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A Team-based Approach to Open Coding: Considerations for Creating Intercoder Consensus

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Abstract

In this article, we discuss methodological opportunities related to using a team-based approach for iterative-inductive analysis of qualitative data involving detailed open coding of semistructured interviews and focus groups. Iterative-inductive methods generate rich thematic analyses useful in sociology, anthropology, public health, and many other applied fields. A team-based approach to analyzing qualitative data increases confidence in dependability and trustworthiness, facilitates analysis of large data sets,

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and supports collaborative and participatory research by including diverse stakeholders in the analytic process. However, it can be difficult to reach consensus when coding with multiple coders. We report on one approach for creating consensus when open coding within an iterative-inductive analytical strategy. The strategy described may be used in a variety of settings to foster efficient and credible analysis of larger qualitative data sets, particularly useful in applied research settings where rapid results are often required.

In this article, we focus on a key approach used in a range of qualitative fields. Specifically, we focus on iterative-inductive thematic analysis (O'Reilly 2005) through line-by-line open coding of semistructured interview and focus group transcripts. This technique generates rich thematic analyses, giving preference to participants' perspectives and on-the-ground observations. In this way, it prioritizes validity, which is an assessment of "whether the results are actually congruent with what the researchers intended to measure or study and whether they are congruent with reality as it is found for participants in the field" (Schensul and LeCompte 2013:320). The trustworthiness and merit of analyses generated through bottom-up open coding is often judged by criteria such as credibility, dependability, confirmability, and transferability (Guba 1981).

We focus specifically on dependability, a form of consistency defined as "determin[ing] whether the findings of an inquiry would be *consistently* repeated if the inquiry were replicated with the same (or similar) subjects (respondents) in the same (or similar) context" that nonetheless allows for variances (Guba 1981:80, emphasis in the original). In the case of coding, dependability would involve applying codes consistently, across the whole data set over time and between different coders (Boyatzis 1998; Creswell and Creswell 2018:202). Boyatzis (1998) summarizes this critical component of thematic analysis as "consistency of judgment." Several strategies may be used to increase consistency of judgment including recoding previously coded data at a later point (Krefting 1991), having samples of coded data cross-checked or audited by an external coder (Guba 1981; Rambaree 2007; Schensul and LeCompte 2013:341), or involving other coders at strategic points in the coding process (Campbell et al. 2013).

Another option to promote dependability is to have multiple researchers consistently apply the same themes to the same texts (see Bernard and Ryan 2009:94; Creswell 2013; Lu and Shulman 2008; MacQueen et al. 1998;

Ryan 1999). A team-based strategy may increase analytic efficiency and facilitate collaborative research by including diverse stakeholders in analysis, particularly important in participatory research. However, challenges with consistency may arise when using inductive methods that start from the open coding of transcripts and build up to a codebook, rather than vice versa. While many projects have successfully employed a team-based coding approach, little is known about the details of reaching consensus and maximizing coding consistency between team members (see Campbell et al. 2013; Lombard et al. 2002). This consensus, or "intercoder agreement," refers to "the stability of responses to multiple coders of data sets" (Creswell 2013:253). In this article, we report our approach to creating consensus among a team of coders when open coding within an iterative-inductive study, aided by the use of software tools including ATLAS.ti (2015, version 6) and the Coding Analysis Toolkit (CAT; Shulman 2016).

While many researchers advocate for or report using teams in coding qualitative data, the mechanisms of conducting and evaluating this work often remain "implicit folklore" (Lu and Shulman 2008). In notable exceptions, scholars have described methods for calculating interrater agreement in a research dyad where one researcher will complete most coding (Campbell et al. 2013), detailed consensus-building team meetings (Creswell 2013; Fonteyn et al. 2008), identified common sources of disagreement between coders (Fahy 2001; Popping and Roberts 2009), and demonstrated or debated the merits of various reliability statistics, for example, the κ agreement index (Burla et al. 2008; Campbell et al. 2013; Haley et al. 2017; Hruschka et al. 2004; Krippendorff 2004; Leiva et al. 2006; Lombard et al. 2002; Popping 2010; Thompson et al. 2004). These examples remain a rare and valuable look into the logistics of qualitative research.

Building on this work, we describe a collaborative approach used to analyze interview and focus group data. Our research contrasts with previous literature due to the line-by-line open-coding process and our large team of coders. Prior studies described analytic strategies that do not include line-by-line open coding (Burla et al. 2008; Carey et al. 1996) or that rely primarily on a priori (deductive) rather than emergent (inductive) codebooks (MacQueen et al. 1998). While less commonly reported, descriptions of team-based approaches tend to be focused on smaller collaborations such as dyads (Campbell et al. 2013). In contrast, coming to consensus among multiple coders in our open-coding strategy presents problems in that coders may describe the same text in different words, "packaging" themes differently (see Armstrong et al. 1997). We use the term intercoder consensus, in contrast to the term interrater reliability, because our coders were not operating independently as suggested by Krippendorf (2004). We were concerned with the dependability of the coders working on the same team not the replicability of the instrument across different teams or projects.

The Building Capacity for Obesity Prevention (BCOP) Study

The work described is a part of the BCOP study, a mixed methods, collaborative study between researchers and practitioners from universities, cooperative extension, and public health departments in Ohio. The study aims to optimize implementation of community nutrition interventions that target changes to policies, systems, and environments within low-resource communities to make the healthy food choice the easiest choice. The qualitative data informing the present article were collected during phase 1 of the applied study (for details on all stages, see Lee et al. 2017) and informed the development of decision-making tools aimed at assessing community readiness and capacity for implementing community nutrition interventions. Tool development, including qualitative data collection processes, was informed by prior research that highlights four critical factors for implementation of community-level interventions including community readiness, practitioner capacity, community health needs, and sociopolitical context (Donnermeyer et al. 1997; Findholt 2007; Freedman et al. 2012; Wandersman et al. 2008). These four domains informed the conceptual framework that guided data collection and analysis.

Study Protocol

Data Collection

Between April and June 2015, we collected qualitative data in nine counties (four rural and five urban) throughout Ohio, chosen for geographic and population density diversity. These counties were chosen because they had on-the-ground staff funded by the state department of health and state cooperative extension programs to support the implementation of community nutrition projects. This research was approved by the institutional review board at Case Western Reserve University.

Semistructured, open-ended interview and focus group guides were created by the researcher–practitioner team to guide qualitative data collection. Questions were designed to gather information on barriers and facilitators to community nutrition project implementation and were based on existing theory (Donnermeyer et al. 1997; Findholt 2007; Freedman et al. 2012; Wandersman et al. 2008). Eighteen solo or dyad in-person interviews were conducted with county-level public health practitioners and community nutrition practitioners who serve low-income populations with a total of 20 participants. Twenty-three focus groups were conducted with 174 participants including two types of participants: (1) members of community health coalitions and (2) people either receiving or eligible for Supplemental Nutrition Assistance Program (SNAP, formerly known as food stamps) benefits. For their time and effort, coalition members received US$20 and SNAP participants received US$10 and a small meal. Interviews and focus groups were conducted by two trained researchers and lasted between one and two hours. They were audio recorded, transcribed verbatim by a third-party transcriptionist, and checked for accuracy by research team members.

Data Analysis

The focus of this article is on the use of iterative-inductive thematic analysis that started with bottom-up open coding. These open codes were then linked to higher-level codes as shown in Figure 1 because our overall analytic approach was based on modified grounded theory including both inductive and deductive analysis, allowing theory to drive analysis just as analysis guided theory building. Initial open codes were created using an in vivo process, where code names were based on words and phrases from the text. Axial codes were used to group open codes into categories (around axes of meaning), where code names were broader and focused on the properties and dimensions of the category to help organize the larger number of open codes. Higher-level and highest-level codes represent theoretical codes that integrate concepts into coherent narratives (Charmaz 2014). Our iterative-inductive thematic analysis coding process sought to ground theory development in the language of the participants, and therefore, the approach emphasized consensus building during the initial open-coding process.

In addition, our coding process was informed by existing theory that illuminated four conceptual domains related to community readiness for implementing community nutrition interventions (Donnermeyer et al. 1997; Findholt 2007; Freedman et al. 2012; Wandersman et al. 2008). Although the four conceptual domains informed data collection through questions included on the interview guides, we began analysis using inductive open coding to assess whether emergent themes aligned with the a priori conceptual framework. Ultimately, we were able to group our open codes into axial codes and then higher-level codes that comprised subdomains of the

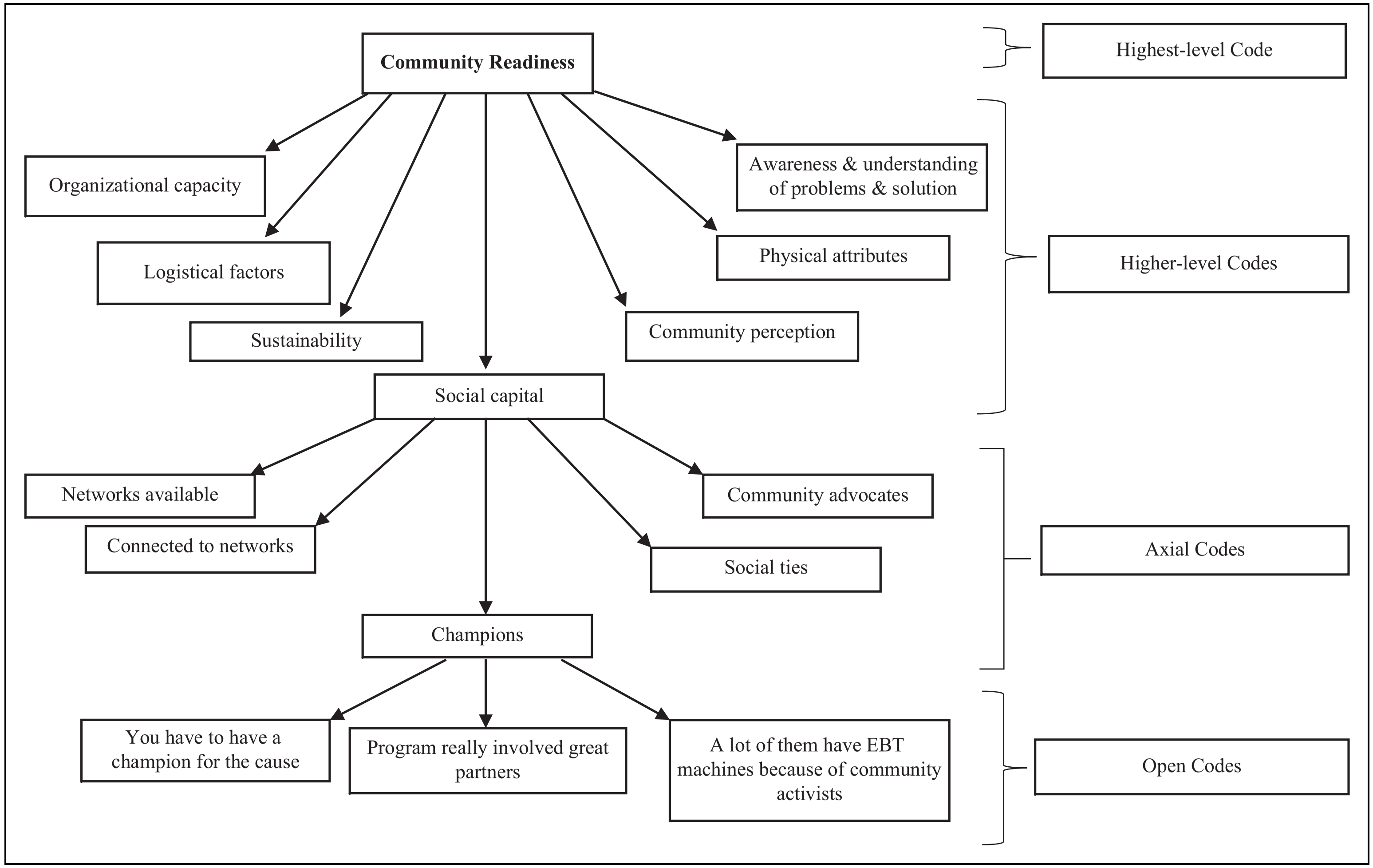

Figure 1. Example of coding hierarchy of community readiness related to implementation of community nutrition interventions.

original four domains of the conceptual framework that served as highest-level codes. Figure 1 shows an example from the domain of community readiness. In this section and those that follow, we discuss how the codebook was built and how it was applied to the data. Developing consistency of judgment within our team of coders was key to both of these processes.

Step 1: Building the Codebook

The data analysis team ($N = 6$) met frequently over the course of six months to prepare and revise the codebook. The process of codebook preparation took place in four steps.

1. We began with open coding. Initially, five team members analyzed three of the same transcripts and met to discuss, compare, and contrast open codes that each identified (see also Hruschka et al. 2004; Kurasaki 2000). Each team member proposed theme trees that could group their open codes into axial codes and then higher-level codes. Team members met to compare and contrast the different theme trees, to identify which codes were similar enough to be grouped together or distinct enough to make separate codes.
2. Preliminary codebooks were drafted based on team members' theme trees, which ultimately could be organized at the highest level into the four domains of the conceptual model, although, as described above, we remained intentionally open to the possibility that our inductive approach could lead to different domains. The team agreed on a codebook style and further discussed emerging themes and axial codes from the first three transcripts.
3. The codebook became a living document that was updated through its application to new transcripts. The team focused on identifying open codes that did not fit the established axial and higher-level codes as well as redundant axial and higher-level codes.
4. A revised codebook was drafted after each team meeting until team members agreed that no new themes were emerging and no difficulties were encountered with existing themes (for a discussion of similar procedures in other contexts, see Carey et al. 1996; MacQueen et al. 1998). In this way, the coding team reached saturation of axial themes (Creswell 2013) and a working codebook. The codebook included definitions and example quotes to promote understanding and consistency across the team. Previously, coded

transcripts were then recoded with the final codebook to ensure consistency of coding practices over time.

Step 2: Training Coders

We designed our coding approach for a team-based analysis to allow for flexibility as some team members left the project and new members joined. Once the initial team had established consensus on the content of the codebook in the process described above, all transcripts were coded by two overlapping teams of coders: the "summer team" and the "fall team." The summer team consisted of four coders, who coded the initial 10 interviews in pairs (two coders coded each interview). After these interviews were coded, two additional members joined the team as three left to form the fall team. The new members were trained by original team members, using two transcripts for practice. After initial training, the fall team evaluated seven additional transcripts in pairs. In total, 17 transcripts were coded in pairs, so that we could compare the practices of two coders on the same text and identify points of disagreement that needed discussion. The remaining 24 transcripts were coded independently by one coder after sufficient intercoder consensus was reached based on ongoing discussion about the results and refinement based on that discussion.

Step 3: Applying the Codebook

The qualitative data analysis software ATLAS.ti (2015) allowed our large and evolving team to collaboratively analyze the data, create a common language in our codebook, and reach consensus while benefiting from the unique perspectives of each team member. The coding protocol also sought to capture coder uncertainty during the coding process. To mark uncertainty, coders were instructed to use the Comments function to write a brief note explaining the uncertainty and tabling it for future team meetings.

While open coding has many benefits, it also has disadvantages particularly relevant to a team-based approach. The exact names of open codes are likely to be idiosyncratic. For example, Table 1 shows how two different coders may code the following segment of text in two different ways.

Here, each coder used slightly different language for their open codes. Additionally, one coder might see two quotations as similar enough to combine into the same open code, whereas another coder might give them separate codes. These discrepancies do not impact analysis: it does not matter whether the code is called "It's not organically grown" or "food not

Table 1. Example of Coding Consensus and Disagreement between Open and Axial Codes among Two Researchers.

	Researcher 1		Researcher 2	
Verbatim Quotations from Transcript	Open Codes[a]	Axial Codes[b]	Open Codes	Axial Codes
The food that we do have if the, that can purchase, you know, um . . . at, at the grocery store, um . . . the, the value of the nutrition has been depleted because they don't grow the food like they used to . . .	Nutritional value of food at grocery store is lower than it used to be	Quality food[c]	Food available does not have the same nutrition; food not grown like it used to	Quality food
Amen . . .				
So it doesn't have the amount of minerals . . .	Food doesn't have as much minerals as it used to	Quality food	Food does not have same amount of minerals	Quality food
Right . . .				
It's not organically grown . . .	It's not organically grown	Quality food	Food not organically grown	Quality food
And the nutrition value that our grandparents had	The nutritional value is not what our grandparent had	Change in lifestyle[d]	Grandparents' food had more nutrition	Quality food

[a]These are grounded or in vivo codes that draw heavily from the language used by participants themselves.
[b]These codes group open codes around "axes" of meaning.
[c]The definition of "quality food" includes both high- and low-quality foods based on factors such as safety, variety, selection, and perceptions of goodness.
[d]The definition of "change in lifestyle" includes indicators of improvements in lifestyles (i.e., the way things are now is better, we used to have unhealthy lifestyles) and declines in lifestyles (i.e., the way things used to be was healthier).

organically grown," particularly as reporting would focus on the full quotation as exemplary of the higher-level theme (i.e., "quality food"), which both coders used identically. However, they introduce problems with comparing the work of two different coders because the two open codes are distinct. We resolved these difficulties using axial codes and higher-level codes of the codebook. Coders linked each open code into one or more user-created axial code, then linked axial-level codes to higher-level codes and then the highest-level codes of the conceptual domains. Refer to Figure 1, which provides an example and illustrates the differences between the types of codes (open, axial, higher level, and highest level).

Finally, team members also ran various checks on their coding before meeting with the team. These checks ensured internal consistency and involved checking for clerical errors and using constant comparisons (Corbin and Strauss 2014) to identify similar open codes that could be combined into a single code. Most relevant to this article is a check of intercoder consensus conducted with the assistance of the CAT. CAT served as an important tool in the refining of our process, identifying areas of discrepancy that we then discussed at team meetings to develop consensus.

In developing this consensus, we were not interested to know whether coders A and B used the same open codes, but rather whether coders A and B linked the same quotations to the same axial codes after open coding. Referring to Table 1, we wanted a strategy that would recognize consensus when the axial codes were the same (as with the organic food open codes both being classified as "quality food") but not when the axial codes were different (as when "The nutritional value is not what our grandparent had" is classified as "changes in lifestyle" but "Grandparents' food had more nutrition" as "quality food").[1]

Step 4: Evaluating Consensus

CAT is a web-based tool accessible at http://cat.texifter.com/ (Lu and Shulman 2008; Shulman 2016). We used this tool as a complement to ATLAS.ti, working with ATLAS.ti outputs.[2] We compared the overall consensus using standard comparisons and then used the report function based on code-by-code comparisons to identify the discrepancies between the two coders at the level of the axial codes. This report creates a table containing the number of quotations each analyst labeled with each axial code, number of overlapped codes between these two coders, and number of exact matched codes between these two coders, along with κ value. While CAT does output a κ variable, our κ scores were very low across the board and this output was therefore not sufficient for our purposes. Rather, we found the output of mismatched annotations helpful in directing us to points of nonconsensus, which we then discussed. We generated another output of mismatched annotations for the codes with a large number of discrepancies in terms of number of codes as well as their match or overlap from CAT, which allowed us to rapidly identify discrepancies and reach consensus through discussion among all team members.

Discussion and Conclusions

Although many qualitative studies are often a solo endeavor, their analytic methods can be adapted to a team-based environment. Consensus among team members can be difficult to reach in grounded and thematic analysis—strategies that rely on line-by-line coding of verbatim transcripts—particularly when discrepancies are arduous to identify. Reaching consensus across larger data sets requires strategies to overcome idiosyncratic differences in phrasing that would interfere with computer-mediated assessment of consensus. The solutions developed in our project have implications for applied and participatory research. First, the consensus procedures developed allowed us to confidently coordinate a large team to accomplish a large amount of qualitative coding in a short period of time. This speed is especially valued in applied research such as rapid assessment (Trotter et al. 2001), where traditional long-term ethnographic research is not practical. Second, the training procedures developed permitted the rapid integration of new team members, minimizing lost time. Third, the rigor developed in coding and the clarity of procedures for resolving discrepancies allowed for the collaboration of team members with different backgrounds. This inclusion allowed not only a multidisciplinary approach but also raises the potential to include community members in the data analysis process, which is particularly valued in community-based participatory research.

The team-based open-coding approach does have some limitations. It is still time consuming and requires qualitative data analysis software that can be cost prohibitive. Additionally, we used a team of academically trained researchers. While we are optimistic this approach could be used for training and including community partners, we have not yet verified this approach in practice.

Team-based open coding is a fruitful approach, but not enough is known about how researchers make it work in practice. This article has detailed one research team's strategy for resolving such issues. This process involved much trial and error, particularly in making the qualitative data analysis software work for us. Our method may be of use to researchers and students working in a variety of settings and is particularly appropriate for applied qualitative research settings in which collaboration and speed are often especially valued.

Authors' Note

The research described in this article was carried out when Cascio and Vaudrin were at Case Western Reserve University. M. Ariel Cascio is now affiliated to Central Michigan University College of Medicine.

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Notes

1. The Coding Analysis Toolkit (CAT) was not initially amenable to our approach because CAT relies on grounded codes, yet we intended to compare on-grounded codes. Therefore, in ATLAS.ti, we had to create "Super Codes" of all axial codes and then create "Snapshot Codes" of each Super Code to link these axial codes directly to quotations. We could then compare these quotations in CAT.
2. See Haley et al. (2017) for a discussion of how to measure intercoder agreement in NVivo version 8.

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