

Why you should read this article

- To differentiate theoretical saturation and data saturation
- To explore possible stages that may signal data saturation.
- To identify pitfalls and ways to achieve qualitative data saturation.
- To explore suggested sample sizes in qualitative data saturation.

Qualitative data saturation in health sciences research

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Abstract

Background Deciding when and where to stop gathering data is a significant challenge for novice and even seasoned qualitative researchers. Qualitative data saturation (QDS) is a well-known concept, but some researchers may struggle to identify explicit indications and stages of saturation.

Aim To use the literature and the author's experiences to discuss possible benchmarks that researchers may find helpful when collecting qualitative data.

Discussion The article discusses how to operationalise data saturation, data saturation points, quality and quantity of data in saturation, and some possible pitfalls.

Conclusion The concept of saturation is most effectively contextualised within a study design when inductive reasoning is employed. Deductive reasoning may prove beneficial to qualitative researchers when predetermined averages of previous study samples in a similar context are used as a guide.

Implications for practice The author proposes recommendations concerning QDS as guides for future qualitative research.

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data analysis, data collection, methodology, qualitative research, research, study design, data saturation

Introduction

Qualitative data saturation (QDS) is one of the golden standards used in qualitative research (Guest et al., 2006, Creswell and Creswell, 2017). Many researchers and students frequently use this phrase to persuade their readers that they have collected enough data for their studies to be valid. The reasons for QDS being the gold standard are arguably twofold. Firstly, reporting on QDS indicates that enough data was gathered and that credibility regarding the data has been built. Secondly, individuals designing research require a proposed number of participants to budget for their protocol prior to starting data gathering and fieldwork (Guest et al., 2006). These are key because, deductively, a poor premise will result in a baseless conclusion.

Nevertheless, there is variance in the literature about QDS and how to apply it regardless of whether the researcher is a novice or an expert. For 20 years Morse (1995) argued that saturation was the secret to superior qualitative studies. She also pointed out that there are few documented standards or ways of calculating the number of participants needed to achieve saturation. Guest et al. (2006) contended that the literature still had not adequately operationalised the idea of QDS, as it did not explain how to calculate saturation or offer practical ways of estimating purposeful sample sizes. Years later, there still remains limited literature exploring this issue. Therefore, this article uses the available literature and the authors' experience to address these issues and discuss possible strategies that researchers may find helpful when gathering qualitative data.

Background

Data saturation is reached when everything that is known or understood about the phenomenon being studied has been captured, suggesting no further information is being revealed by the data (Corbin, 2021). As an essential component of validity for qualitative research and a criterion that satisfies the ontological and epistemological underpinnings of qualitative research, the idea of data saturation is deeply ingrained in some qualitative research logic (Braun and Clarke, 2021).

Despite the importance of QDS, the field is often neglected, partly because it is a complex concept to describe. Fusch and Ness (2015) argue that data saturation is reached when there is sufficient information to do a replication of the study, where further coding is no longer practical, and the ability to gather fresh information has been reached. Unfortunately, as study designs vary, there is no one-size-fits-all approach to achieving data saturation (Guest et al., 2006). However, there are several broad notions and principles that researchers agree upon, and these include the capacity to reproduce the study and the lack of fresh data, themes, or coding (Guest et al., 2006). Although these data saturation concepts and principles are useful guidelines, each study design will have a different approach to determining when and how to achieve these broad principles. According to some writers, such as Gray et al. (2016), selecting the right sample size to achieve data saturation requires taking into account the study's design, scope, topic, and data quality.

Operationalising data saturation

The literature discusses various types of QDS, including data saturation, theoretical saturation, code or thematic saturation, and meaning saturation. Each of them has its specific connotations, evaluation methods, and judgement criteria (Yang et al., 2022).

Data Saturation

Data saturation is defined as the stage in which further interviews or observations yield repetitive information without adding to the depth or breadth of existing findings (Guest et al., 2006). This is usually not about seeing the same pattern of data repeatedly; rather, it is about conceptualising comparisons of these incidents that produce various patterns of data and their attributes until no new attributes of the pattern appear (Thornberg and Charmaz, 2014). When their data gets repetitive, some researchers mistakenly think they have reached data saturation, leading to most researchers declaring and claiming to have reached saturation without offering any supporting evidence (Thornberg and Charmaz, 2014).

Thornberg and Charmaz (2014) distinguished between theoretical saturation and data saturation, which occurs when gathering new data no longer reveals novel theoretical insights or new characteristics of the generated grounded theory and its categories or concepts but instead yields a negative response to the question. Although theoretical saturation is sometimes mistaken for data saturation, (Glaser and Strauss, 1967) theoretical saturation is theory-bound, while data saturation is not.

Theoretical saturation

Theoretical saturation is the moment at which the dimensions and features of the ideas and conceptual relations chosen to portray the target event are fully defined and have captured its complexity and variance (Sandelowski, 2008). Researchers are required to answer the question: Are there any gaps in the grounded theory or in its categories? It is the most often cited form of QDS and pertains directly to the development of theory. It is the point at which the researcher does not need any additional data to develop the properties at which every category has fully established characteristics, including dimensions and variations (Glaser and Strauss, 1967, Corbin and Strauss, 2014). Glaser and Strauss (1967) described theoretical saturation as the moment at which the researcher does not need any additional data to develop the categories' properties.

The phrase 'theoretical saturation' as used by Glaser and Strauss relates directly to the development of theory and is most commonly used in grounded theory approaches (Guest et al., 2006). It is reached when all of the major variants of the phenomenon have been identified and included in the developing theory. In grounded theory, the researcher would purposefully look for significant variations of each concept in the theory until they were saturated (Guest et al., 2006).

Guest et al. (2006) argue that frequent use of the term 'theoretical saturation' has defused its meaning and made it ambiguous. The authors consequently decided to operationalise the term to mean that moment when additional data are gathered and analysed in the study but produce little or no change to codes generated (Guest et al., 2006). The term theoretical saturation is seldom employed in content

analysis and thematic analysis, as these analysis types are not theory-bound (Corbin, 2021). Glaser and Strauss (1967) argue that theoretical saturation is linked to theoretical sampling but has nothing to do with representative sampling. They contend that when grounded theorists search for further information during theoretical sampling but discover no novel attributes or traits of their categories, they have reached theoretical saturation.

Code saturation and meaning saturation

Data saturation can also be considered in terms of 'code saturation' and 'meaning saturation'. Code or thematic saturation is being able to outline the main areas adequately enough to establish a thorough grasp of the tangible concerns made explicit in the data, while meaning saturation is being able to illuminate conceptual elements of codes and more subtle conceptual concerns (Hennink et al., 2017).

Morse (1995) suggests that qualitative data saturation is an elastic concept; however, it is preferable that the same idea be independently expressed by multiple participants rather than relying on the frequency with which a single individual repeats it, as repetition by one participant can artificially inflate counts (Guest et al., 2006). This approach reflects code or thematic saturation, which is reached when the primary ideas or codes are adequately captured across participants and can be consistently identified in the data. At this stage, researchers are able to clearly demonstrate recurring phrases or concepts in the text and link them to specific data points, signifying that no substantially new codes are emerging.

Reaching code saturation depends on a variety of factors, including (1) the volume and complexity of data, (2) the experience and fatigue of the investigator, and (3) the number of analysts examining the data (Ryan and Bernard, 2003). It is also possible that rushing the data analysis could risk missing in-depth and important content that would generate a better understanding.

It is possible to achieve code saturation with a limited number of interviews, which provides an outline of the key areas necessary to establish a thorough grasp of explicit, tangible concerns in the data. However, to give depth, richness, and complexity to data that carries significant value for comprehending phenomena of interest, additional data and meaning saturation are typically required. Meaning saturation may require between 16 and 24 interviews (Hennink et al., 2017) to illuminate conceptual elements of codes and more subtle conceptual concerns, for which the researcher may need a lot more data to accomplish. It is necessary to have more information than just identifying codes because the question is not whether you heard it all, but rather if you understood it all (Hennink et al., 2017).

Data Saturation Points

One way that qualitative data saturation can be demonstrated is by constructing a saturation grid (Braun and Clarke, 2021). A saturation grid is used to compare data for clarity of data saturation during concept-driven or deductive logic analysis. Themes or main headings are listed vertically, and the questions asked are listed on the horizontal axis (Brod et al., 2009). A mark is then indicated under

each interview corresponding to a theme if that theme or major topic is found in an interview transcript. This is basically mapping the frequency of the theme within each transcript or interview.

Another way of confirming the data saturation point is by having another qualitative researcher conduct the coding (inter-coding) of the transcribed data to ensure data saturation (Brod et al., 2009). Inter-coding can be used to confirm data saturation in content analysis and is helpful for validation in thematic analysis (Graneheim and Lundman, 2004). Confirmability is used in both content analysis and thematic analysis. Arguably, codes can only be confirmed through content analysis, as validation may be difficult in this context. This is because in content analysis, researchers derive their themes above the literal content of transcripts; hence, it can be confirmed but may be difficult to validate.

The sample size to reach saturation should not be set uniformly, and it must be embedded in the specific research process. Given the inherent uncertainty around saturation, little oversampling may facilitate the attainment of data saturation (Yang et al., 2022). Based on data saturation types mentioned earlier, including inductive thematic saturation and a priori thematic saturation, as suggested by Saunders et al. (2018) occur at different points. Data saturation may occur in three stages when an inductive logic is applied. These stages include (1) on-site or initial data saturation, (2) intermediate or cognitive data saturation, and (3) final or conspicuous data saturation (Saunders et al., 2018, Yang et al., 2022). Qualitative researchers must pay attention in these stages, as data saturation points may happen differently for different qualitative designs.

There has been considerable disagreement about the perfect number of interviews needed to achieve QDS. Table 1 shows the varied suggestions that authors from the 20th and 21st centuries have offered in the literature – and that further confuse graduate students who use deductive logic to guide QDS. Whereas Ryan and Bernard (2000) argue that most ethnographic studies use between 30 to 60 interviews, Bertaux (1981) previously noted that 15 should be the least accepted sample size in qualitative descriptive studies. According to Morse (1994) classifications, a phenomenological study requires at least six participants, while ethnographies, grounded theory investigations, and ethnoscience studies require thirty to fifty people. In qualitative ethology, a study typically requires 100 to 200 units of the item. For Creswell and Poth (2016), between five and twenty-five interviews are recommended for a phenomenological study, whereas twenty to thirty are recommended for a grounded theory study. An author like Kuzel (1992) suggests that sample heterogeneity and research objectives should be pivotal, recommending six to eight data sources for homogeneous samples and twelve to twenty data sources for maximum variation.

Table 1: Suggestions in the literature about sample sizes

Author	Study type	Data collection method	Sample	
			min	max
Ryan and Bernard (2000)	Ethnography	Interviews	30	60
Bertaux (1981)	Qualitative study	Interviews	15	-
Morse (1994)	Phenomenology	Interviews	06	-
Morse (1994)	Ethnography	Interviews	30	50
Morse (1994)	Grounded theories	Interviews	30	50
Morse (1994)	Ethnoscience	Interviews	30	50
Morse (1994)	Qualitative ethology	Observation	100	200units

(Morse, 2000)	Qualitative studies	Interviews	6	-
Creswell and Poth (2016)	Phenomenology	Interviews	5	25
Creswell and Poth (2016)	Grounded theory	Interviews	20	30
(Gray et al., 2016)	Grounded theory	Interviews	22	-
Kuzel (1992)	Homogenous samples	Interviews	6	8
Kuzel (1992)	Heterogenous samples	Interviews	12	20
Brink and Van der Walt (2018)	Qualitative studies	Interviews	20	30
Constantinou et al. (2017)	Qualitative studies	Interviews	12	-
Guest et al. (2006)	Qualitative studies	Interviews	6	12
Hennink et al. (2017)	Qualitative studies	Code & meaning saturation	5	30
Hennink et al. (2019)	Qualitative studies	Focus groups	6	9
Coenen et al. (2012)	Qualitative studies	Focus group	5 groups	-
Guest et al. (2017)	Qualitative studies	Focus group	6 groups	-
Hennink and Kaiser (2022)	Qualitative studies	Interviews	9	17
Hennink and Kaiser (2022)	Qualitative studies	Focus groups	4	8
Laari and Duma (2023a)	Qualitative studies	Interviews	15	24
Laari and Duma (2023b)	Grounded theory	Interviews	24	30

Quality and quantity of data in data saturation

Some authors argue that when considering QDS, data should be best thought of in terms of 'richness and thickness' (Dibley, 2011), rather than sample size (Burmeister and Aitken, 2012). While rich data is seen as quality, multi-layered, complex, detailed, and nuanced, thick data is considered in terms of quantity. It is possible to have rich data but not a lot of it, or to have a lot of thick data but not rich. However, possessing both richness and thickness is crucial (Fusch and Ness, 2015). Saturation depends on the depth and redundancy of information rather than the resources expended; therefore, depleting resources alone does not guarantee data saturation. The richness of the data is just as important as the numbers (Burmeister and Aitken, 2012), as no new themes can emerge without new data or coding (O'reilly and Parker, 2013). Morse et al. (2014) contend that researchers interpret the concept of QDS differently, leading to inconsistent assessment and reporting. It is possible that one has reached data saturation if they have exhausted all new data or themes.

Challenges in achieving QDS

The 'shaman effect'

To enhance confidence in achieving data saturation, Bernard (2013) argues that interviewing people who would not normally be considered is sometimes necessary to prevent the shaman effect. The shaman effect is where participants with specialised information on a topic intentionally or inadvertently dominate or withhold some information because they consider the questioner as an authority (Bernard, 2013). When the shaman effect occurs, participants perceive the researcher as an authority or a special figure, which influences their ability to effectively communicate their views. The researchers should work to mitigate this effect by regularly reflecting on their roles, appearance, and authority. They should avoid acting as experts and use inclusive language, like 'I am here to learn from you,' to motivate participants to share their own personal views.

Gatekeepers

Gatekeepers are individuals or organisations with the power to grant or deny access to a research site. They protect the interests and privacy of participants and may sometimes influence who is accessible to the data collector. Care should be taken while approaching gatekeepers at the research site, who might prevent the data collectors from accessing important informants at the site (Holloway et al., 2010). They can impede complete data gathering, which may affect data saturation and inadvertently influence the quantity and quality of the data. The researcher should discuss the sampling strategies with the gatekeepers, who may facilitate access to all participants to select from without restrictions.

Unconscious bias

Novice researchers may inadvertently approach data collection under the assumption of complete objectivity, allowing their underlying worldviews to influence the research process. Such unacknowledged biases can hinder their ability to accurately identify the point of data saturation, where no new themes or insights emerge (Fusch and Ness, 2015). This unawareness poses a risk to the credibility and rigour of qualitative data collection. To mitigate these effects, the use of reflective journaling and the practice of reflexivity are recommended. Reflexivity involves the systematic monitoring of the researcher's own positionality, assumptions, and potential influence on data collection and interpretation, thereby enhancing the trustworthiness and transparency of the data collection process.

Participant fatigue

The more time researchers spend gathering data, the more likely it is they will achieve saturation (Mwita, 2022). However, lengthening data collection sessions can also affect the collected data's quality and relevance. This is because longer sessions can result in participants becoming fatigued and uninterested and thereby providing irrelevant answers to questions (Johnson et al., 2021). Consequently, the data collector requires training to acquire the right experiences and observational skills needed to collect sufficient data without unduly stressing participants through overly lengthy interactions.

Picking a threshold

Deciding on a saturation threshold before the start can be a challenge. Morse et al. (2014) contended that researchers interpret QDS differently, which leads to an overall inconsistency in assessment and reporting. Many researchers who use saturation as a criterion of data quality do not disclose how they determine the saturation threshold. While some researchers have tried, their approaches have differed depending on the investigation (Mwita, 2022). It can therefore be argued that clarification is needed about how one objectively attained a saturation threshold. Data saturation may be jeopardised if the right participants are not selected, although determining who is a relevant participant varies from study to study; deciding on the number to consider and stopping when attained is a challenge and may threaten the aim of data saturation.

Discussion

This paper suggests it is crucial to consider several often-overlooked stages during data collection to achieve data saturation, that is, when gathering data, when reviewing transcripts, and when conducting coding and data analysis. Hennink et al. (2017)'s examination of 25 in-depth interviews found code or analysis saturation was achieved at nine interviews, with few thematic issues identified. However, meaning saturation required 16 to 24 interviews. Code or analysis saturation, sometimes referred to as inductive thematic saturation (Saunders et al., 2018), may indicate when researchers have heard it all, but meaning saturation may be required to understand it all (Hennink et al., 2017). Similarly, Laari and Duma (2021, 2023b) obtained QDS from 15 participants but subsequently interviewed nine more people to achieve theoretical saturation and densify the categories for theory development. The additional samples suggest that saturation is not fixed and should not be predetermined; rather, conceiving data saturation using inductive logic should consider (1) on-site or initial data saturation, (2) intermediate or cognitive data saturation, and (3) final or conspicuous data saturation.

In one way, during data gathering, the initial data saturation may signal if the researcher is doing self-data gathering. This happens when the researcher notices more similar answers from the current participant to previous participants when prompts are not generating different answers. In another way, saturation may also occur during the reading and familiarisation of the transcripts. This is the intermediate, or cognitive data saturation, where the researcher begins to identify more similar answers from different participants as the researcher advances with the reading of the transcripts. While initial and cognitive data saturation serve as indicators, they don't represent actual data saturation. True and final saturation occurs when the researcher starts coding, reducing the data to meaningful bits to arrive at answers to the research objectives. Final and conspicuous data saturation occurs at this stage. Qualitative researchers should pay attention to these signalling stages to guide their QDS inductively if they are doing self-data gathering. Field notes would facilitate clear signs for inductive QDS.

Irrefutably, based on the literature sampled, deductive QDS should take into consideration the study design and the data-gathering methods used. The author suggests the following: Grounded theory studies should deductively consider 20-30; phenomenology, 6-15; ethnography, 30-60; and descriptive qualitative studies, 15-20. Whereas interviews may deductively propose 15 to 20 participants, focus group discussions may consider 6 to 9 groups to reach conspicuous data saturation. It is a well-established fact that a study without a predefined scope may appear difficult for a researcher to understand whether the collected data is sufficient or not, but relying only on predetermined numbers may limit the study from exploring new insights (Mwita, 2022). So, both inductive and deductive (abductive) logic are contextually beneficial and reliable choices in QDS.

Abduction is suggested, as this will give the researcher the ability and the freedom to move back and forth between both inductive and deductive logic for analysis to happen. The author concludes that although deductively using predetermined sample sizes is helpful, qualitative researchers should not be fixated on predetermined sample sizes, as this may be misleading in situations where the study context is altered, such as when using trained data collectors.

In Table 2, I propose the minimum and maximum number of interviews that researchers should consider depending on the research approach that is used. For focus group discussions, one may need six to nine groups to achieve the same results, whereas 15 to 20 interviews will suffice for descriptive qualitative studies.

Table 2. The author's suggested sample sizes for QDS

Qualitative study type	Sample	
	Min	Max
Ethnography	30	60
Grounded theory	20	30
Phenomenology	6	15
Descriptive qualitative study	15	20

Conclusion

Achieving quality qualitative data saturation (QDS) in qualitative research is a nuanced process that goes beyond simply collecting a certain number of views from participants. As the literature reveals, richness and thickness of data, not just sample size, are essential to ensure comprehensive understanding. Challenges such as the shaman effect, gatekeeping, unconscious bias, participant fatigue, and the ambiguity in determining saturation thresholds can undermine the integrity of data collection if not carefully managed.

This calls for a more flexible and layered approach to QDS, recognising that saturation can occur in stages, including initially during data collection, cognitively during transcript review, and finally during data coding. Researchers are encouraged to use field notes, reflexivity, and a context-sensitive sampling strategy when working with qualitative data. The proposed framework of combining inductive and deductive (abductive logic) allows for a dynamic process that adapts to the evolving nature of qualitative studies.

Ultimately, the key to achieving true QDS lies in balancing depth and breadth, remaining reflexive, and resisting over-reliance on predetermined numbers. Instead, researchers should strive for conceptual clarity, methodological flexibility, and ethical sensitivity, ensuring that the voices of participants are authentically represented and meaningfully analysed.

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