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Article

Data Display in Qualitative Research

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Abstract

Visual displays help in the presentation of inferences and conclusions and represent ways of organizing, summarizing, simplifying, or transforming data. Data displays such as matrices and networks are often utilized to enhance data analysis and are more commonly seen in quantitative than in qualitative studies. This study reviewed the data displays used by three prestigious qualitative research journals within a period of three years. The findings include the types of displays used in these qualitative journals, the frequency of use, and the purposes for using visual displays as opposed to presenting data in text.

Keywords: visual display, diagram, matrix, categorization, visualization, qualitative data analysis

Author Note: The authors do not have any relationship or personal investment with the three journals, or their editorial boards, reviewed in this article.

Data display has been considered an important step during the qualitative data analysis or the writing up stages (Burke et al., 2005; Coffey & Atkinson, 1996; Dey, 1993; Eisner, 1997; Grbich, 2007; Lofland, Snow, Anderson, & Lofland, 2006; Miles & Huberman, 1994; Radnofsky, 1996; Slone, 2009; Yin, 2011). Data display in a graphic format is a way of portraying information succinctly and efficiently, illustrating details provided in longer textual information. Visual displays provide a multidimensional space to organize data and show connections between different pieces of relevant data (Dey, 1993). A main goal of any diagram is to provide ready access to information and convey a message, a discovery, or a particular perspective on a specific data or topic (Iliinsky, 2010; Lengler & Eppler, 2007). A graphic representation allows the reader to acquire insights, develop an elaborate understanding, or appreciate new knowledge.

Grounded theorists believe that creating visual representations of the emerging theories is an intrinsic and essential step in theory building (Clarke, 2005; Charmaz, 2006; Strauss, 1987; Strauss & Corbin, 1998). This qualitative tradition of inquiry strongly encourages the use of diagrams and figures to synthesize major theoretical concepts and their connections. In qualitative studies, visual displays can be useful and serve several purposes at all stages of analysis, and visual displays, just as with any other form of alternative representation, are used with the purpose of "illuminating rather than obscuring the message" (Eisner, 1997, p. 8). A display may be used to represent exploratory, basic, or initial data, or at the other end of the process of analysis, it could help in showing detailed or causal explanations, and it could even be used as a way of generating research hypotheses and developing theory (Burke et al., 2005; Miles & Huberman, 1994). Therefore, visual displays can be functional in supplementing extended textual passages (e.g., when used to box a significant excerpt of participants' voices or enlist participants' demographic information); in representing a model or links among different key concepts or terms developed in final analysis (e.g., when causal networks or other forms of diagrams represent interrelationships or connections); or in illustrating participatory research and collaborative analysis (e.g., when concept maps are co-generated by subjects and researchers and are used to demonstrate findings). In essence, diagrams not only add life to qualitative data, as Yin (2011) has stated, but they also give readers the possibility of seeing the author's meaning represented in more ways than just textually.

It has been suggested that to achieve efficiency in helping the reader gain the intended message, a visual display should be as uncomplicated as possible, and it should possess the right balance of important information and minimum detail, avoiding unnecessary off-topic content or information. Irrelevant data create visual noise, which in turn forces the reader to take a long time to find the essential and meaningful information (Iliinsky, 2010; Morse, 2006). Displays overburdened with information can become cluttered and inaccessible. Displays with high levels of complexity might overload the reader with information or stimuli; but, too synthetic designs might oversimplify the message. A visual display should eliminate any barrier to the goal of presenting information in a clear and accessible way but yet seek to be engaging and appealing (Dey, 1993).

The display format and shape of the entries may vary considerably and are usually adjusted to the researcher's needs. In the field of management, a wide variety of graphic displays are commonly used to depict ideas, organize information, reveal an implicit plan, or explain a process. The complexity of a display is a factor to take into account. The amount of relationships and concepts depicted increases the relative complexity. Whereas some displays may require a narrative to support their understanding, others may be more quickly understood without additional explanation. Another aspect relates to the entry reading of the display. The most common ways of interpreting a display are left to right or top to bottom, or the inverse. Other displays include a circular modality most commonly used to depict cycles or closed processes, and its reading can

start at any place (Knowlton & Phillips, 2012). Thus, the use of lines, or single- or double-headed arrows, should be carefully used to convey the intended meaning and avoid confusing the reader (Morse, 2006).

The *Publication Manual of the American Psychological Association* (APA), 6th Edition (American Psychological Association, 2010) described all illustrations other than a table as a figure. Figures included graphs, charts, maps, drawings, and photographs. A broad categorization of figures used with non-quantitative information was grouped under the label of charts. No specific attention was given, however, to the broad spectrum of possible figures used in qualitative research. The definition and in-depth exploration given to quantitative forms of displays in the APA manual is not surprising. The development of visual displays to portray quantitative data has an extensive history that began more than two centuries ago (Tufte, 2001). A core goal of quantitative data display is to provide "a visual one-to-one correspondence of number to graphical element" (Onwuegbuzie & Dickinson, 2008, p. 204). Statistical graphics are tools for reasoning about quantitative information and provide a means of understanding causality, showing comparisons, or summarizing a large set of numbers in a coherent way (Tufte, 2006). Although there are some variations, the types and formats of quantitative visual displays are well established; for example, Nicol and Pexman (2010) categorized 11 different kinds of displays: "bar graphs, histograms, line graphs, plots, drawings, combination graphs (which combine graphs or incorporate drawings or photographs with graphs), pie graphs, dendrograms, stem-and-leaf plots, charts, and photographs" (p. 5). In contrast, while sorting through different descriptions of qualitative visual displays we noticed that authors have labeled diagrams in different ways. That is, there was no consistency found in the literature with regards to labeling specific visual displays used in qualitative research. The landmark work of Miles and Huberman (1994) still constitutes to this day the most comprehensive classification system of diagrams and provides the most extensive discussion on this topic.

Although there is an increase in visual display use in qualitative articles (Morse, 2006), scant attention has been paid to the definitions, purposes, effects, and common uses of diagrams in qualitative research publications. Given the potential resource that visual displays provide and considering the underutilization of visual displays in qualitative research (Onwuegbuzie & Dickinson, 2008), the goal of this review was to explore the frequency of use, patterns, purposes, and preferred selected types of data display. We also reviewed the use or nonuse of qualitative data analysis software. Contemporary software supports some innovative means of data display. It is relevant to explore whether there is a link between data display and the use of data analysis software.

We examined the diagrams used in the articles that were published between 2007 and 2009 in the journals *Qualitative Health Research* (QHR), *Qualitative Inquiry* (QI), and *Qualitative Research* (QR). In this study, the terms *visual displays* and *diagrams* are used as synonyms as they represent the same concept. Previous work guided our understanding and conceptualization of visual displays (see, for example, Coffey & Atkinson, 1996; Dey, 1993; Eisner, 1997; Grbich, 2007; Lofland et al., 2006; Miles & Huberman, 1994; Radnofsky, 1996; Slone, 2009; Yin, 2011). Two specific definitions of visual displays represent the core foundation for this study. Miles and Huberman (1994) initially defined a visual display as "an organized, compressed assembly of information that permits conclusion drawing and action" (p. 11). In addition, a broader definition indicates that a visualization method is "a graphic representation that depicts information in a way that is conducive to acquiring insights, developing an elaborate understanding, or communicating experiences" (Lengler & Eppler, 2007, p. 1).

Method

Sample

The sample for this study comprised articles published in three well-known qualitative research journals (QHR, QI, and QR) between 2007 and 2009; those were the most recent issues at the time of data collection. The selection of the sample of articles for this study was done in a three step process. The first step consisted in reviewing all articles and classifying them according to use or nonuse of visuals. The second step was to separate the articles with visual materials that represented data or data analysis from other types of visuals, such as photographs, paper and pencil drawings (i.e., children or adult drawings), and cartography maps. Only visual displays that were data representations were considered because they matched visual displays as defined in this study. Finally, editorial introductions or commentaries were also excluded. A total of 215 articles from the three journals met the criteria to be included in this review.

The three journals were selected because they use qualitative inquiry and use a broad array of methodological approaches. Each of them presents a unique profile and attracts a varied public. The three are published by SAGE Publications, which is one of the largest publishers of qualitative research journals and books.

QHR is an international, interdisciplinary, research-oriented referred journal interested in qualitative methodology that addresses health-related topics. It introduces studies conducted in a wide spectrum of disciplines. QHR mainly publishes empirical field-based studies and theoretical developments. It also includes book reviews, editorials, and commentaries on conceptual and methodological issues pertaining to qualitative research. QHR published 10 issues in 2007 and 12 issues in 2008 and in 2009.

QI is a referred journal focused on methodological issues brought up by qualitative research rather than on the content or results of the research. It is an interdisciplinary journal that presents research from various fields, such as anthropology, communication, cultural studies, education, gerontology, health, psychology, social work, and sociology, among others. It publishes a broad wealth of arts-based studies, including autoethnography, drama, poetry, and self-reflections. QI published 8 issues in 2007 and in 2008 and 10 issues in 2009.

QR is a referred journal oriented to providing a forum for the discussion of qualitative research across the social sciences and cultural studies. It publishes empirical studies as well as articles raising philosophical, theoretical, historical, or ideological debates about qualitative research. QR published 4 issues in 2007 and 5 issues in 2008 and in 2009.

Data Analysis

To reach the stated review goals, the selected articles included in this study were grouped according to year of publication, types of visual displays and purposes for using them, and use or nonuse of qualitative data analysis software. Standard Microsoft Office software, such as Excel, was used to organize and save this information, and social media and collaboration tools were used to share information and work on data analysis. A description of the analysis is as follows:

1. The authors examined the presence or absence of visual displays in the three journals for the period 2007-2009.
2. Based on the literature, definitions, and current conceptualizations of visual displays (Coffey & Atkinson, 1996; Dey, 1993; Eisner, 1997; Grbich, 2007; Lofland et al., 2006; Miles & Huberman, 1994; Radnofsky, 1996; Slone, 2009; Yin, 2011), the diagrams presented in the articles were classified and defined according to their format and purposes. There was a recurrent comparison and re-classification of displays as our analysis progressed.
3. A final rubric with definitions for displays that appeared in these three journals was gradually created, reviewed, and refined.
4. Lastly, the authors identified the use or nonuse of qualitative data analysis software.

Results

Out of the 784 articles reviewed, only 27% used some type of data display (see Table 1). QHR published 431 articles during the years 2007-2009, QI published 237, and QR published 116. It was found that QHR, QI, and QR published 173, 18, and 24 articles with displays, respectively, within that timeframe.

Table 1

Comparison Between Articles Analyzed and Articles that Included a Visual Display Per Journal

	QHR	QI	QR	Total articles
Articles with displays	173	18	24	215
% articles with displays	40%	7.6%	20.6%	27%
Total articles	431	237	116	784

Types of Visual Displays

This section presents a rubric of the types of visual displays, including their definitions, found in the three journals reviewed (see Table 2). Displays that appeared at least once were included in this classification. There was only one article that used a traditional quantitative type of display, a scatterplot. That display was not included in this classification because data in this type of display are typically portrayed as a collection of points representing a numerical value in each axis. The visual displays identified are presented alphabetically, along with a representative example of a visual display extracted from the reviewed articles. The frequency of use of these displays is discussed later.

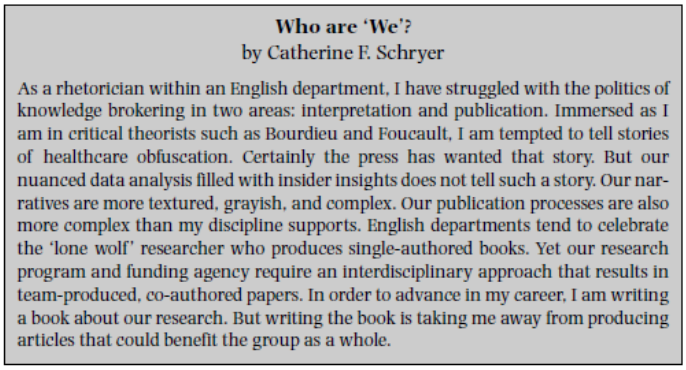
Table 2

Types of Visual Displays and Purposes

Visual display	Purpose
Boxed display	To highlight a specific narrative considered important and frame it in a box
Decision tree modeling	To describe options, decisions, and actions
Flow chart	To illustrate directional flow and show pathways of different groups
Ladder	To represent the dimensions of the progression of certain phenomenon through time or to show levels or stages
Matrix	To cross two or more dimensions, variables, or concepts of relevance to the topic of interest
Metaphorical visual display	To depict in a metaphorical way the topics or themes found
Modified Venn diagram	To indicate shared or overlapping aspects of a concept, a category, or a process
Network	To depict relationships between themes and subthemes or categories and subcategories
Taxonomy	To classify or organize information

Boxed display.

This is, literally, text framed within a box. Researchers used this type of display to highlight a specific narrative considered important enough to extract from the text and frame in a box. It emphasizes the authors' interests or points of relevance. Boxed displays stand out and are, by far, the simplest form of display. In conducting this review we found that most boxed displays kept the white background color of the article, but some backgrounds were shaded, such as in the case selected (see Figure 1). In the article from which the following example was extracted, Lingard, Schryer, Spafford, and Campbell (2007) used four boxed displays to report their personal accounts and reflections about the research they were conducting. As a result, this type of display helped them separate the more extensive theoretical conceptualization represented in text format from their personal narratives framed in boxed displays.



Who are 'We'?
by Catherine F. Schryer

As a rhetorician within an English department, I have struggled with the politics of knowledge brokering in two areas: interpretation and publication. Immersed as I am in critical theorists such as Bourdieu and Foucault, I am tempted to tell stories of healthcare obfuscation. Certainly the press has wanted that story. But our nuanced data analysis filled with insider insights does not tell such a story. Our narratives are more textured, grayish, and complex. Our publication processes are also more complex than my discipline supports. English departments tend to celebrate the 'lone wolf' researcher who produces single-authored books. Yet our research program and funding agency require an interdisciplinary approach that results in team-produced, co-authored papers. In order to advance in my career, I am writing a book about our research. But writing the book is taking me away from producing articles that could benefit the group as a whole.

Figure 1. Example of a boxed display. Adapted from "Negotiating the Politics of Identity in an Interdisciplinary Research Team," by L. Lingard, C. F. Schryer, M. M. Spafford, and S. L. Campbell, 2007, *Qualitative Research, 7*(4), p. 512. Copyright 2007 by Sage Publications. Reprinted with permission.

Decision tree modeling.

Gladwin portrayed decision tree modeling as "a way to ground a description of real-world decisions and actions coherently by using multiple examples" (as cited in Miles & Huberman, 1994, p. 186). The beginning or top decision tree modeling usually shows the choice alternatives; the middle shows the decision criteria; and the bottom shows the decision outcome (Miles & Huberman, 1994). In the following example, Freidin (2008) used a display to represent the treatment patterns for complementary and alternative asthma treatments (see Figure 2).

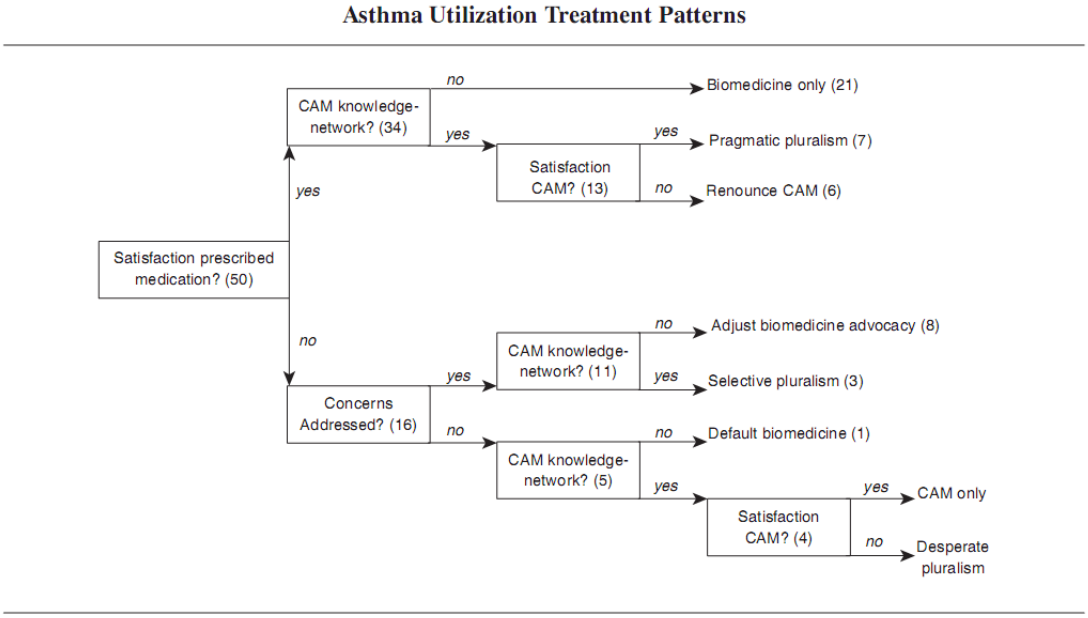


Figure 2. Example of a decision tree modeling. Adapted from "Complementary and Alternative Medicine for Children's Asthma: Satisfaction, Care Provider Responsiveness, and Networks of Care," by B. Freidin, 2008, *Qualitative Health Research, 18*(1), p. 47. Copyright 2008 by Sage Publications. Reprinted with permission.

Flow chart.

In flow charts, key concepts or terms are arranged "in terms of their relationships through time or in a process rather than as static entities" (Lofland et al., 2006, p. 216). Flow charts usually indicate the alternative paths that different participants follow in a specific process. They depict a stream and they are useful in portraying different routes of action. Data are represented using different symbols (e.g., circles, ovals, rectangles, etc.) and arrows are used to connect and/or show direction of flow. A flow chart may take different forms, but its main characteristic is that it represents pathways, trajectories, and processes.

In the following example of a flow chart, Draucker and Martsolf (2008) depicted core psychosocial processes of storying childhood sexual abuse (see Figure 3). The rectangles represent five processes, their relationship and direction. The participants of this study classified the telling of the story as aversive or encouraging, which was critical in the further telling of the story. The arrows represent common pathways of telling trajectories.

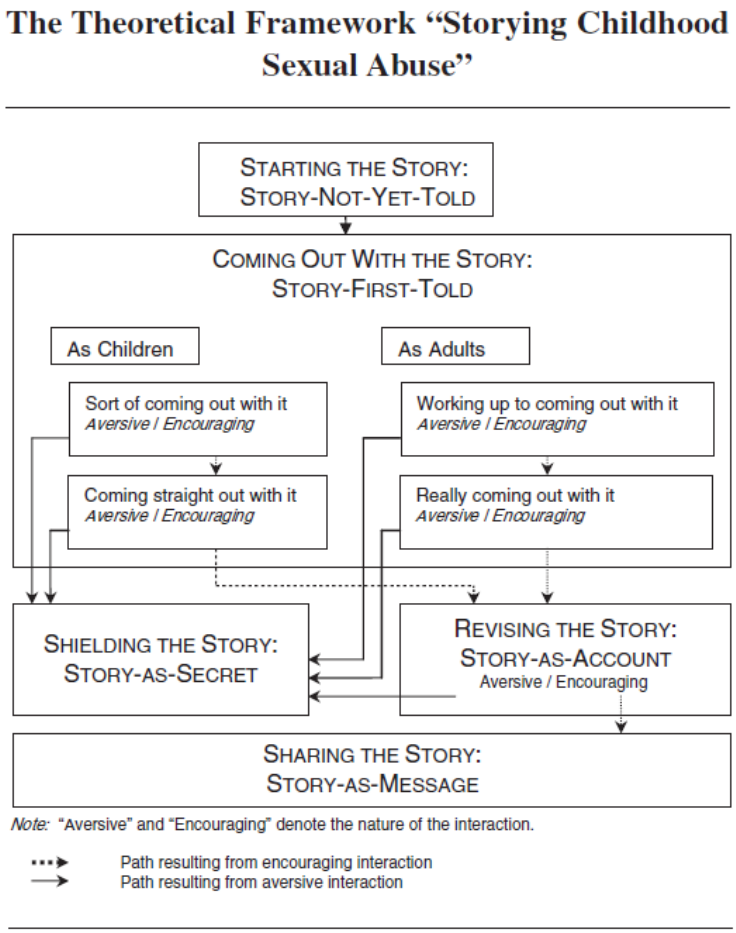


Figure 3. Example of a flow chart. Adapted from "Storying Childhood Sexual Abuse," C. B. Draucker and D. S. Martsolf, 2008, *Qualitative Health Research, 18*(8), p. 1039. Copyright 2008 by Sage Publications. Reprinted with permission.

The ladder or step-by-step process.

This diagram represents the dimensions of the progression of certain phenomenon through time. The ladder shows the different phases or steps that participants experience under certain circumstances. The representation of the steps indicates a leap or change in the process of acquiring something. Similar to flow charts, ladders indicate the progression of a process, but the ladder, in addition, indicates the level of change. Each step in a ladder represents the basis for the next step. Whereas flow charts or networks indicate loops or cycles of processes or experiences, ladders are unidirectional. No formal definition has been given for this type of diagram in the literature. In their book, Miles and Huberman (1994) presented a diagram that they labeled as a "ladder of abstraction," in which a step by step analytical progress from data to abstraction was depicted.

In the following example, Eriksson, Starrin, and Janson (2008) studied what caused job burnout that led to long term sickness absence (see Figure 4). The authors presented their findings as a ladder with eight steps that denoted the process of emotional deprivation that participants experienced previous to the burnout. In addition to being a ladder display, this example could also be considered a metaphorical visual display. The essence of this type of display is to use a

common or known symbol to visually highlight what is represented. In this case, the use of stairs visually informs the reader that there is an ascending or progressing upward path.

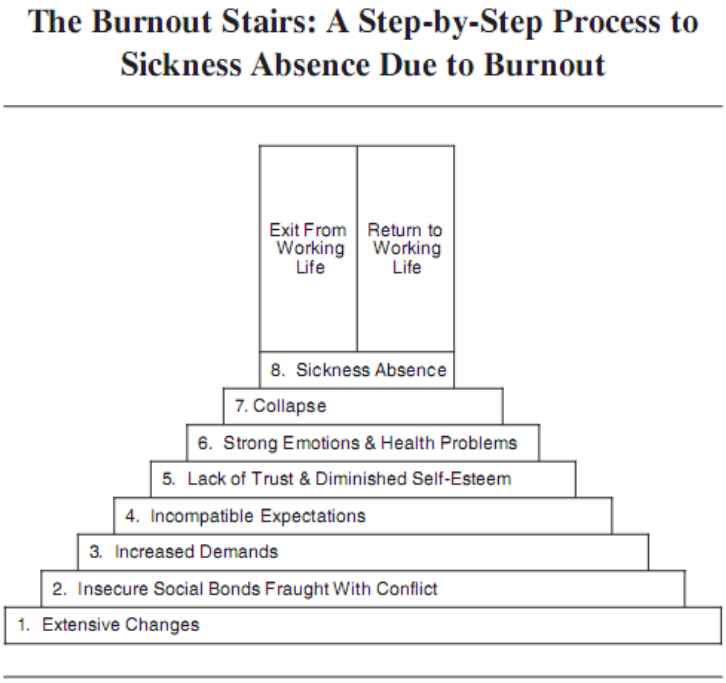


Figure 4. Example of a ladder. Adapted from "Long-Term Sickness Absence Due to Burnout: Absentees' Experiences," by U. Eriksson, B. Starrin, and S. Janson, 2008, *Qualitative Health Research, 18*(5), p. 623. Copyright 2008 by Sage Publications. Reprinted with permission.

Matrix.

Matrices are tables based on a "cross-classification of two or more dimensions, variables, or concepts of relevance to the topic or topics of interest" (Lofland et al., 2006, p. 214). Matrices, or tables, are widely used with a variety of purposes that range from enlisting demographic information to the complex illustration of results.

In the following example, LeGreco and Tracy (2009) used a matrix with two columns and four rows to display the four phases of discourse tracing. The unique tasks of each phase are bullet-pointed. The matrix operated as an organizational and descriptive display of the topic under study (see Figure 5).

Table 1
Discourse Tracing Methodological Overview

Discourse Tracing Overview	
Phase	Tasks
Phase 1: Research design	• Define the case using a rupture or turning point • Review the literature to outline potential research directions
Phase 2: Data management	• Gather data from a variety of sources that span micro, meso, and macro levels of discourse • Order data chronologically • Read over this data for emergent themes and issues
Phase 3: Data analysis	• Create structured questions based upon literature and emergent themes and apply those questions to the data • Write the case study based upon answers to structured questions and with a focus upon the formation, interpretation, and appropriation of discursive practices
Phase 4: Evaluation	• Address theoretical conclusions of the case • Develop practical implications and recommendations that may apply to other cases

Figure 5. Example of a matrix. Adapted from "Discourse Tracing as Qualitative Practice," by M. LeGreco and S. J. Tracy, 2009, *Qualitative Inquiry*, *15*(9), p. 1523. Copyright 2009 by Sage Publications. Reprinted with permission.

Metaphorical visual display.

This type of display depicts in a metaphorical and, at times, poetic way the nature of the topics or themes found. Metaphorical visual displays represent findings and results by means of a common or consensual sign or symbol embedded in the culture. According to Lengler and Eppler (2007), metaphor visualizations convey complex insights using simple and common templates. These displays have the peculiarity of serving two functions or using two layers of representation. On one level they present the information graphically in a structured and organized way, but in addition, the key features of the metaphor are used to convey a second level of representation, which provides insight or implicit knowledge about the represented information. Similar to networks, metaphorical visual displays illustrate models, theories, or frameworks and represent the connection between themes and subthemes.

In the following example, Barnes and Murphy (2009) chose a scale to represent how women with HIV weighed or judged their decision to get pregnant (see Figure 6). Thus, the words used in this display denote one level of representation and the scale itself indicates the second level. The scale symbolized ideas of fairness, equilibrium, stability, or unsteadiness, among others.

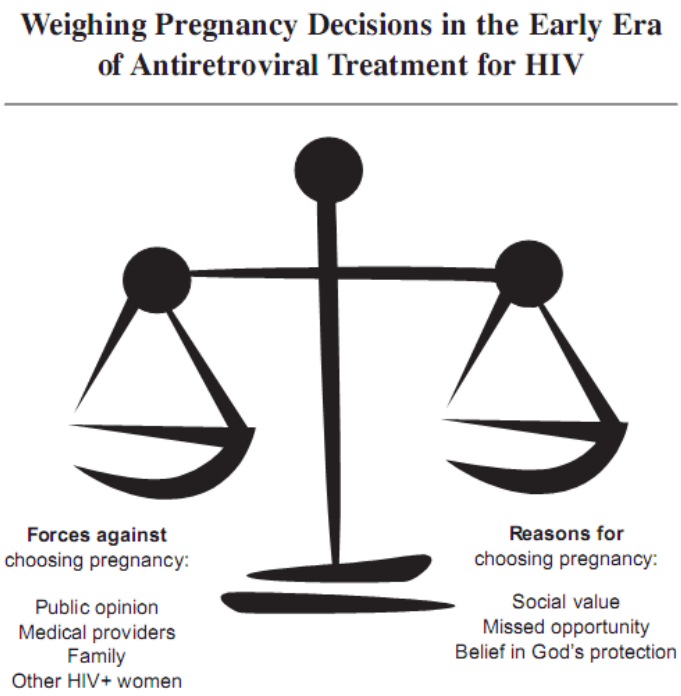


Figure 6. Example of a metaphorical visual display. Adapted from "Reproductive Decisions for Women with HIV: Motherhood's Role in Envisioning a Future," by D. Barnes and S. Murphy, 2009, *Qualitative Health Research, 19*(4), p. 485. Copyright 2009 by Sage Publications. Reprinted with permission.

Modified Venn diagram.

John Venn created this type of diagram around 1880 to show all possible relations among groups of things. It consists of overlapping circles with intersections that represent common areas between them (Baron, 1969). Qualitative research articles usually employ a modified version of a Venn diagram to display shared aspects of a concept, a category, or a process. Venn diagrams have also been used to depict a model or conceptual framework.

In the following example, Carr (2008) explored the importance of spiritual nursing care (see Figure 7). The author used a modified Venn diagram to depict the central processes, subprocesses, and qualities that describe the meaning of spiritual nursing care. The author stated that she picked circles because they represented wholeness, and the circles that overlap and are broken depict the mutual influence that the processes have on each other as well as their dynamic nature. The broken lines of the circles represent the openness to external environmental influence of all processes and subprocesses associated with spiritual nursing care.

Figure 7. Example of a modified Venn diagram. Adapted from "Mapping the Processes and Qualities of Spiritual Nursing Care," by T. Carr, 2008, *Qualitative Health Research, 18*(5), p. 696. Copyright 2008 by Sage Publications. Reprinted with permission.

Network.

A network is defined as a "collection of 'nodes' or points connected by lines ('links')" (Miles & Huberman, 1994, p. 94). Networks allow the focus to be on many variables at a time. In qualitative studies, networks are commonly used to show frameworks, models, or theories that indicate findings about the phenomenon under study. Network displays show results or conceptual analysis, and they help to portray the connection or relationship among the theoretical aspects under study. In addition, this type of display illustrates the links between the themes and their categories and subcategories. In the following example, Cheyney (2008) used a network to represent the relationship that existed among the three main and dominant themes that emerged from the data and the relationships among them (see Figure 8).

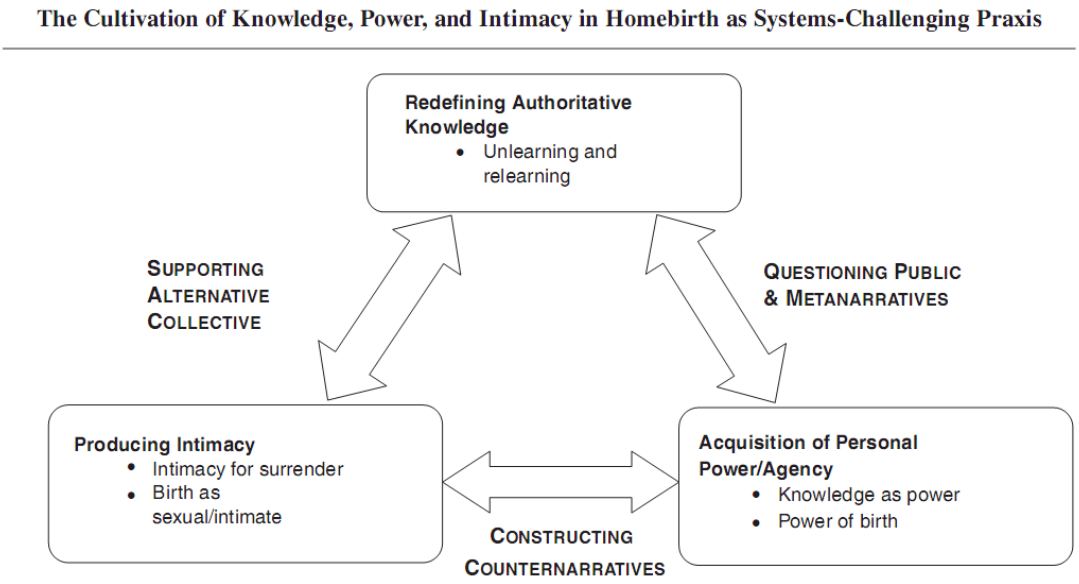


Figure 8. Example of a network. Adapted from "Homebirth as Systems-Challenging Praxis: Knowledge, Power, and Intimacy in the Birthplace," by M. J. Cheyney, 2008, *Qualitative Health Research, 18*(2), p. 257. Copyright 2008 by Sage Publications. Reprinted with permission.

Taxonomy.

A taxonomy is a classification organized in a hierarchical structure, ordered by supertype-subtype relationships. The subtype retains all the properties of the supertype, with an additional property or constraint. For example, a rose is a type of flower; thus, every rose is a flower, but not every flower is a rose. Spradley (1980) developed a taxonomic analysis which indicated how a domain is organized and how actors, objects, activities—components—of any system are related to one another. In our review, it was found that taxonomies represent different types of classification and are used to classify or organize information. Authors used taxonomies to illustrate the organization chart of data collection sites, the snowball approach of connecting with participants, and the hierarchical structure of an organization under study. In the following example, Westhues et al. (2008) used a display to enumerate the different organizations and steering committees that supported their research project (see Figure 9).

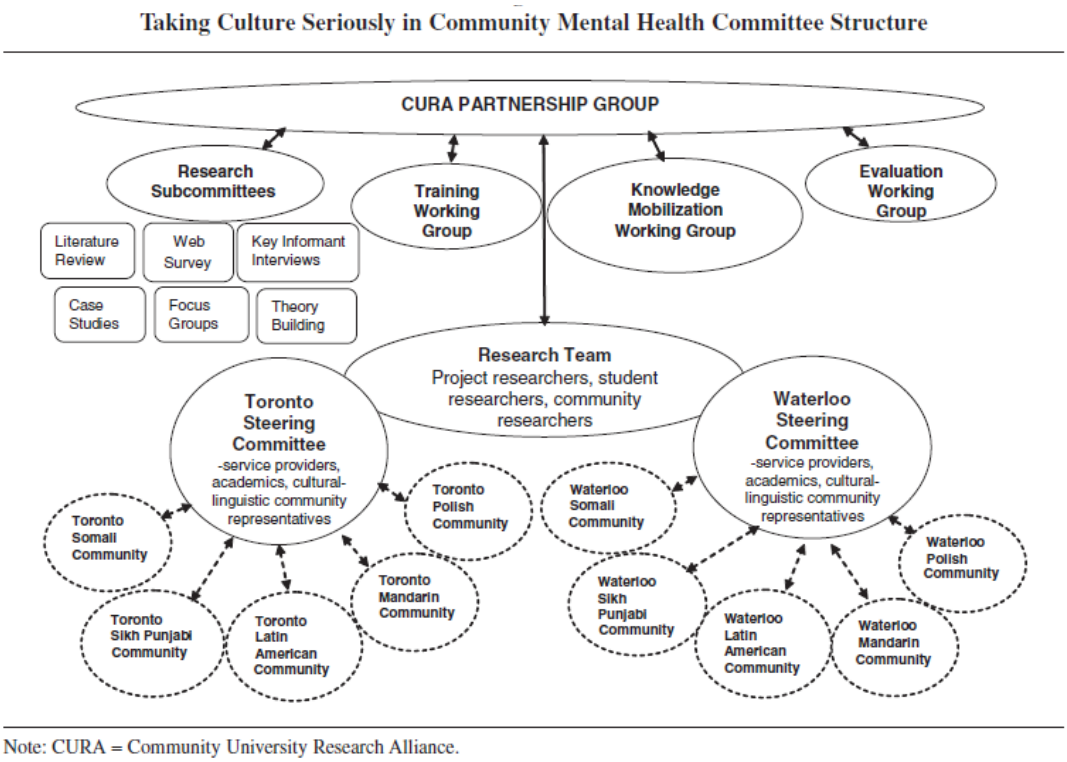


Figure 9. Example of a taxonomy. Adapted from "Developing a Theory from Complexity: Reflections on a Collaborative Mixed Method Participatory Action Research Study," by A. Westhues, J. Ochocka, N. Jacobson, L. Simich, S. Maiter, R. Janzen, and A. Fleras, 2008, *Qualitative Health Research, 18*(5), p. 703. Copyright 2008 by Sage Publications. Reprinted with permission.

Frequency of Use

We found that the most frequently used visual displays across the three journals were matrices, followed by networks, flowcharts, and boxes (see Table 3). The rest of the displays were also present but with less frequency. It was not uncommon to find that a single article used more than one display. There were a total of 377 displays used in the 215 articles.

Table 3

Frequency of Use of the Different Types of Data Displays Across Journals

Type of display	Frequency of use	Percentage
Matrix	227	60.2 %
Network	48	12.7 %
Flow chart	35	9.2 %
Boxed display	29	7.7 %
Modified Venn diagram	17	4.5 %
Taxonomy	8	2.1 %
Ladder	6	1.6 %
Metaphorical visual display	4	1.1 %
Decision tree modeling	3	0.8 %
Total	377	100.0 %

In observing patterns of use across the three journals it was noted that displays such as ladder, metaphorical visual display, and taxonomy were only used in QHR (see Table 4). QI authors used four types of displays, and the most commonly used were matrices and boxes, which were also the most commonly used by authors in QR.

Table 4

Use of the Different Types of Data Displays Per Journal

Type of display	Journal			Total
	QHR	QI	QR	
Matrix	186	17	24	227
Network	40	3	5	48
Flow chart	30	0	5	35
Boxed display	7	15	7	29
Modified Venn diagram	16	1	0	17
Taxonomy	8	0	0	8
Ladder	5	0	1	6
Metaphorical visual display	4	0	0	4
Decision tree modeling	2	0	1	3
Total	298	36	43	377

The frequency of display use of each journal across the three years surveyed kept a similar tendency (see Table 5).

Table 5

Total Use of Displays by Year and Journal

Year	Journal			Total
	QHR	QI	QR	
2007	88	4	15	107
2008	111	6	15	132
2009	99	26	13	138
Total	298	36	43	377

The exploration of the use of displays of each journal during each year indicated that QI significantly increased the number of articles that used visual displays (see Table 6). It is important to mention, however, that during 2009 this journal published two more issues than in their previous two years.

Table 6

Number of Articles that Used Displays by Year and Journal

Year	Journal			Total
	QHR	QI	QR	
2007	49	4	10	63
2008	65	5	6	76
2009	59	9	8	76
Total	173	18	24	215

Most Commonly Used Display and Purpose of Use

Results indicated that the most commonly used display is the matrix, accounting for almost 60% of total display use. The matrix seems to be the most adaptable and resourceful of all the types of displays, and it was used to represent different aspects of a study. Whereas networks or flow charts were regularly found under the results section of a published article, matrices could be found in any section of an article. As a result, a closer look at the use of matrices during the year 2007 in QHR was conducted to explore its use in more detail. The frequency of and purposes for using matrices were classified according to the main four sections of an empirical article: Introduction and/or Literature Review, Method, Results/Findings, and Discussion (see Table 7). During the year 2007, 25 articles used at least one matrix. Some articles used more than one matrix, adding up to four matrices in a single article. A total of 49 matrices were found in QHR in 2007 and were classified. Theoretical articles were not included in this matrix review as they did not follow the same standard division of sections as empirical articles.

The examination of the purposes for using matrices in QHR in 2007 revealed that most of them were used in the Results/Findings section, which also tended to be the longest section in any qualitative article. The most common use of matrices in the Results/Findings section was to compare participants' experiences or phenomenon that happened before and after an event, or to group participants' responses. In addition, matrices were used to compare and contrast groups of participants who experienced a phenomenon or occurrences of a phenomenon expressed in numbers or percentages. In this section, matrices were also used to present categories/subcategories, themes, dimensions, phases, or core variables of the topic investigated, with their definitions or characteristics and/or with participants' excerpts, quotations, or vignettes. In some cases, the matrix provided both the definition of the themes and the vignettes that emerged from the data collected.

The second most frequent use of matrices was observed in the Method section, specifically under the participants' description. Matrices were used to show participants' demographic information, characteristics, or conditions, or other relevant issues. They were also used to show the number and composition of focus groups and their participants, or places where focus groups or data were collected. In sum, matrices referred to information about the participants of the study or units of analysis in documental type of research. Two other main uses of matrices were to enlist the interview guide or areas of exploration in the Method section and to provide definitions or core theoretical concepts in the Introduction section.

Table 7

Purpose and Frequency of Matrix Use in QHR During the Year 2007

Section	Subsections	Purposes	Count	% per section
Introduction		Define relevant concepts of the topic explored	2	4%
Method	Participants	Indicate participants' characteristics, profiles, issues, or choices	10	31%
	Instruments	Show the interview guide, and indicate the general focus of the interviews or some form of triggering stimulus for participants	4	
	Data Analysis	Depiction of steps for data analysis	1	
Results/ Findings		Enlist categories/subcategories, themes, dimensions, phases, or core variables found in the topic explored	5	61%
		Compare and contrast: a) an experience/phenomenon that happened before and after an event b) results expressed in terms of numbers and/or percentages, like occurrences of a phenomenon or comparison of groups of participants who experienced a phenomenon	24	
		Enlist definitions provided by different authors about one concept	1	
Discussion		Depict results and make hypothesis or interpretations	1	4%
		Enlist definitions provided by different authors about one concept	1	
Total			49	100%

Results on the Use of Computer Assisted Qualitative Data Analysis Software (CAQDAS)

CAQDAS make it easy to transform the way data is viewed, but using specific software involves a learning curve that not all researchers are keen on devoting time to. We were interested in learning if there was a preference for specific software at the time of visual display creation; therefore, the study also looked into the frequency and type of use of computer programs in the different articles analyzed. Among the various software mentioned in the reference lists of the articles analyzed, NVivo and ATLAS.ti were the most popular. Both applications allow the user to create labels or codes that associate words, phrases, images, or even multimedia to display patterns and construct conceptual structures of data. Similar in functionality, these two pieces of software take a "strikingly" different approach to handling nontext data (Lewis, 2004). Online tutorials and links to several training opportunities for NVivo and ATLAS.ti demonstrate that the software packages are robust but not easy to use. Developers of both software packages will expect users to go through some level of training before they can start using the software meaningfully. NUDIST is another of the software packages mentioned in the journals studied. This one, admittedly a precursor of NVivo, is older and has a limitation in terms of the type of formats that it accepts (Lewis, 1998). This implies that files have to be saved in the format required or the system will not recognize the file. There are also references to Ethnograph, a text

retrieval software with limitations if compared to any of the more popular software; MAXQDA, a strong package for supporting interrelationships among data and memo (Kus Saillard, 2011); and WinMAX and Qualitative Media Analyzer, two applications created to handle mostly data contained in simulations, animation, audio, or video. It is relevant to mention that CAQDAS support the creation of visual representations to portray qualitative results.

Out of the 152 empirical articles with visual displays published in QHR, 49 reported using some type of CAQDAS to process and analyze data. The most common were NVivo (17), ATLAS.ti (15), NUDIST (8), and Ethnograph (6), and the other less common were WinMAX (1), MAXQDA2 (1), and Qualitative Media Analyzer (1). Only one study published in QR during the analyzed period reported using CAQDAS, specifically ATLAS.ti, and none of the empirical articles published in QI reported using qualitative software. Whether or not authors used CAQDAS to aid them in the development of a visual display is unknown because this was not reported in the articles.

Conclusions

This research study revealed that although visual displays have been used for diverse purposes and have been included in different sections in qualitative research papers, they are underutilized in publications in qualitative research. Our review of published articles during the years 2007-2009 in three valued qualitative journals indicated that less than one third of the journal articles in that period used some form of visual display. Displays have been used for various reasons, such as for the representation of emerging theories, models, or conceptual frameworks; presentation of themes and categories; highlighting of content; display of demographic information or sampling procedures; contrasting or comparing of data sets; and demonstration of the flow or pathways of participants' experiences, among other uses. They were frequently placed in the Results/Findings section of the articles, but we observed some in other sections of the articles as well. We believe that there is a need to keep expanding the area of visual displays in qualitative research. Like Onwuegbuzie and Dickinson (2008), we support the use of diagrams and visual aids in qualitative research and consider that they are underutilized. As indicated by our own research, we can say that the use of visual displays is also underdeveloped.

Although contemporary society is increasingly moving to more visual forms of communication, our results indicated that this increase is not reflected in articles in qualitative research. Possibly the strict rules about the physical space that a journal article will take in print, or the learning curve involved in using technology tools, are some of the reasons that prevent the development of visual displays. We expect that with the consequent proliferation of online journals and other digital publications, visual displays will be more widely used, giving "the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space" (Tufte, 2001, p. 51).

We also expect that theory and practice related to visual displays will be included in preparation of future qualitative researchers. A review of a sample of courses in qualitative research indicated that the use of visual displays, or related literature, was not listed in any syllabi of psychology graduate-level courses in qualitative methods in 20 United States syllabi and one Canadian syllabus reviewed. A discussion of the use of CAQDAS was only included in two syllabi (Verdinelli & Scagnoli, 2010). None of the scant literature on qualitative visual displays was listed on the reviewed syllabi, which also shows that the area is underutilized and underdeveloped.

In contrast to qualitative data display, statistical quantitative data display has a long tradition and a clear classification and definition of the types of displays used. This study aims to provide a

classification that will serve as a blueprint to identify the types of displays used in qualitative research, thus expanding and detailing the diverse types, uses, and capabilities of visual displays. Nine different types of visual displays were found, and the matrix was the most widely used. It proved to be the most versatile type as it could be found in any section of an article, from the Introduction to the Results/Findings and even in the Discussion section. Decision tree modeling and metaphorical visual display were the types of displays used least. Only four metaphorical visual displays were used in QHR and none in QI or QR. Although using metaphors might certainly not apply to every study, the authors found metaphors visually attractive and pleasantly surprising. The use of a metaphorical visual display could strengthen the message and has the potential of being easily remembered because it engages the reader through visual information and implicit knowledge, which connects to a reader's experience.

Similar to previous findings, results indicated that the use of CAQDAS is relatively low (Shin, Kim, & Chung, 2009). The articles reviewed did not specify if the displays used were preformatted or designed with the aid of CAQDAS. It was estimated that the increase in the use of this type of software would eventually lead to the use of more displays (Morse, 2006).

Visual representation of data is well facilitated by technology media, and it is expected that visual displays will become more prominent in qualitative research analysis. Undoubtedly, the use of displays enhances the reading and comprehension of articles, providing the readers with additional data representation and highlighting the authors' data analysis.

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