The Application of Abductive and Retroductive Inference for the Design and Analysis of Theory-Driven Sociological Research

by Samantha B. Meyer and Belinda Lunnay
Flinders University

Abstract

Abductive and retroductive inference are innovative tools of analysis which enable researchers to refine and redevelop social theory. This paper describes and demonstrates how to apply these tools to strengthen sociological theory-driven empirical research outputs. To illustrate how abductive and retroductive inference work for the benefit of enhanced qualitative analysis we present the findings of a qualitative study that investigated heart disease patients' trust in medical professionals (n=37). We outline the research process using a six-stage model developed by Danermark et al. (1997) that will guide researchers doing exploratory research in how to use abductive and retroductive inference in qualitative research design and analysis. A snapshot of the study findings are provided for illustration purposes. The reader will learn how the application of these under-utilized methodological tools provides a novel way of analyzing sociological research.

Introduction

1.1 Deductive inference is commonly used in the analysis of qualitative theory-driven research. However, we argue that applying solely deductive inference in qualitative data analyses may be limiting to researchers interested in theory development. For example, in theory-driven research, deductive analysis requires the researcher to compare data back to the initial theoretical framework. Data that are not part of the initial framework are often excluded from the analysis. We argue that abductive and retroductive inferences are complementary tools which allow for a more comprehensive analysis of theoretically-driven data. Similar to deduction, abduction and retroduction require the researcher to move between theory and data. However, data that are not in keeping with the initial theoretical framework become significant to the discussion of the findings. This paper will demonstrate how research outputs differ when using a purely deductive approach rather than a combination of analytical methods. It is recognised that in social research, some researchers do in fact use abductive and/or retroductive inference, albeit unconsciously, and investigate data that fall outside of the initial theoretical frame. However, this paper provides a 'how to' for researchers interested in strengthening the methodological design and analysis of theory-driven research.

1.2 The following section provides an overview of the methodological tools. To illustrate the utility of these tools, we present the design, findings and analysis of theory-driven sociological research. Empirical findings from a qualitative study investigating heart disease patients' trust in medical professionals (n=37) are used to illustrate these methodological tools in practice. The purpose of including these findings is to provide a 'how to' and 'for what gain' illustration of the abductive and retroductive approaches to qualitative analysis. We briefly discuss the methods of the above-mentioned empirical research as a case example. This includes a six-stage model for designing and guiding explanatory research (Danermark et al. 1997). We demonstrate that these under-utilised methodological tools produce novel insights about known phenomena and render more comprehensive theoretical explanations of events or experiences.

Abduction and Retroduction

2.1 In brief, abduction involves analysing data that fall outside of an initial theoretical frame or premise. Retroduction is a method of conceptualising which requires the researcher to identify the circumstances without which something (the concept) cannot exist. Used in conjunction, these forms of inference can lead to the formation of a new conceptual framework or theory (Danermark et al. 1997). Both abduction and retroduction are analytical tools used in critical realism (Danermark et al. 1997). Consequently, we feel that an outline of the components of abductive and retroductive inference necessitates a brief description of the critical realist philosophy (Archer 1995; Danermark et al. 2002; Reed 2008). Critical realism is anchored in the critique of positivist approaches to the social acquisition of knowledge. Critical realism is based on the premise that research centered on understanding human experiences should concentrate on human cultural norms, values, symbols, and social processes viewed from a subjective perspective. Contemporary critical realism is largely attributed to the ideas of British philosopher Roy Bhasker (1978:13) whose primary question for 'understanding reality' was 'what properties do societies and people possess that might make them possible objects for knowledge?' An ontological focus on what produces events (or in this case, experiences) rather than events per se is central because as critical realist researcher Margaret Archer (1995: 1) explains, critical realism views society as 'inseparable from its

human components because the very existence of society depends in some way upon our activities.' Central to critical realism is that the explanation of social phenomena is achieved through revealing the mechanisms that produce them (Archer 1995). When seeking to understand the experiences and behaviors of humans, uncovering the mechanisms that underlie such experiences and behaviors is required.

2.2 Revealing the multi-faceted causes of behavior is a complex aspect of research analysis that requires interpretative tools capable of unpacking the association between what people do, and the individual or structural factors encountered in their environment that shape behavioral responses. It is argued that deductive inference is limited in the guidance it provides on how we can gain knowledge about what makes events, lived experiences or phenomena possible (Danermark 2002). Deductive inference is beneficial for identifying findings and subsequent conclusions that follow from specific research premises. However, abductive and retroductive inference are complementary to deductive inference, moving the analysis of data beyond the original research premise. Both forms of analysis facilitate the emergence of knowledge that cannot be gained through deductive inference (Ayim 1974; Kapitan 1992). Habermas (1972: 113) explained these inferences in terms of 'thought operations' and therefore as 'different ways of reasoning and thinking in order to proceed from something to something else.'

2.3 Critical realists acknowledge that the perspectives of research participants are often fallible. We disagree with the notion that participants are fallible. While lay accounts often differ from sociological conceptualisations, it does not mean they are incorrect but rather, they offer potential for sociologists to understand and interpret lay accounts and unveil a distinction between the lay and sociological understandings; adding to the refinement of concepts and identifying the need for a more critical approach when analysing sociological research. Nonetheless, the underlying argument of critical realists is the importance of the analysis of lay accounts. This is largely based on the premise that the 'empirical' is the experience of the participant, and is distinguishable from the 'actual' and the 'real' (Bhaskar 1975). In contrast to the 'empirical', the 'actual' is defined as the events as they actually happened (not necessarily as they were experienced), and the 'real' are the generative mechanisms (structural and social contexts) that naturally exist (Angus et al. 2006). It is important for theory development to be able to separate the empirical from the actual and the real and it is the role of the researcher to do so, whilst being cognitive that in analysing lay accounts, there is potential for the analysis to be seen as sociological imperialism. This is not our intention and we sympathize with Schuetz (1943: 147) who suggests, 'What makes it possible for a social science to refer at all to events in the life world is the fact that the interpretation of any human act by the social scientist might be the same as that by the actor or by his partner.' To mitigate this, the research must use robust methodological tools when distinguishing between the actual and the real. We demonstrate the utility of two such robust tools: abduction and retroduction in providing a more rigorous form of analysis capable of distinguishing the actual from the real through 'understanding' the complex processes of research participants.

2.4 Prior to moving on to a discussion of the two forms of inference, it must be acknowledged that the originator of these two terms, Charlies S. Peirce (1839-1914), used them interchangeably (Chiasson 2005). Whilst we recognise Peirce's contribution to developing these terms, our discussion is based on modern accounts of these terms which recognise them as distinct. Our account of these terms, and practical application, clearly identifies their distinction for readers.

Abduction

2.5 Abductive inference was characterised by Peirce as being the basis of scientific inquiry, and one of the three fundamental modes of logical reasoning (in addition to induction and deduction) (Kapitan 1992). Habermas (1978) suggests that abduction is a mode of inference used to broaden knowledge and stimulate the research process. It is through abduction that new ideas are introduced. The crucial difference between abduction and deduction (Curry et al. 2009; McEvoy and Richards 2002; Popay and Williams 1996), is that abduction shows how something might be, whereas deduction proves that something must be a certain way (Habermas 1978). For example, when doing theory-driven research, the findings might or might not fit the mould of the theoretical frame. When using deductive inference, the theory is proved or disproved. However, findings that are outside of the initial theoretical premise may remain unanalysed. Fundamentally, abduction is a means of forming associations that enable the researcher to discern relations and connections that are not otherwise evident or obvious. This allows the researcher to formulate new ideas, think of something in a different context, and to 'see something else' (Danermark et al. 1997). The aim is to identify data that are beyond the initial theoretical premise.

2.6 Unlike abductive inference, deductive inference informs only discoveries that are part of a general or universal context or structure. For example, a researcher may test a theory that all patients trust doctors they are familiar with and find that based on participant responses, this is not the case and the theory is refuted. Abductive inference is required to discover circumstances and structures (the actual and the real) that are obscured in empirical data because abduction is not logically rigorous like deduction (Collins 1985) – hence, they are complementary. Following deductive analysis, the researcher looks to analyse knowledge that cannot be reduced to the empirical experience described by participants (Danermark et al. 1997). With regard to the above example, the researcher might look at the reasons why an individual does not trust, the language they use, and consider data that fall outside of the original theoretical premise. Abduction is a way of (re)interpreting data and used in conjunction with retroduction, often leads to the formation of a new conceptual framework or theory (Danermark et al. 1997). Retroduction is a way of conceptualising by identifying the circumstance without which something (e.g. trust) cannot exist. The utility of abduction and retroduction in the development of theory is demonstrated in the discussion section of this article.

2.7 We argue that abductive inference is fundamental to theory-driven research. The defining characteristic of theory-driven research, that it uses theory a priori (Montgomery et al. 1989), forms the basis of its perceived weaknesses. A central critique is that given the structured nature of the research, the researcher cannot logically identify the unintended artefacts of empirical data - the experiences of the participants are filtered through the theoretical lens (Coryn et al. 2010). The use of abductive inference enables researchers to address this critique by moving the analysis beyond the theoretical frame. Additionally, theory-driven researchers have been accused of conducting empirical research for the sole purpose of testing theory, rather than the empirical outcomes (Stufflebeam and Shinkfield 2007). The application of abductive inference assists the researcher to overcome this potential bias and to give theory-driven research greater transparency. The iterative process of analysis using this form of inference expands the initial theoretical assumptions and extends the research beyond a deductive analysis. The researcher further investigates the traditionally unexplored findings throughout data collection and analysis, revealing a more comprehensive understanding of the theoretical frame, while pursuing quality empirical outputs.

Retroduction

2.8 In his account of retroduction, Peirce noted that every new idea or concept which has led to progress is derived solely from retroduction (Ayim 1974). Retroductive inference is built on the premise that social reality consists of structures and internally related objects but that we can only attain knowledge of this social reality if we go beyond what is empirically observable by asking questions about and developing concepts that are fundamental to the phenomena under study. Danermark, et al. (1997) argue that in the social sciences, retroduction is a mode of inference that is essential. Retroduction is a means of knowing the conditions fundamental to the existence of phenomena.

2.9 Retroduction differs to deduction in that it is not 'logical'. In the analysis of research, retroductive inference will not move a researcher from a basic premise or hypothesis to a conclusion (Danermark et al. 1997). Moreover, unlike abductive inference, the researcher must bring assumptions to the research when employing retroductive inference. It is the a priori knowledge which allows the researcher to move beyond, and to begin to question and clarify the basic prerequisites or 'conditions' for a priori assumptions or theoretical frameworks. Danermark et al. (1997) suggest that the use of the term 'conditions' refers to the circumstance without which something cannot exist. For example, if we are interested in investigating a specific concept (X), we as researchers need to ask, what are the conditions under which X occurs? What makes X possible? In the case of the research presented in this paper, one moves beyond theories of trust, towards a more comprehensive understanding of the actual and real conditions under which patients' trust in practitioners occurs. Similar to abductive inference, one moves away from the theory. However, unlike abductive inference, the theoretical frame is the starting point at which retroductive inference can be employed.

2.10 Retroductive inference is often employed in social sciences research because it is, although not often defined, central to the analysis of social science research. "Social research, in simplest terms, involves a dialogue between ideas and evidence" (Ragin 1994: 55). The researcher moves between knowledge and observable events, recognizing that knowledge cannot be reduced to observable events. Evidently, the term retroduction is an instinctive mode of inference and it has been argued that all discoveries fall within the retroductive stage of inference (Ayim 1974). However, when writing about qualitative research methods, it is often difficult to explain the processes in how qualitative analysis is actually conducted. It is difficult to describe the process of developing an idea. Retroductive inference is a label which assists researchers in explaining their method of analysis. There are five strategies that can be used to facilitate the employment and description of retroductive inference, regardless of whether the research is in line with critical realism (Danermark et al. 1997): Counterfactual thinking, social and thought experiments, studies of pathological cases, studying of extreme cases, and comparative case studies.

Counterfactual thinking

2.11 In counterfactual thinking, we use our stored knowledge and experience of social reality to explore questions such as 'could one imagine X without Y'?

> If we consider presence and absence, the necessary and the contingent, the constitutive and the non-constitutive as opposites, we can say that counterfactual thinking is at the same time, dialectic, since in this reasoning we examine something in relation to its opposite (Danermark, Ekstrom et al. 1997:101).

2.12 The use of counterfactual thinking is central to social sciences research and is unavoidable in any field where researchers cannot perform controlled experiments (Tetlock and Belkin 1996). As researchers, we often have to consider how something may be if the situation were to be different, in the absence of a control. Individuals use counterfactual thinking on a daily basis when reflecting upon a decision they have made and how the outcome may have differed had they made an alternative choice (Coricelli and Rustichini 2010). Similarly, researchers must use counterfactual thinking when considering how the outcomes of their research might differ according to the conditions under which their investigation occurred. However, these processes are often difficult to explain. Counterfactual thinking requires the researcher to identify the constitutive factors under which concepts exist, and to differentiate between constitutive factors and accidental circumstances.

Social experiments and thought experiments

2.13 When using social and thought experiments, researchers are asked to imagine and work through the detailed implications of hypothetical worlds (Tetlock and Belkin 1996). Similar to counterfactual thinking, both methods aim to get researchers to identify the constitutive factors of everyday conversations. Unlike counterfactual thinking, social and thought experiments focus on constitutive social interactions and conversations.

Studying pathological circumstances and extreme cases

2.14 Studying pathological circumstances and extreme cases are methods which assist researchers in specifically identifying the conditions under which X is possible. There are conditions under which specific research interests are more obvious: 1. Those where the mechanisms are disturbed and conditions are challenged; 2. In extreme cases where mechanisms appear in an almost pure form (Danermark et al. 1997). The method used within this research was studying extreme cases. Extreme cases refers to the study of specific cases where the mechanisms under investigation exist in a "purer" form than usual (Danermark et al. 1997). For example, we can study trust in medical professionals in situations where risk is very high such as emergency or life threatening situations (an 'extreme' case) to understand the mechanisms that characterize trust (potentially in a 'purer' form). We can then examine and compare if the same mechanisms also characterize trust in medical professionals in low risk situations such as check-ups (a 'normal' pathological case). Studying extreme cases allows the researcher to learn about the conditions for the 'normal' area under investigation, by researching the extreme or manipulated (the abnormal).

Comparisons of different cases

2.15 In designing research that will utilize retroductive inference in the analysis, researchers may also consider using a method of data collection which entails comparing their case study to an additional case study and examining the differences. Danermark et al. (1997:105) describe:

> The researcher chooses to study a number of cases which are all assumed to manifest the structure she wishes to describe, but which are very different in other aspects. If the researcher wants to develop a theory of the ritual element in social interaction, she will preferably endeavour to compare several completely different interaction situations in order

to be able to discern the structure all these cases have in common.

In comparing different cases, the researcher can determine what (X) is, and the mechanisms that must be in place for it to occur, by identifying the different qualities and structures that are involved in different situations.

2.16 The above demonstrates five strategies that can be used to facilitate the employment of retroductive inference. Each can be combined in different ways depending on the nature of the research project (Danermark et al. 1997). The research presented in this article employed the studying of extreme cases and counterfactual thinking. These strategies are best demonstrated in the section on research design (stage 4) and more importantly, the discussion section of this article.

Demonstrating the Application of Abduction and Retroduction: Background to the Empirical Results

3.1 To illustrate how abductive and retroductive reasoning works for the benefit of enhanced qualitative analysis, we demonstrate with findings from a qualitative investigation of heart disease patients' trust in medical professionals. Critical realism as a methodology has been previously used in qualitative research regarding heart disease (Angus et al. 2007; Clark et al. 2007; Clark et al. 2008; Clark et al. 2011). Our research is distinct in that the guiding epistemology of this research is not critical realism but rather, constructivism (Crotty 1998). Constructivists argue that meaning is constructed by humans as they engage with the world they are interpreting; meaning is not discovered but constructed (Crotty 1998). The focus is on the manner in which researchers constitute theories in the act of describing them (Mir and Watson 2001). Mir and Watson (2001: 1169) quote the following to capture this distinction:
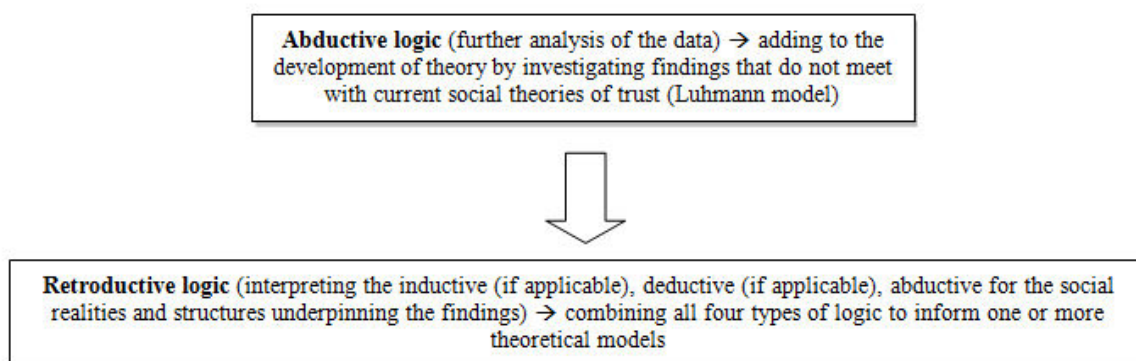
> While critical realists indeed focus on the contingent relationships between phenomena and structures, they still subscribe to the realist notion that the inherent order of things is 'mind-independent' (Tsang and Kwan 1999: 761). On the other hand, constructivists attribute structures not to a mind-independent reality, but rather to the generative (and therefore constructive) act of researchers and theorists (Latour and Woolgar 1989).

While this research is constructivist, we have employed abductive and retroductive inference because we recognise their utility as comprehensive tools that are both rarely mentioned in social research (Danermark et al. 1997).

3.2 Trust may be seen as "the mutual confidence that no party to an exchange will exploit the other's vulnerability" (Sabel 1993: 1133), with the *truster* being required to 'accept the risks associated with the type and depth of the interdependence inherent in a given relationship' (Shepard and Sherman 1998: 423). The research presented was driven by a critical analysis of Niklas Luhmann's social theories of trust (Meyer et al. 2008). This initial critical analysis formed the basis of the inquiry into heart disease patients' trust in medical professionals. In brief, Luhmann addresses the concept of trust in terms of its function in society (Luhmann 1988). He argues that trust occurs in situations of familiarity (but not complete knowledge), and is the glue that holds everything together in social life because it reduces the complexity of how individuals think about the world around them, providing them with the capability to actively make decisions (Pearson et al. 2005). The decision to place (dis)trust reduces complexity in society because both decisions function as ways to pursue individual actions rationally (Luhmann 1979). Luhmann argues that if there is no risk considered, there is confidence or expectation rather than trust (Luhmann 2005). The awareness of risk is what moves an individual's decision from the assumption of confidence to one where trust is required (Luhmann 1988). Additionally, Luhmann argues that trust is a reflexive choice – one makes a conscious choice to trust and accept the associated risks of trusting. As such, *risk* and *choice,* from a Luhmannian perspective are defining characteristics of, and necessary preconditions for, trust.

3.3 Luhmann never tested his theories empirically and as a means of further investigating the role of risk in trust, the research presented in this article examined the nature of heart disease patients' trust; specifically how the riskiness of their heart disease impacted their choice to trust in medical professionals. As this article will demonstrate, analyzing the role of risk using abductive and retroductive inference is beneficial for making and generating novel analytical thought (Figure 1); in this case, by suggesting a distinction between the concepts of trust and dependence. Before we do this however, a brief[1] outline of the empirical methods and findings we used in this case study is provided to delineate the application of abductive and retroductive inference and show readers how these analytical tools might be used.

Figure 1. Depicting the application of the two lines of inquiry; abduction, retroduction

Abductive logic (further analysis of the data) → adding to the development of theory by investigating findings that do not meet with current social theories of trust (Luhmann model)

Retroductive logic (interpreting the inductive (if applicable), deductive (if applicable), abductive for the social realities and structures underpinning the findings) → combining all four types of logic to inform one or more theoretical models

Research Design and Methods

The Research Design

4.1 Danermark et al. (1997) outline a six-stage model for explanatory research which was utilized in the design of this research. Below we outline how each of these six stages has been used to inform the study design and consequently, drive the research method (in-depth exploratory interviews).

4.2 *Stage 1: Description.* An explanatory social science analysis usually starts in the actual or real, and researchers identify the event or situation they intend to empirically research. An important part of the description stage of the study is to acknowledge the role of the researcher in describing, and consequently, designing the research and interpreting the findings (Danermark et al. 1997). In line with constructivism (Crotty 1998), the description stage involved acknowledging the assumptions that the researchers brought to this research. Sociologists must be reflexive and consequently aware of the effects their position and prejudices have on the interpretation of the research material. Although this research is theory-driven, we acknowledge that the preconceptions of the researcher do inevitably have a place in the formulation of the theoretical frame and hence, the research design. For example, SBM collected the data for this research. SBM's previous experiences with the medical system and prior critical analysis of the notion of trust shaped the lens through which the data were analysed (Bourdieu 1990). To mitigate this, we employed a technique referred to as 'bracketing' which is used to ameliorate some of the potentially deleterious effects of the preconceptions of the researcher that might be seen to taint the research process (Tufford 2012). Additionally, it must be acknowledged that the dynamic way in which SBM interacted with the research participants and interpreted the data, is a reflection of SBM as the researcher (Bourdieu 1990). For example, given the subjectivity present in the analysis of qualitative research, it cannot be overlooked that in adding to, or redeveloping social theories of trust based on empirical observations, aspects of the social world that are not subjected to empirical falsification might be taken for granted by the researcher (May 2001) – in critical realist terms, the actual and the real.

4.3 There is a pragmatic point that needs to be considered; we often assume that the theories we derive from the social world are independent of our preconceptions based on our values. It is for this reason that, throughout this research, the claim is not made that social theories of trust are falsified by the empirical evidence. Rather, within this research abductive and retroductive inference provided a means of identifying distinctions between trust and other concepts such as dependence. Kuhn (1996: 10) argues that theories are not falsified but become the subject of continuous research and that evidence which does not support theories should be regarded as only a temporary problem towards which future research is directed: 'Normal science means research firmly based upon one or more past scientific achievements, achievements that some particular scientific community acknowledges for a time as supplying the foundation for its further practice' (Kuhn 1996). The theory is never falsified because there will always be evidence that both supports and refutes it (May 2001). As Kuhn (1983: 564) argues choosing a theory to explain scientific findings should not be seen as a "puzzle-findings enterprise" – it is irrational to explain scientific findings using a theory that best fits the data (Kuhn 1983). The process of description guides the researcher to acknowledge their role in the design and analysis of empirical research.

4.4 *Stage 2: Analytical resolution.* In stage two, the phenomenon (trust) was deconstructed by distinguishing the components of trust. We identified the components by critiquing theory and isolating specific areas of interest to be used for theoretical inquiry (risk) (Meyer *et al.* 2008). The qualitative methodology was employed to investigate specific components of the social theories of trust and relevant critiques.

4.5 Interviews (n=37) were conducted between October 2008 and September 2009. Ethics approval to conduct this research was granted by the Social and Behavioural Research Ethics Committee. Individual semi-structured interviews were chosen to encourage participants to disclose information regarding their relationships with doctors and engage in open discussion. Interviews were conducted in participants' homes or at locations of their choice (e.g., two interviews took place at a shopping mall, one at a café and another over a picnic).

4.6 The interview guide consisted of 32 open-ended questions but the interviewer SBM probed based on responses. Each interview question was developed based on Luhmann's theories of trust. The content of the questions was specifically in relation to participants trust in doctors and the medical system. After ensuring that each of the questions served the purpose of either investigating aspects of the theory or would be used to build rapport, the interview guide was piloted. After the pilot the order of the questions was altered slightly, as was the wording. Interview lengths varied from 30 minutes to 2 hours depending on the nature of the participant and on the inter-subjectivity in the interview context.

4.7 All respondents were asked identical questions in the same sequence. The interviewer probed based on responses (Guest *et al.* 2006). The interview questions specifically asked participants about their level of trust in doctors and the medical system, which has obvious implications for the use of the word 'trust' in participants' responses. However, the researchers' reflexive acknowledgement of this was taken into account when analysing the data by employing abductive inference which is evident in the discussions below.

4.8 *Stage 3: Abduction/theoretical redescription.* The third stage involves abductive inference, a means of interpreting and redescribing different components/aspects from hypothetical frameworks and theories. As noted above, Luhmann did not test his theories empirically which presented a gap for critique and empirical exploration (Meyer et al. 2008). Within this research, alternative theoretical models were compared and integrated with Luhmann's model, thus shaping the research design, by studying his original ideas and relevant critiques (Alexander 1996; Lupton 1997). As a result, relevant critiques were integrated as part of the interview guide in addition to components of Luhmann's theories (as noted above, risk). For example, with regards to this research Lupton argues that not all individuals have the capacity to question medical advice (also known as stratified reflexivity (Ward 2006)) and that reflexive trust differs across socioeconomic status (SES). Although for the purpose of this article we do not discuss differential findings according to SES, in addition to theoretical sample (discussed below) we expanded our initial sampling strategy to include a range of SES participants to further explore Lupton's critiques which involved theoretical redescription.

4.9 *Stage 4: Retroduction.* The process of retroduction was undertaken using extreme case sampling. An intrinsic case study (Stake 2003) with heart disease patients was undertaken to investigate social theories of trust. Whilst the case study was of value because it highlighted important components of doctor–patient (dis)trust, theoretical development was the focus. Conducting a case study with a group of participants who were confronted with situations where they chose to (dis)trust provided a means of investigating the factors affecting trust at a conceptual level. This approach to sampling may also be understood as theoretical sampling (Layder 1998) because the sampling strategy was designed to specifically investigate aspects of Luhmann's social theories of trust and relevant critics.

4.10 Participants were sampled from 33 different postcodes around Adelaide, Australia. As the aim was to add to the refinement of Luhmann's conceptualisation of trust, the sampling strategy was designed to investigate risk and choice. As such, participants were sampled based on the level of risk inherent in their CHD. Participants who had been prescribed a statin (a medication used to lower cholesterol for the prevention of CHD) were identified as lower risk, and participants who had experienced some form of cardiac event (heart attack or heart surgery) were identified as higher risk.

4.11 As noted above, participants were also sampled on the basis of SES. Individuals were identified as lower SES if they had an annual household income of less than $30,000 (Australian dollars). In situations where income was not stated by participants, education and IRSD (Index of Relative Socioeconomic Disadvantage) were used to estimate SES. Participants with high school education living in disadvantaged areas were identified as lower SES in relation to participants in more advantaged areas with TAFE (Training and Further Education) or university education.

4.12 Extreme case sampling allowed the researches to specifically target aspects of the theoretical frame under investigation. Participants were recruited through South Australian cardiac rehabilitation programs and general practitioner surgeries. Additional participants were recruited via snowballing in cases where participants referred their friends or family to the study. Potential participants were given an information sheet, a letter of introduction, consent form, and a demographic survey. No financial incentives were offered for participation in the study. Participant demographics are available in Table 1.

Table 1: Participant demographics

	Age (years)	Sex (Male/Female)	Level of CHD risk (Higher/Lower)	SES (Higher/Lower)
M1	68	M	H	L
F1	65	F	L	H
F2	57	F	L	H
F3	73	F	L	L
M2	77	M	L	L
M3	66	M	L	H
F4	66	F	L	H
F5	72	F	H	H
M4	80	M	H	H
F6	76	F	L	H
M5	65	M	H	H
M6	69	M	H	H
F7	62	F	H	H
F8	71	F	H	L
M7	50	M	L	L
M8	58	M	H	L
M9	61	M	H	H
F9	72	F	L	L
F10	73	F	H	L
M10	75	M	L	L
F11	77	F	L	L
M11	76	M	L	L
F12	73	F	L	L
F13	82	F	L	L
M12	52	M	L	H
M12	52	M	L	H
M13	45	M	L	L
M14	52	M	L	H
M15	76	M	L	H
F14	32	F	H	H
F15	73	F	H	L
M16	60	M	H	H
M17	68	M	H	H
M18	74	M	H	L
M19	65	M	H	H
M20	62	M	H	L
M21	61	M	H	H
M22	69	M	H	L
	Mean: 66 Median: 68	22Male/15Female	18Lower/19Higher	18Lower/19Higher

4.13 *Stage 5: Comparisons between different theories and abstractions.* Abductive and retroductive inference allow for the elaboration and estimation of the explanatory power of a given theory in the analysis of data. This could mean concluding that one theory, unlike competing theories, describes the necessary conditions for the phenomena under study (trust). In other cases, the theories might be seen as complementary. Deduction was used to identify data that were in fitting with the initial theoretical frame. However, abductive and retroductive inference were employed via an iterative process of coding. The coding system was initially derived from a priori theoretical critiques and knowledge of the literature on patient trust (Meyer *et al.* 2008) and evolved throughout the analysis. The acknowledgement in this approach, which is in line with abduction and retroduction, is that all observations and interpretations are theory-laden, rejecting the notion that data speak for themselves (Layder 1998). The analysis was conducted using pre-coding (or provisional coding) and memo-writing (Layder 1998).

4.14 Pre-coding is an iterative process that involved highlighting or pulling out words or sections of text

that appeared significant, despite the fact that some segments of data did not trigger an association with theory. We argue that pre-coding employs abductive inference because it allows researchers to identify findings external to the original theoretical lens for further exploration and interpretation of the data (beyond the original theoretical premises). Pre-coding "may give rise to provisional codes which are subsequently firmed up and 'validated' by ongoing data collection and analysis and may eventually be adopted as core codes and categories" (Layer 1998: 55). In this sense, emerging data that is not in keeping with the original theoretical frame is not overlooked – the theoretical frame is fluid, rather than rigid. Within this research many of the findings did not fit within Luhmann's social theory of trust. For example, Luhmann argues that 'choice' is an element of trust and as discussed below, when participants said they had 'no choice' but to trust, abductive inference provided a means of thinking beyond theory. Rather than interpreting participants' comments as being something other than trust (according to Luhmann), more consideration was given to the lay use of the word trust – does it differ to academic conceptualisations? In this sense, rather than refuting the theory, a more nuanced analysis of the findings presented an alternative theory. Lay conceptualisations may differ to sociological conceptualisations of trust. Abductive inference was essential for the emergence of this finding. Additionally, the use of abductive inference in the iterative process of pre-coding led us to further explore what participant 'trust' may be understood as theoretically. The process of identifying the notion of dependence began using abductive inference but was further explored using retroduction during memo-writing.

4.15 Memo-writing requires the researcher to write notes to themselves, asking questions, identifying problems and suggesting connections about how the data has revealed concepts or categories via coding: 'Memo-writing therefore is meant to generate discussion and self-dialogue which fashions a conjunction between theoretical reflection and the practical issues surrounding data collection and analysis' (Layer 1998: 59)[2]. The process of memo-writing involves retroductive inference, and specifically, counterfactual thinking. Counterfactual thinking is a means of trying to understanding the conditions under which something occurs, and requires the researcher to reflect on and question their interpretation of the data, identifying how concepts emerged in a practical setting (beyond classical theory). According to Luhmann, the preconditions for trust are risk and choice – in the absence of choice, trust cannot exist. What exists in the absence of choice but the presence of risk in a medical situation? Asking these questions using retroductive inference led us to theorize that these conditions created a situation of dependence. Upon this discovery, we went back to the empirical and theoretical literature, to further refine and interpret the findings (Meyer and Ward 2009, forthcoming). This is discussed in greater detail in the discussion section of this article.

4.16 *Stage 6: Concretisation and contextualisation.* The importance of collecting data under specific conditions was stressed in this research. The aim was to interpret the meanings of certain mechanisms of trust as they came into view in a certain context. For example, trust in situations of risk. This is a means of contributing to *explanations* of concrete events and processes. Using this extreme case allowed for the discovery of the structural conditions of trust. However, the context in which the research is conducted is important to the analysis of the research. It is for this reason that we suggest that the research findings cannot be generalised but need to be further explored in different clinical settings. This stage is also important because it guides the researcher to distinguish between structural conditions and accidental circumstances. For example, a person with heart disease might have trust in any doctor in an emergency situation, which might suggest that risk plays a substantial role in trust. However, it is imperative that the researcher further examines the findings because the data might suggest that this specific participant has generalised trust in all doctors, no matter what the risk. In this case, it might not be risk that influences trust.

Findings and Discussion

5.1 The data presented herein are given only to provide a snapshot of findings useful for demonstrating the benefits of abductive and retroductive inference.

Abduction

5.2 Addressing participants' use of the word trust demonstrates the usefulness of abduction. As noted above, fundamentally abduction differs from deduction in that it builds on creativity and imagination as a means of forming associations that enable the researcher to discern relations and connections that are not evident or obvious (Habermas 1978). In the case of the research presented in this article, many of the findings fitted the mould of Luhmann's social theories of trust. The findings did, or did not prove to be trust based on Luhmann's conceptualisation. However, taking the analysis a step further and making abductive inferences revealed a previously unexplored distinction between trust and dependence. When asked about their trust in specific healthcare professionals, namely their GP and other doctors they receive information from regarding their heart disease, the notion of dependence (interpreted in this study from a sociological standpoint) emerged. This was particularly so when participants spoke of situations where they felt they had no choice but to trust doctors. For example, M2 said that you have to trust doctors because:

> They're [doctors] the ones that have the knowledge and they're the ones that are in control of medicines and things like that. Where else are you going to go? I mean, you just have to do that. You've gotta have trust in – there are some people you know you've gotta have trust in.

5.3 Similarly, F11 also discussed her lack of choice in trusting doctors in emergency medical situations:

> You haven't got any choice [to trust] though because I mean, you know, you're given a pre-med while you're in bed. Somebody wheels you down and then when you open your eyes you're back in your bed and for all you know, the bloke sweeping the floor could have done the thing. You don't know (F11).

5.4 F11's response does not indicate she necessarily trusts the doctor who is performing the operation but rather, suggests that she has no agency or control in emergency situations. Her comment indicates that she recognises the level of vulnerability inherent in trusting but nonetheless, still places trust regardless of this vulnerability. Whilst she might indeed be trusting, her comment might also be interpreted as one which suggests that in times of vulnerability, some patients cannot afford to 'choose' to distrust and request a second opinion, they 'have' to 'trust'.

5.5 Luhmann's conceptualisation suggests that trust requires an element of choice and hence, the comment that participants had "no choice but to trust" cannot be interpreted as trust. This finding was consistent across many of the participants who used the word 'trust' in the absence of what Luhmann would argue, is a precursor for trust, choice. The employment of abductive inference is evident in the analysis of the participant responses provided above. These findings do not mean that Luhmann's theory

of trust is false. The findings produce a new frame from which to view or interpret trust: 'The conclusion provides new insight as an outcome of our interpreting or explaining something' (Danermark, *et al.*, 1997: 90). If we were to use solely deductive inference and analyse the 'empirical', the theory would have been refuted – choice is *not* necessary for a patient to trust. However, the use of abductive inference led us to question whether patients are in fact trusting in situations of no choice. Two conclusions can be drawn: 1. Lay individuals may conceptualise trust differently than sociologists; 2. Luhmann's theory is not incorrect but rather, the concept to which participants are referring is not trust. Our reinterpretation (along with the use of retroductive inference) led us to develop a preliminary theory of dependence (Figure 2). The findings suggest that a lack of 'choice' in trust may play an influential role in patient dependence (Meyer and Ward 2009, forthcoming). Although the theory of dependence is in need of further investigation, it remains a useful framework for future applied research and would not have been identified in the absence of abductive inference.
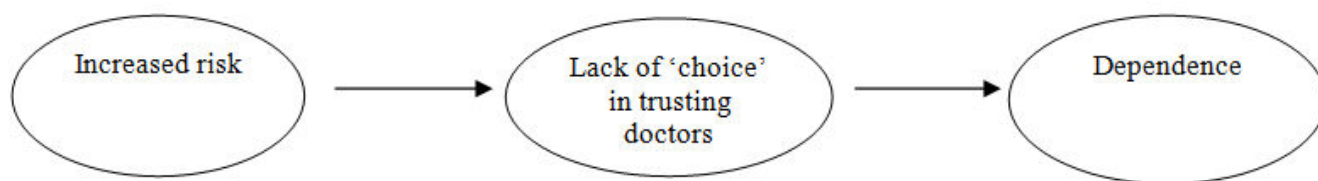
Figure 2. A model of dependence

5.6 Figure 2 is a preliminary model of dependence that is in need of more investigation. Whilst suggesting this distinction, we remain conscious of Scheutz's (1943: 149) postulate of adequacy whereby he suggests that the "construction of the scientific world is not an arbitrary act of the scientist which he can perform at his own discretion" and that the 'typical construction [of the scientific world needs to] be compatible with the totality of both our daily life and our scientific experience.' That is, we must also be conscious of our role as the researcher in the interpretation of data, and also that of the participant and the forces that shape their descriptions. This is facilitated by stage one of the research design whereby we reflect on our role in the analysis. In the case of this analysis, abductive inference has led us to also reflect on the use of the word 'choice' in lay accounts of trust. We recognise that participant descriptions may be inaccurate or that, contrary to Luhmann, trust can occur in situations of no choice, as is identified by other social theorists (Barbalet 2009). Deductive analysis led us to identify the findings that were in fitting with the theoretical framework – trust in situations of choice (Meyer and Ward 2009, forthcoming). Abductive analysis led us to identify findings outside of the theoretical frame – trust in situations of no choice. However, retroductive inference is required to reflexively question our analysis and subsequent construction of participants' use of the word trust, our theoretical interpretation, and to critically analyse the initial theoretical framework in daily life. As noted earlier, retroduction can be used to move beyond theories of trust, towards a more comprehensive understanding of the actual and real conditions under which patients' trust in practitioners occurs.

Retroduction

5.7 Retroduction is a means of seeking to clarify the basic prerequisites or conditions of social relationships, reasoning, knowledge, and people's action. In essence, retroduction is a form of analysis that provokes the researcher to identify the circumstance without which something cannot exist. Two strategies outlined by retroductive inference provide a means of investigating the prerequisites and conditions under which trust exists: counterfactual thinking and studying extreme cases.

5.8 *Counterfactual thinking.* Counterfactual thinking uses our stored knowledge and experience of social reality to explore questions such as 'could one imagine trust without X (e.g. risk)'? For example, with regards to investigating social theories of trust, Luhmann would argue that in order for trust to exist, there needs to be an element of risk involved (Luhmann 2005). In this case, the fundamental element of retroduction is trying to attain knowledge about what internal relations make X (trust) what it is. What makes trust possible? What properties must exist for trust to exist and be what trust is? A way of answering these questions is to address the fundamental conditions or structures involved in trust. What are the concrete and transcendental preconditions for trust? Without the use of retroductive inference, we would not have recognised the potential for a distinction between trust and dependence. The amount of risk evident in a patients' medical condition has an impact on their perception of whether or not they can choose to (dis)trust. The absence of "choice" from a Luhmannian perspective would negate trust. Using retroductive inference, we continued our analysis to try to understand what X is in the presence of risk, but the absence of choice – this led us to make the argument that from a social science perspective, patients in situations of no choice are dependent rather than trusting (Meyer and Ward 2009, forthcoming). For example, F4 said that if she was sick enough she: '. . . wouldn't care who [what doctor] it was as long as they could help' and that she would not have a choice when she needed immediate medical advice. She is suggesting that in situations of high risk, the capacity to reflexively trust might be removed. Regardless of (dis)trust, dependence is the outcome.

5.9 F7 noted that as the level of risk and vulnerability decrease, patients become more reflexive and less dependent:

> In an emergency, in the initial stages which has just happened to me I do whatever they say because I'm scared, I'm you know, I'm vulnerable and all the rest of it. When you just start getting over that as it happened to me, then you start 'hey hang on!'

5.10 F7 is suggesting that as the level of risk decreases, patients' reflexive capacity to 'choose' increases. Her comment suggests that the level of risk inherent in a medical situation ultimately impacts whether or not the patient trusts and/or is dependent. By using counterfactual thinking, we were able to ask the question 'how much risk is needed for trust to occur and at what point are the risks so high that dependence is the outcome?'

5.11 In application to this research, Danermark, et al. (1997: 101) might suggest:

> If we consider presence and absence [of choice], the necessary and the contingent, the constitutive and the non-constitutive as opposites [trust and dependence], we can say that counterfactual thinking is at the same time, dialectic, since in this reasoning we examine something in relation to its opposite.

Although one might suggest that trust and dependence are not in essence, opposites (Barbalet 2009), this quote still provides insight suggesting that if we can differentiate between two similar concepts, we can more easily identify these concepts in empirical research.

5.12 *Studying extreme cases.* In order to answer questions regarding the nature of trust we can study various cases where the preconditions for trust appear more clearly than in other cases. It is for this reason that patients with heart disease were chosen as a vehicle for theoretical investigation. To investigate trust, cases where (dis)trust occurs were required for examination. Given the inherent risk involved in heart disease, Luhmann would argue that situations of (dis)trust would occur because risk has substantial influence over an individual's decision to trust (Meyer *et al.* 2008). Danermark et al., (1997) among others (Tetlock and Belkin 1996), argue that there are two cases where the preconditions of X [trust] will appear much more clearly, one of which is extreme cases where mechanisms appear in an almost pure form. Carrying out this as a social experiment involves challenging the conditions of normality. For example, in researching people who have heart disease, certain mechanisms have been removed to provoke others to appear – that is, we specifically chose to interview people who have been in emergency situations, as well as individuals who only have experiences with doctors in routine medical visits. It has been argued that within routine medical appointments, "the 'information rich' may have the means to investigate alternative therapies or seek forms of self healing when they mistrust their physician" (Meyer *et al.* 2008: 183). However, in situations of risk (when people with heart disease present at hospital in emergency situations), conditions for seeking alternative forms of help are challenged and this choice may be removed. Controlling the conditions under which people have been faced with the decision to (dis)trust allowed for the observation of cases where the preconditions for trust might differ between higher or lower risk situations. The selected case study presented suggests that patients' medical risks might define whether patients trust or are dependent. Thus, retroductive inference permitted a better understanding of hidden structures and mechanisms.

5.13 Retroductive analysis also requires the researcher to consider the use of the word trust in everyday contexts. While the meaning of the word 'trust' in lay accounts may at times be regarded by sociologists as something other than trust, we must also recognise that lay conceptualisations of trust in everyday contexts may differ. Hardin (2001: 55) refers to differential lay uses of the word (e.g. trust in the absence of choice) as 'conceptual slippages'. It may be that in the everyday context, trust does not require choice. However, as social scientists we recognise that in the research context, our analysis and interpretation must remain consistent. Resultantly, we recognise that the use of the word 'choice' in lay accounts of trust is in need of further exploration.

Conclusion

6.1 Employing abductive and retroductive inference in the process of analysis makes it possible to explain events and the social processes that cause events. As outlined by Danermark et al. (2002: 74) this includes describing and conceptualizing the properties and mechanisms that make an 'event' happen, and then, describing how different mechanisms are apparent under different conditions. Re-description and re-contextualization, key features of abduction, give new meaning to already known phenomena and help social scientists to understand previously taken-for-granted phenomena in a novel way. The different and creative ways of relating research phenomena to new frames of reference, possible through abduction and retroduction, enables the researcher to make connections and form new ideas about something that is previously known but can be *identified* or *understood* in a different context. This expansion of knowledge is fundamental to progress in sociological research methodologies and theory.

6.2 The use of abductive and retroductive inference is beneficial for the interpretation of qualitative data, providing a more nuanced analysis than solely deductive inference permits. As this article has demonstrated, the use of these underexplored forms of inference is beneficial for theory development, and for identifying findings that may remain unanalyzed in the absence of these forms of inference. The methods of abduction and retroduction may also be used to extend the analysis of research that is not theory driven and may add clarity to methods of analysis. For example, many researchers in the social sciences use methods of analysis borrowed from grounded theory. A criticism of constant comparative analysis is that researchers employing this method of analysis are often vague in their account of the analysis (Boeije 2002). In this way, the extension of the analysis which employs abductive and retroductive logic may be used for explanatory purposes.

6.3 The tools borrowed from critical realism have not been applied previously to research investigating social theories of trust. This article provides evidence of the benefits of these forms of inference, and outlines a six-stage model for designing qualitative sociological research for academics interested in further exploring these tools. This article provides a detailed account of how abductive and retroductive tools are applicable in social research. Additionally, we highlight benefits of the application of this tool in terms of theory refinement, novel ways of analysing data, detailing previously uncultivated insight, and potential for generating new theories.

Notes

[1]The empirical findings of this research serve the purpose of demonstrating the use and utility of abductive and retroductive inference in qualitative analysis. As such, the methods and findings sections are minimal and the researcher can be contacted for additional publications of these findings.

[2]For a more detailed account of Layder's methods of analysis, see Layder (1998) Chapter 3.

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