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Guidelines for Reporting About Network Data (GRAND)

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Extended Abstract

Background
Rapid growth in the volume and diversity of network research has substantially enriched our understanding of the social and natural worlds. However, it has also introduced a challenge – clearly communicating about networks – that has many origins. First, historical and disciplinary differences have led different terms to be used for the same concept (e.g., node vs. vertex) and different indices to be used for measuring the same property (e.g., density vs. mean degree). Second, the development of new analytic techniques has outpaced the emergence of a consensus about how to describe them (e.g., for dynamic or multi-level networks). Third, network data are uniquely rich in their ability to simultaneously capture not only an overall structure, but also attributes about individual entities and their relationships, leading to a lack of clarity about what to communicate.

Focus of presentation
To address these challenges, the US National Science Foundation supported the formation of an international, interdisciplinary working group to develop **Guidelines for Reporting About Network Data** (GRAND). To date, the 15-member working group has (a) reviewed best practices for developing reporting guidelines [1–3], (b) reviewed existing recommendations for describing network data [4–6], (c) conducted a survey of network journal editors, (d) conducted a survey of network researchers, and (e) met virtually and in-person multiple times. These efforts have yielded preliminary draft guidelines for several types of networks (e.g., unipartite, hypergraph, dynamic). This talk will present the preliminary guidelines and their rationale, solicit feedback from attendees, and invite participation in the development of the final guidelines.

Summary of preliminary guidelines
The guidelines are organized hierarchically into three major sections:

- Description
  - Network: *Items in this section describe the entire network, including its type (e.g., temporal, hypergraph), source (e.g., empirical, generated), the type of system it describes (e.g., an American high school in 2005), and how to obtain the data.*
  - Nodes: *Items in this section describe the network's nodes, including their meaning (i.e., what entities they represent), count, and any non-structural attributes.*
  - Edges: *Items in this section describe the network's edges, including their meaning (i.e., what relationship they represent), count, weight, and direction.*
- Data
  - Procedure: *Items in this section describe how the data was collected or generated, and any ethical issues or approvals associated with its collection or use.*
  - Error: *Items in this section describe potential sources of error or bias, including constraints imposed on node degree (e.g., name up to five friends) or node missingness.*

  - Transformation: *Items in this section describe transformations performed on the raw data, including symmetrizing, binarizing, projecting, excluding, or imputing.*
- Structure: *Items in this section report basic structural descriptive properties of the network including the number of components, connectivity (edge density or mean degree), reciprocity (for directed networks), and balance (for signed networks).*

As an example, the guidelines can be used to compactly describe the 'Zachary Karate Club' network: *"The Zachary Karate Club network is an empirical whole network composed of 34 nodes representing people, which are connected by 78 unweighted and undirected edges representing friendship. It contains one component, and has an edge density of 0.139. These data were collected via observation at an American university between 1970 and 1972, and are available and described in more detail in Zachary (1977). It is unknown whether data collection received institutional approval."* The working group is also experimenting with stylized tabular descriptions, following the model of nutrition labels because they have been designed for clarity and readability (see Figure 1).

References

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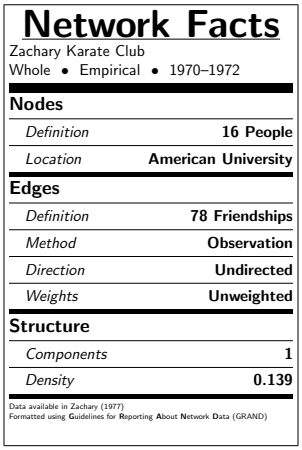

Figure 1: **Prototype stylized tabular description of Zachary Karate Club network.**