervention.

Indeed, much of the research comprising this collection provides evidence for designing interventions that may activate new interpersonal pathways or leverage established network ties (Valente, 2012; Shin et al., 2014). For example, Mundt and Zakletskaia (this issue) demonstrate the importance of interpersonal support systems for adolescents using psychological counseling services; their research highlights the importance of integrating group-based interventions in psychological counseling that focuses on building capabilities in social skills and developing social connections. In this case, building new interpersonal ties had important implications in adolescent mental health and social well-being. In contrast, Yuan and colleagues (this issue) show that peer influence is stronger in stable network systems compared to those with notable churn. Taken together, these two papers provide new insights on contexts in which intervention may focus on different aspects of social structure.

Another common theme was a research emphasis on multiplexity with some papers explicitly studying multiple relationships and others employing them as secondary components of their analyses. Using the former approach, Young et al. (this issue) evaluated the role that multiple domains of interaction (personal confidant networks, sexual partnerships, online friendship, and online support group affiliation) work in combination to affect different sex behavior outcomes in a population of young black men who have sex with men. This direct approach to multiplexity is complemented in the issue with implicit approaches, such as those taken by de la Haye et al. who evaluated how an intervention affected multiple types of health encouragement behaviors in families. Such interest in multiple relationships likely stem from the growing understanding of how human social networks involve multiple dimensions of interaction and that these dimensions, in isolation, as well as in combination, can have important implications for health.

Scientific Priorities for Networks and Health

From this collection, we see three primary priorities for the field. The first is the need to dive a bit deeper and unravel *how* interpersonal mechanisms and social structure impact health. This

will likely require mixed-methods and multi-level approaches to fully understand the cognitive, psychological, social and behavioral mechanisms at play; this understanding is paramount for the development of effective interventions guided by network science. Second, ubiquitous technologies are resulting in data streams that capture some of these complexities, requiring the need for new methodological approaches to both integrate these data in meaningful ways. Third, patterns of interaction that may arise from these digital footprints or, simply through observation, may help to identify those who are fragile or vulnerable for early intervention efforts. Key to success in this endeavor is identification of these patterns with translation to measurement protocols for use in practice.

This is important because we know that social connections impact health. In a meta-analysis, Holt-Lunstad and colleagues (2010) demonstrated that social relationships, including limited social support resources and social isolation, contributed more to mortality than other factors, such as tobacco use, pollution, and being overweight. What is not clear from this meta-analysis is the underlying mechanisms through which interpersonal ties impact health. Papers comprising this special issue aim to unravel some of these mechanisms - whether focused on micro processes characterized by triadic sequencing (for example, Schleier et al, this issue) or macro network structures (for example, Mundt and Zakletskaia, this issue). One could also imagine that social support mechanisms not only impact emotion-focused coping processes, but also enable and motivate engagement in healthy lifestyle behaviors - thus, impacting health through multiple avenues as a variation on multiplexity. This idea is consistent with de la Haye and colleagues' (this issue) work investigating the role of encouragement on dietary behavior and, ultimately weight status, in at-risk families. We see unraveling how these interpersonal mechanisms impact health outcomes, and the various pathways through which that can happen, as an important continued avenue of inquiry.

As new technologies provide for more data capturing on how humans engage with their environment, inclusive of both social and behavioral interactions, the network sciences have an important role to play. The challenges of integrating many sources of these micro-structural data in meaningful ways that connect such trajectories to health are an important opportunity for the field. This is particularly relevant with the advent of precision medicine and the *All of Us* initiative, where social and behavioral risk factors are key contributors to morbidity and mortality even after biological disposition is controlled for (Holt-Lunstad et al., 2010; Domingue et al., 2018). While a focus on ubiquitous technologies fits squarely in the "big data" space, capturing co-presence (Lienert et al., 2017), access to resources, and behavior, we do not want to lose sight of the importance of individual cognitions and perceptions of their social worlds which may be just as important as these digital footprints in influencing health. Indeed, as Yuan et al. point out in this issue, the emergence of new technologies themselves may offer opportunities to examine how perceptions shape and are shaped by connections in social networks over time. Thus, mixed methods approaches that integrate the "big data" with the deeper dive into understanding more fully the quality, structure, and function of these social interactions, potential institutional and cognitive barriers to access that go beyond geographic proximity to resources, and social-psychological factors that impact behavior are warranted. We see such mixed methods approaches as important next steps in understanding how interpersonal mechanisms get 'under the skin' and impact health from very micro processes to macro structures.

For such interpersonal effects to manifest in clinical outcomes, efforts to tease out how to apply network approaches to interventions that affect, or otherwise reveal, disease trajectories are needed. Here too, contributors to this issue make headway. For instance, echoing the distant past history of using network analysis for clinical purposes referenced in our opening remarks, Schleier, et al. propose that the triad census can be employed to evaluate communicative ability in developmental milestones for young children. Through this work, those children most at risk can be identified earlier in their development, perhaps providing opportunity for earlier intervention efforts. Such work represents not just innovation in measurement, but it also represents real movement towards clinical translation of network science.

Finally, the emerging emphasis on precision and personalized medicine is likely to shift social network research on health. More work is needed to fully situate social contexts of health into this new paradigm. Specifically, the co-evolution of individual health outcomes with structural changes in social networks, along with the nested nature of biological and social data (Holt-Lunstad, 2018), will need to be examined to fully appreciate the interplay between networks and health in manners that extend beyond the associational studies present in the literature (see, for some examples of both associational and predictive approaches in another special issue edited by Schaefer & adams, 2017). If social networks are part-and-parcel to personalized medicine, and we think they are, then recognition and funding support for additional longitudinal surveillance and theories of network influences on health are necessary. We fully expect that the scholars featured in this issue will be on the forefront of this endeavour.

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