Guidelines for Reporting About Network Data (GRAND)

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Network research has grown rapidly across multiple topics and disciplines in the 21st century. Although this growth has brought new insights and diversity to network research, it has also introduced challenges in clearly communicating about networks. Following the lead of other rapidly-growing methods (e.g., PRISMA for meta-analysis), this manuscript describes a large-scale collaborative effort to develop Guidelines for Reporting About Network Data (GRAND). They were developed by a 15-member working group in collaboration with a large community of network scholars (the GRAND Consortium) through a series of literature reviews, surveys, and feedback sessions. The resulting guidelines are presented in this manuscript, and are available at https://www.grand-statement.org. They are intended to facilitate clarity and transparency in network research reported in scientific documents by providing researchers, editors, and peer reviewers with guidance about the information that should always be reported.

Keywords: network science, reporting guidelines, social network

Introduction

Social network analysis (e.g., Moreno & Jennings, 1934) and network science (e.g., Erdős & Rényi, 1959) have long histories, but research in these fields has increased dramatically in the 21st century. Network research can now be found in nearly all areas of the social and physical sciences, as well as in the humanities and arts. The increased volume and diversity of network research has substantially enriched the field and our understanding of the social and natural worlds. However, it has also introduced a challenge: clearly communicating about networks.

This is not a new challenge in the sciences. Many methods have confronted the challenge of clear communication in the face of rapid innovation, disciplinary differences, and complex data. One widely adopted solution to this challenge has been the collaborative development of a set of communication guidelines, for example: the Preferred Reporting Items for Systematic reviews and Meta-Analyses guidelines (PRISMA; Moher, Liberati, Tetzlaff, Altman, & Group,

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2009), the American Association for Public Opinion Research's standard definitions for surveys (American Association for Public Opinion Research, 2023), and the American Psychological Association's Journal Article Reporting Standards (JARS; Kazak, 2018). While these guidelines have proven useful in their respective fields, no comprehensive guidelines exist for reporting about network data.

This paper reports on a large-scale collaborative effort to develop *Guidelines for Reporting About Network Data* (GRAND). We begin by describing the goals and desired characteristics of such guidelines. We then describe three phases of development: a review and scoping survey, a working group, and public feedback. Finally, we present the completed guidelines and discuss their intended use.

Goals

We aimed to achieve three broad goals by developing and disseminating GRAND. First, by helping authors fully describe the networks they use in published research, these guidelines are intended to *facilitate readers' understanding*. After reading a GRAND-compliant description of a network, readers are more likely to understand what the network is intended to represent, and thus how to interpret the results of analyses performed on the network. This is particularly important during the peer review process, where clarity can lead to faster and more accurate evaluations of a submitted manuscript.

Second, by helping authors consistently describe the networks they use, these guidelines are intended to *facilitate automated and manual data extraction* for the systematic review and meta-analysis of network findings. For example, GRAND-compliant descriptions will help avoid cases where "summaries of social network characteristics were [not] sufficiently homogenous to undertake statistical meta-analysis" (Fletcher, Bonell, & Sorhaindo, 2011, p. 549; c.f. Palumbo, Volpe, Matanov, Priebe, and Giacco (2015)), thereby allowing network characteristics and findings to be compared and aggregated for greater precision (Kovacevic, Shevchyk, & Neal, 2026).

Finally, by providing guidance to authors about which basic features of a network should be reported, when the data are shared as Neal et al. (2024) recommend, these guidelines are intended to *facilitate proper re-use*. For example, GRAND-compliant descriptions will help future researchers identify and prioritize using existing network data with node and edge definitions that are appropriate for their research question.

To achieve these goals, we aimed for GRAND to have three characteristics. First, the guidelines should be *interdisciplinary*. That is, they should be applicable to networks describing different types of systems (e.g., social, biological, physical) and examined from different orientations (e.g., social network analysis, network science). Second, the guidelines should be *inclusive*. That is, they should be applicable to many different types of networks (e.g., whole, ego, higher-order, dynamic) collected and recorded in different ways (e.g., quantitative, qualitative). Finally, the guidelines should be *limited*. That is, they should be restricted to the minimum information that should always be reported, and that is straightforward to assess using widely-accepted methods, leaving other context-specific details to the discretion of authors, peer reviewers, and editors.

Process

To develop GRAND, we mirrored the process used to develop the widely-adopted PRISMA reporting guidelines for systematic reviews and meta-analyses (Moher et al., 2009). First, we began with a review of existing guidelines and recommendations, and conducted a scoping survey to identify existing consensus and practices in reporting. Second, we formed a demographically and intellectually diverse working group to develop a draft set of guidelines. Finally, we conducted a series of additional surveys and listening sessions to solicit feedback and iteratively refine the draft guidelines.

Phase 1: Review and scoping survey

A review of the literature identified three existing sets of guidelines for network research that varied in their length and focus. First, Bagrow and Ahn (2022) proposed a list of 26 items that researchers should include in what they called 'network cards', with a particular focus on reporting structural metrics (e.g., clustering coefficient, diameter, assortativity). Second, Luke et al. (2023) proposed a list of 18 items based on a review of health studies and a survey of health researchers, with a particular focus on epistemological issues (e.g., "Make the value of a network analysis apparent"). Finally, Alieva et al. (2026) proposed a list of 7 items based on a review of network research published in the Spanish-language journal *REDES*, with a focus on harmonizing terminology used in the social sciences. These lists offered a useful starting points for the participatory development of an interdisciplinary set of guidelines. Many of the items that were common across these existing lists were retained in GRAND (e.g., define the edges), while idiosyncratic items were included in early drafts of GRAND but were ultimately removed (e.g., structural metrics, epistemology).

Two scoping surveys were conducted in Spring 2023 to understand network researchers' current beliefs about what information should be reported in research publications describing network data. The first survey was a census of all 237 board members of two network professional associations (INSNA and NetSci) and seven network journals (*Applied Network Science*, *Connections*, *Journal of Complex Networks*, *Journal of Social Structure*, *Network Science*, *Social Networks*, *Social Network Analysis and Mining*). The

second survey was a convenience sample distributed via social media (Mastodon, Twitter) and network listservs (SOCNET, REDES, cna2023, siam-ns). Collectively, these surveys yielded 306 responses from respondents who were diverse with respect to gender, discipline, and orientation and had an average of 15 years experience conducting network research.

A majority of respondents (74%) agreed that having guidelines for reporting about network data would be useful, while only a minority believed that such guidelines could be sufficiently general that they would apply across disciplines and topics (47%), or that they would be adopted by network researchers (41%). There was broad agreement that researchers should always report how the data were collected or generated (90%), the definition (90%) and count (90%) of nodes, and the definition (92%) and count (75%) of edges. There was also broad agreement that researchers do not always need to report structural metrics such as the clustering coefficient (12%), mean path length (12%), diameter (9%), or modularity (5%). Highlighting differing disciplinary conventions, respondents were mixed about the importance of some items, for example, whether researchers should report the network's density (34%) or mean degree (35%). These results suggested that developing network reporting guidelines was worthwhile and identified points of broad agreement, while also highlighting issues that required further consideration (e.g., what metric of connectivity should be reported, if any) and potential challenges to guideline development (e.g., generality, adoption).

Phase 2: Working group

In early 2025 the first author recruited the remaining named authors to form a working group. Members of the working group compiled an initial set of guidelines based on the results of the phase 1 review and survey. Then, during quarterly virtual meetings and in-person meetings at the 2025 Sunbelt (Paris) and NetSci (Maastricht) conferences, they iteratively refined these initial guidelines by adding, removing, and revising items based on working group discussions and the results of public feedback.

Phase 3: Public feedback

To solicit public feedback on GRAND, the working group held listening sessions at the 2025 Sunbelt (Paris) and NetSci (Maastricht) conferences, and conducted feedback surveys in November 2025 ($N = 41$) and March 2026 ($N = 110$). In each feedback survey, respondents reviewed each item in the then-current draft, indicating their level of agreement with including the item and providing feedback on ways to improve it, as well as offering an overall assessment of the guidelines. In the first survey, on average respondents agreed with 83.5% of the items. Following revision by the working group, in the second survey, on average respondents agreed with 94.6% of the items. The working group undertook a final round of revisions based on feedback provided in the second survey to obtain the final guidelines.

Guidelines

The final guidelines (GRAND v1.0.0) are available at https://www.grand-statement.org in three forms: (1) a printable short-form (see Appendix A), (2) an annotated long form that includes notes and examples for each item, and (3) a customized version that is generated by a web-based form with a series of simple questions about a researcher's own data (e.g., are the edges in your network directed or undirected?). These guidelines are intended to facilitate clarity and transparency in network research reported in scientific documents by providing researchers, editors, and peer reviewers with guidance about the information that should always be reported. However, because network research is constantly evolving, they should be viewed as a living document that can be updated and expanded to remain current with developments in the field.

The guidelines are organized in four sections: Data, Nodes, Edges, and Transformations. The 'Data' section contains 7 reporting items related to the dataset as a whole, including whether the data are empirical or synthetic, when and where the data are intended to represent, and where the data can be obtained. The 'Nodes' section contains 5 reporting items related to the nodes or vertices, including the count and what they are intended to represent. The 'Edges' section contains 7 reporting items related to the edges or arcs, including the count and what they are intended to represent, as well as selected attributes (e.g., direction, weight). Finally, the 'Transformations' section contains 6 reporting items related to transformations performed on raw data to obtain the analytic data, including symmetrizing originally directed edges or dichotomizing originally weighted edges.

These guidelines were designed narrowly to identify only those items that should always be reported, even when a given dataset has been described elsewhere, or when a well-known network is being used as an example or case study. As a result, they omit many details that readers may want to know. In practice, the research question and disciplinary conventions will require reporting additional information that is not included in the guidelines. For example, the guidelines do not include reporting any structural metrics (e.g., density, clustering coefficient, etc.) because the meaningfulness of these values depends heavily on the nature of the network and research context. Such values can and should be reported when they are meaningful and relevant, but are not necessary to report in *all* network research.

The guidelines include such common and fundamental information that many researchers may already routinely report it, in which case GRAND serves primarily as a helpful reminder and checklist. However, to promote clarity, we rec-

ommend that the guideline items be reported in the main document, rather than in an appendix or supplementary materials. This information may be scattered throughout the text in contextually appropriate places, or may be reported together in a single summary paragraph or table. This should be feasible even in relatively short documents with strict word limits because multiple guideline items can be reported very compactly. For example, in the case of the Zachary Karate Club network, 10 separate guideline items can be reported in a single sentence: "The Zachary (1977) Karate Club network was collected between 1970 and 1972 via observation in at American university and contains 34 nodes that represent people, which are connected by 78 unweighted and undirected edges that represent friendship."

The intended audience for these guidelines includes authors, peer reviewers, and editors. First, we encourage authors to refer to GRAND as a useful reminder of details to include in their manuscripts. This may be particularly helpful for new network scholars who are developing skills in scientific writing, and for established network scholars who want their work to be accessible across disciplinary boundaries. Second, we encourage peer reviewers to look for, and expect to find, at least the information recommended by GRAND in the documents they evaluate. Finally, we encourage editors to ask authors to provide at least the information recommended by GRAND prior to obtaining peer reviews so that the review process can be efficient and avoid misunderstandings about the data.

Data Availability Statement. Results from the scoping survey, public feedback surveys, and earlier drafts of GRAND are available at https://osf.io/zjwm7/.

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Ethics Statement. All study activities were approved as exempt by the Michigan State University Institutional Review Board (21 February 2023, STUDY00008880).

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