

Author's response to reviews

Title: Network-based social capital and capacity-building programs: An example from Ethiopia

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Author's response to reviews: see over

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Mario Dal Poz
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Dear Dr. Dal Poz:

Thank you for the opportunity to revise our manuscript, "Network-based social capital and capacity-building programs: An example from Ethiopia." We have addressed the reviewers' comments, as described in the attached itemized list. We want to thank you and the reviewers for your feedback and believe that the manuscript has become stronger as a result. We hope you and the reviewers agree with our assessment.

Sincerely,

A handwritten signature in black ink, appearing to read "Shoba Ramanadhan", followed by a horizontal line extending to the right.

Shoba Ramanadhan, ScD, MPH

Referee #1 Evaluations

n/a

Referee #2 Evaluations

Comment 1:

It is very important to clarify that the MHA program in the study setting either does or does not have building social networks as an explicit program goal. This should be made clear in the abstract too. Being clear from the beginning would make this conclusion more powerful.

Response:

We agree that the clarification that social network development was not an explicit program goal is important and have added language throughout the paper to this effect.

In the introduction section of the abstract (page 2, line 4), we added the following:

Although network development and social capital generation were not explicit program goals, we took advantage of a natural experiment and studied the social networks that developed in the first year of an executive-education Master of Hospital and Healthcare Administration (MHA) program in Jimma, Ethiopia.

In the background section of the main text (page 7, line 4), we added the following:

Social network development and social capital generation were not explicit goals of the training program, but we were able to take advantage of this natural experiment to test exploratory hypotheses.

In the discussion section (page 17, line 12), we added the following:

The [network] growth is also notable given that network development was not an explicit goal of the training program.

Comment 2:

In the paragraph that describes the characteristics of networks, there are many terms introduced quickly, and often unclearly. There is a special lack of clarity about the term 'degree' which could also be misinterpreted as academic degree. These are clarified somewhat on the next page, but this term and others might be defined in bullet fashion as they are introduced.

Response:

We thank the reviewer for the suggestion to clarify the network analysis terms used in the paper. We have revised the structure to: 1) present basics of network analysis measures, 2) introduce and define network-level measures, and 3) introduce and define individual-level measures. We also added an example of the calculation for out-degree given the importance of this measure for our analyses.

The revised section (starting on page 9, line 19) is as follows:

We measured a series of network characteristics which have been shown in other settings to promote exchange of information and flow through networks [26]. These measures were based on data about connections (or reported relationships) between network members. Some measures focus on presence or absence of a connection,

whereas others include information about the “direction” of the connection. For the latter, the measure can capture whether Member X reported a connection to Member Y, Y reported a connection to X, or both reported a connection to each other. To describe the network as a whole, the first measure of interest was network density, or the proportion of possible relationships between members that were realized, which described the extent to which network members are connected, regardless of the direction of connections [26]. A more dense, or more highly connected, network may be useful for sharing information and resources and cooperation, whereas a more sparsely connected network may provide greater access to diverse contacts and novel resources [10, 18]. A density level of around 15-20% is expected to support knowledge-sharing in a network of about 100 members [31]. We also identified isolates, individuals who reported no connections to other network members. Isolates are of interest as their lack of connections prevents them from contributing to or benefiting from network membership. Last, we identified components, or subgroups of members that are not connected to each other and therefore cannot share information and resources [26].

Shifting our focus to individual network members, we calculated degree, which is defined as the number of connections between a given network member and all other network members, regardless of the direction of ties [32]. The bulk of our analyses focused on out-degree, or connections from a given network member to other network members. Thus, if Member X reported three connections with other network members, his / her out-degree value would be three, regardless of how many network members reported connections to Member X. In the Trainee Network, trainee out-degree was the number of connections a trainee reported regarding other trainees, grouped into tertiles. In the Trainee-Supporter Network, trainee-supporter out-degree was the number of connections to supporters reported by each trainee, grouped into tertiles. Last, geographic homophily referred to whether or not pairs of network members worked in the same region.

Comment 3:

Later on (page 15), the terms informational and functional terms are used and again, they are unclear. I can guess at their meaning but could be defined a bit more clearly.

Response:

We appreciate the reviewer’s comment. We have highlighted our definitions of informational and functional exchange in the Methods section (page 11, line 17). The section starts with the following language:

To assess potential by-products of social network development, we measured informational and functional exchanges, which are complementary manifestations of social capital that can help trainees achieve work-related goals [10, 24].

Comment 4:

On page 16, it is described when discussing the centralization of the network that access to

technologies is a limiting factor, and that centralization tended to occur only in Addis. I was somewhat surprised at this because cell phone technology has been spreading rapidly. My most recent experience has been in Kenya and almost every manager in the health sector has one or two cell phones and the networks seem to be robust, even in rural areas. Perhaps this is not the case in Ethiopia, but I think things are changing there also. Although the tendency is to use them for text messages given how time is charged, a program that was being intentional about including social networks could use cell phones as an explicit tool.

Response:

The reviewer makes an excellent point that cell phones will be an important way for capacity-building programs to move beyond the centralization that tends to reflect access to technology and services. At the time of our study, cell phone service was limited and unreliable in many areas of Ethiopia where CEOs lived and worked. However, to address the reviewer's comment, we have added the following to the discussion (page 17, line 22):

Information and communication technologies, such as mobile phones or internet, can mitigate challenges of physical distance and logistics in low-resource settings [25]. At the time of the study, reliable access to such technologies was limited for individuals working outside the Addis Ababa region [41], though these technologies may play an important role in network development in the future.

Referee #3 Evaluations

Comment 1:

In your methods, please explain why you only use out-degree in your contingency table analyses, instead of total degree.

Response:

We appreciate the reviewer's comment and have added a description of our rationale for using out-degree as our independent variable (page 11, line 8).

Compared with degree, this measure narrows the focus to connections that may be perceived as functionally useful to respondents [33]; here, these connections involve the set of individuals from whom respondents may seek and gain skills.

Comment 2:

Is there a reason you did not include eigenvector centrality, which is a composite score that weighs in both in-degree and out-degree of an individual? This may be a more suitable measure of centrality.

Response:

We agree that eigenvector centrality is an important measure of centrality and explored the impact of this attribute on our outcomes of interest, but did not find that it was an important predictor. As this measure is an important marker of power in a system, we hypothesize that it may have been of greater importance if we had been tracking the flow of resources through the system, rather than on ability of trainees to access resources through their connections.

Comment 3:

In your methods, please clarify the questions you asked the participants. Did you use one or three name generators to elicit the trainee-trainee and trainee-supporter networks: (1) “with whom do you interact for professional purposes;” (2) “from whom did you receive guidance on topic X;” and (3) “from whom did you receive tangible support?” Or were the latter two questions asked, without asking the respondent to name the particular person with whom they engaged in exchange? The way in which the methods section is written does not make this clear.

Response:

We appreciate the reviewer’s suggestion and have clarified the description of the data collection process. To reduce respondent burden, we utilized one name generator (with whom do you interact for professional purposes) and then asked respondents to note guidance and tangible support from trainees and supporters. The following language now appears in the methods section (page 11, line 21).

Trainees were asked whether or not they received guidance in non-classroom settings from: a) other trainees, and b) supporters.

We made a similar addition to describe the collection of data regarding instrumental exchange (page 12, line 16).

Trainees were asked whether or not they received a series of tangible resources from: a) other trainees, and b) supporters.

Comment 4:

In your methods, please clarify whether, in measuring the trainee-supporter network, the supporters were asked to name other supporters or just trainees?

Response:

We appreciate the reviewer’s suggestion and have revised the description of data collection in the methods section to note that supporters were asked to name both trainees and supporters as network members (page 9, line 11).

Respondents were presented with a roster that listed all trainees and supporters. The survey asked all respondents to identify trainees and supporters with whom they interacted for professional purposes.

Comment 5:

In your results, if all trainees had at least one connection at the end of the year, how is it that the number of average connections for the lowest tertile was 0.5? Did you use only out-going connections to arrive at this number? Please clarify.

Response:

The reviewer is correct, all trainees had a degree of at least one at the end of the year and the tertile average refers to out-degree. We have revised our description of the results to clarify (page 15, line 1).

At Year 1, trainees in the lowest out-degree tertile averaged 0.5 outgoing connections compared with an average of 2.0 outgoing connections for the middle tertile, and 6.1

outgoing connections for the highest tertile.

We made a similar change for the description of trainee-supporter out-degree tertiles (page 16, line 10).

In this network, the average number of outgoing connections with supporters was 2.3 for the lowest trainee-supporter out-degree tertile, 5.3 for the middle tertile, and 14.9 for the highest tertile. Trainee-supporter out-degree did not vary significantly between regions.

Comment 6:

In your conclusion, you mention that trainees were able to gain different resources from different types of members. Please clarify how this is supported by your results.

Response:

We felt that finding an association between out-degree and two types of resource exchange in one network and only one type of resource exchange in the other network suggested that differential network composition led to differential resource access. The following language is intended to support this point (page 18, line 8).

We also saw evidence of the benefits of diverse connections for program participants and found that program participants were able to gain different categories of resources from different types of network members. This is likely a function of differential access to resources by individuals in different organizations and levels of power [10].

Comment 7:

In your introduction, please be clearer in how you are defining your concepts. What definition of social capital are you using for the purposes of the research? Where does trust and obligation fit in with resource exchange? How does social capital that fit in with your understanding of capacity-building?

Response:

We appreciate the comment and have expanded our discussion of social capital in the introduction section. We take a network perspective on social capital (such as that put forth by Lin and others), which focuses on resources available to network members. We feel that social capital may be an important by-product of capacity-building efforts. The following sections are intended to address these questions.

Page 4, line 11

These capacity-building programs typically target human capital, or increased value of a professional as s/he acquires knowledge, skills, and other assets that may benefit an employer or system [10]. Another benefit of these programs, which is seldom evaluated, may be the development of social capital, or resources that exist in a social structure and can be retrieved and utilized to meet specific goals [10].

Page 5, line 9

Although there are a wide range of conceptualizations of social capital [17], we take a network perspective, which holds that the extent to which an individual can realize the

benefits of social capital is a function of his / her position in a given social network [18]. This drives our focus on: a) the resources that can be accessed by network members (either directly or through contacts), and b) the structure of relationships or linkages in a network of interest [10].

Comment 8:

It may be more useful to make the figures larger. At the current size, it is difficult to appreciate the size differentials of the nodes.

Response:

We thank the reviewer for the suggestion and have increased the figure sizes.

Comment 9:

In your results, the mean number of beds and staff may not be as useful to the reader as the distribution of large versus small hospitals.

Response:

We wanted to utilize categories that were meaningful in the context of the healthcare system under study and thus focused on number of beds and staff, as well as rural/urban and classification type. We defer to the editor if another approach is preferred.

Comment 10:

If the analyses are done using out-degree, I recommend that the size of the nodes also be presented in out-degree. Whichever measure you use, it would be helpful for the reader to be consistent.

Response:

We presented our network maps based on degree to support our initial discussion of the overall growth and patterning of the network. Although we had a particular interest in out-degree and resource exchange, we also wanted to demonstrate the overall growth of the network and thus utilized degree to drive node size in both figures. Again, we defer to the editor if another approach is preferred.

Comment 11:

In your discussion, the central claim you make seem stronger than what the data shows. While the number of degree was correlated with a greater likelihood of any resource exchange, your data does not support that higher ties are correlated with more exchange. It is likely that there are one or two well-connected trainees who are providing those resources, and the trainees connected to them are more likely to receive them. This is especially plausible given the centralizing tendency of the network.

Response:

We agree with the reviewer that our claims should focus on the relationship between out-degree and likelihood of resource exchange. We have modified our discussion to reflect this distinction (page 17, line 7):

We found that the number of connections within the network was associated with

likelihood of resource exchange, as hypothesized based on extant social network literature [10, 39].

Comment 12:

In your discussion, you mention factors that may enable or hinder the relationships. However, given that this is a two-year University-based program, is it realistic to assume that transportation and information technologies would greatly help or hinder these interactions?

Response:

We thank the reviewer for the comment and have added language to the methods section to better describe the program. Trainees spend the vast majority of their time working as CEOs on-site at their hospitals and only attend the program for periodic three-week sessions. We have added language to this effect (page 7, line 23).

As an executive-education program, the course was offered over two years, with three-week long sessions in residence three times per year, as well as regular progress reports and evaluations when trainees were working at their hospitals.

Comment 13:

In your introduction, you seem to base your argument on Burt's definition of social capital, which relies on the idea of brokerage and control. Since you are talking about to argue for amplification of scarce human resources through social networks. You may know this already, but Coleman (1988) describes three mechanisms in which social relations serve as resources for individuals. First, trustworthiness and a sense of obligation to each other creates a cycle of people doing things for each other. This means that the overall usefulness of the tangible resources of the community is amplified by their availability to others when needed. Second, the social ties of individuals serve as potential sources of information. Finally, an individual's social network establishes and enforces societal norms.

Response:

We thank the reviewer for the comment and agree that Coleman's work regarding mechanisms is an important contribution to the literature. For this exploratory study, we chose to focus on the relationship between network connections and resource exchange (and thus used definitions by Burt and Lin as a guide), but will certainly explore mechanisms by which connections drive exchange in further work.

Comment 14:

Do you have any recommendation to improve the density and diversity of ties? Do you see any policy or health services implication of your study for similar programs in Ethiopia or in other settings?

Response:

Intentional network development may be a useful vehicle to improve both the density and diversity of ties in networks such as these and may serve as useful targets for policymakers. We have highlighted this idea in our conclusion section (page 20, line 6).

Capacity-building programs provide a unique opportunity to direct interactions between participants and potentially useful contacts through coursework, mentoring

relationships, and other course-related activities. Active promotion of relationship-building by organizations and / or program developers can support diversity of contacts and development of strong channels for knowledge transfer [47-49].