Advancing Complexity Theory as a Qualitative Research Methodology

Claire Gear[1] , Elizabeth Eppel[2], and Jane Koziol-Mclain[1]

Abstract

Although complexity theory is increasingly used to explain and understand complex health-system behavior, little is known about utilizing complexity theory to augment qualitative research methods. We advance this field by describing our use of complexity theory as a qualitative research methodology to explore sustainable health-care responses to intimate partner violence. We outline how complexity theory shaped our theoretical perspective, conceptualization of the research problem, and selection of methodology and methods. We show how a research methodology informed by complexity theory can capture new insights into complex problems, advancing the application of complexity theory and qualitative research design.

Keywords

complexity theory, complex adaptive system, intimate partner violence, health care, methods in qualitative inquiry, discourse analysis

What Is Already Known?

Complexity theory is increasingly used to explain and understand complex health-system behavior, yet application within health-care research varies widely. Most often, a selection of complexity concepts is applied to guide a research approach or data interpretation.

What This Paper Adds?

We advance this field by considering the implications of utilizing complexity theory as a qualitative research methodology and present a possible framework for exploring and describing complex system behavior.

Introduction

Explicit use of theory in research aids understanding of how knowledge is generated, interpreted, and manipulated (Cheek, 2000; Thompson, Fazio, Kustra, Patrick, & Stanley, 2016). Deliberate selection and articulation of theoretical perspectives, methodologies, frameworks, models, methods, and outcomes is necessary to call attention to the dynamics which influence knowledge (Jordon, Lanham, Anderson, & McDaniel, 2010; C. M. Martin & Felix-Bortolotti, 2010). In health care research, assumptions about knowledge often go unacknowledged, triggering calls for improved theory application to support generalizable and robust findings (C. M. Martin

& Felix-Bortolotti, 2014; Thompson et al., 2016). Complexity theory is particularly useful in calling attention to influences on knowledge and is increasingly being used to explain and understand complex health care system behavior. However, current application of complexity theory within health-care research varies widely (Brainard & Hunter, 2016; Braithwaite et al., 2017; McDaniel, Driebe, & Lanham, 2013; Thompson et al., 2016). In this article, we explicate a complexity methodological approach to study the New Zealand (NZ) primary health system response to intimate partner violence (IPV), contributing an innovative perspective on an internationally persistent and complex problem.

Responding to IPV as a health issue is often referred to as a "wicked" or complex problem due to the entanglement of many different factors that sustain violence within families. Moreover, as these factors and possible solutions are continuously coevolving, there is an absence of a point at which IPV and its

[1] Centre for Interdisciplinary Trauma Research, Auckland University of Technology, Auckland, New Zealand
[2] School of Government, Victoria University of Wellington, Wellington, New Zealand

Corresponding Author:
Claire Gear, Centre for Interdisciplinary Trauma Research, Auckland University of Technology, Private Bag 92006, Auckland 1142, New Zealand.
Email: claire.gear@aut.ac.nz

effects "end" (Family Violence Death Review Committee, 2014; Young-Wolff, Kotz, & McCaw, 2016). Internationally, IPV is recognized as a public health problem of epidemic proportions due to the significant effects on health and well-being and consequent high health service utilization (Bonomi, Anderson, Rivara, & Thompson, 2009; Garcia-Moreno et al., 2015; World Health Organization, 2013). However, efforts to implement effective health system responses to IPV have proven challenging and little progress has been made on sustaining IPV responses within clinical practice (Garcia-Moreno et al., 2015; Young-Wolff et al., 2016). In NZ, complexity theory is being used to understand the behavior of the complex systems involved in responding to family violence (Gear, Eppel, & Koziol-Mclain, 2017). For example, the Family Violence Death Review Committee (2014) utilized complexity theory to alter the way we view the problem of family violence and inform a series of shifts to direct the family violence system toward improved service delivery.

We consider complexity theory a useful and critical heuristic to explore the complex problem of IPV. Yet, in reviewing the literature, examples of qualitative health care research which consistently applied or articulated the use of complexity theory across the research design were scarce. We advance this field by exploring the implications of applying complexity theory as a qualitative research methodology. As described by Grant and Giddings (2002), methodology guides a researcher's stance from the formation of the research question to the choice of methods. We share how our use of complexity theory shaped our theoretical perspective, our conceptualization of the research problem, and our selection of methodology and methods. In the discussion, we theorize the implications of complexity theory use for data analysis and reporting and discuss the strengths and limitations of complexity theory as a qualitative research methodology.

Complexity Theory

Complexity theory focuses on understanding the patterns of interaction between system elements at different levels and times, rather than analyzing individual elements in isolation (McDaniel & Driebe, 2001). Complexity theory provides numerous concepts which can be applied alongside diverse extant theoretical frameworks to view complex phenomena in different ways (Eppel, 2017; Tenbensel, 2015). This facilitates a transdisciplinary approach to research, allowing different bodies of knowledge to be blended to provide a wider understanding of complex problems (Gear et al., 2017; C. M. Martin & Felix-Bortolotti, 2014). For example, Best et al. (2016) combined a complexity lens with system dynamics mapping and realist evaluation to map interactions between system elements which enabled or constrained clinical guideline implementation and how these interactions affected outcomes. They found the use of a complexity lens important for identifying element interactions at different levels, facilitating a deeper understanding of the factors influencing large-scale change.

Table 1. Description of Common Complexity Theory Concepts.

Agent	A system element or part capable of responding to other agent actions and information. Responses may include learning and adaptation. The element may be an individual, collective, or process
Nonlinearity	A characteristic of agent interaction generated by unpredictable agent responses to the actions of others
Feedback loops	Recursive mechanisms arising from multiple agent interactions over time that either reinforce (positive) or undermine (negative) each other. Positive feedback loops support a change trajectory while negative feedback loops tend to undermine or negate change
Coevolution	An ongoing process in which agents are influenced by, and mutually adapt to, changes generated by agent interaction
Self-organization	The spontaneous emergence of new relationships, forms, or patterns of behavior arising from repeated agent interactions over time
Emergence	New system properties or levels of complex organization generated by agent self-organization
Boundaries	An artificial frame or socially constructed reference point which connects (not separates) a system with its environment. System fluidity means boundaries cannot be defined objectively
Far-from-equilibrium	A dynamic state in which complex systems maintain a stable appearance by balancing multiple interactions between diverse agents and feedback loops. Stability can be disproportionately disrupted by small changes
Path dependency	The influence of system history on current system behavior and events
Complex adaptive system	A type of system characterized by endogenous nonlinear dynamism generated by interaction between diverse agents which makes adaptation and spontaneous self-organization possible, but unpredictable

Source. Braithwaite et al. (2017); Cilliers (2001); Eppel (2017); McDaniel and Driebe (2001).

A recent scoping review of complexity theory identified 18 complexity concepts used in health services research (Thompson et al., 2016). Table 1 provides a description of the most commonly referenced complexity theory concepts, including self-organization, emergence, nonlinearity, feedback loops, and path dependency. Most often, a selection of these concepts has been applied as a framework to guide the research approach or data interpretation (Thompson et al., 2016). However, there is wide variation in complexity theory application and considerable conceptual stretch or fuzziness remains. Clear articulation of how complexity theory is applied in research design, conduct, and outcome evaluation is necessary to support future concept development and use (Brainard & Hunter, 2016; Braithwaite et al., 2017; Tenbensel, 2015; Thompson

Box 1. Examples of Complexity Theory-Informed Case Study Research.

Anderson, Crabtree, Steele, and McDaniel (2005) demonstrated how complexity theory can be used to extend case study methods and examine system elements not captured using traditional methods.

Booth, Zwar, and Harris (2013) applied a qualitative approach to case study collecting interview, document, and observation data to explore how chronic illness care changed over a decade in one general practice. Using pattern matching logic, they compared understandings of change between traditional implementation science discourse and a complexity-informed explanation. They found complexity theory better described how system agents participated in change over time.

Browne, Varcoe, Ford-Gilboe, Wathen, and Team (2015) designed a mixed methods multiple case study to explore the contextual factors which shaped the implementation, uptake, and impact of a complexity-informed intervention designed to increase equity-oriented care in primary health-care clinics. They expect their analysis to show what practice level changes and policy and funding contexts are needed to enhance equity-oriented care.

Felix-Bortolotti (2011) combined complexity theory and political economy to guide analysis of a policy case study on primary health-care workforce policy issues and ramifications. She found complexity theory helped to understand the forces which impinge on primary health care and why the sector has evolved in a fragmented way.

et al., 2016). Brainard and Hunter (2016) found some studies of complexity-informed public health interventions cited complexity concepts without "understanding or truly embracing" many aspects of complexity theory, thereby impeding an understanding of the effectiveness of a complexity theory approach (p. 8).

Qualitative research of complex systems has potential to capture and understand complex dynamics that might otherwise be unexplored (Clark, 2013; Fleiszer, Semenic, Ritchie, Richer, & Denis, 2015; McDaniel et al., 2013). The most common method for studying complexity has been case studies (Thompson et al., 2016). Box 1 shows how scholars have utilized complexity theory alongside case study methodology. The examples also demonstrate the transdisciplinary potential of complexity theory. A qualitative complexity approach has been useful in understanding complex emergent phenomena such as sustainability (Gear et al., 2017; Mohrman, Shani, & McCracken, 2012) or quality improvement (Ellis & Herbert, 2011; McDaniel & Driebe, 2001). Although complexity theory may be usefully applied to parts of the research design (as demonstrated in Box 1), we advance this field by considering the implications of utilizing complexity theory as a qualitative

research methodology to inform the full research design exploring what affects sustainable primary health-care responses to IPV.

The Theoretical Perspective

The choice of theoretical perspective shapes both the research design and the scope and level of knowledge which can be understood and described (Patton, 2002). A complexity approach specifically calls attention to the influence of the theoretical perspective as it naturally presents boundaries to alternative ways of knowing (Clark, 2013; Paterson, Baarts, Launsø, & Verhoef, 2009). For example, health care systems have been traditionally viewed as Newtonian and mechanistic aided by the use of research methods (such as randomized controlled trials [RCTs] which assume direct relationships between cause and effect) (McDaniel et al., 2013). However, scholars are recognizing that such methods obscure complexity arising from interactions between different health system elements (Gear et al., 2017). Complexity theory calls attention to these interactions and how they lead to spontaneous organization and the emergence of new relationship structures (McDaniel & Driebe, 2001; McDaniel et al., 2013; Thompson et al., 2016).

Consistent with the focus on interaction, we chose to position our approach within the poststructural paradigm. Poststructuralism focuses on how knowledge is constructed through interaction between concept and language (Cheek, 2000; Cilliers, 1998; Morcol, 2001). For example, a view of IPV as a health issue represents particular views about our health and how health care should be practiced (Cheek, 2000). This view of knowledge construction helps to theorize about dynamic interactions within complex systems. We can explore how interaction between different system elements influences what we accept to be real (Cilliers, 1998).

The poststructural rejection of an objective ontology maintains openness to interaction between both explored and unexplored elements of a complex system and their continuously shifting nature (Cheek, 2000; Cilliers, 1998, 2011). This perspective is especially useful for this study considering the continuously changing inputs, relationships, outcomes, and consequences involved in IPV (Brainard & Hunter, 2016; Family Violence Death Review Committee, 2014; Gear et al., 2017). While complexity theory has also been usefully applied using a realist approach (Byrne, Callaghan, & Winter, 2013), we rejected the search for a "reality" for being at odds with a continuously transforming health care system which generates uncertainty, surprise, and multiple possibilities (Begun & Kaissi, 2010). The poststructuralist perspective reminds us that knowledge of the future is always uncertain and multiple outcomes are possible (Begun & Kaissi, 2010; Cheek, 2000; Cilliers, 1998, 2011).

The Research Problem

Responding effectively and sustainably to IPV in health care has proven to be a persistent problem of particular complexity

internationally (Garcia-Moreno et al., 2015). Complexity theory provides the means to conceptualize the research problem as a complex adaptive system (CAS), focusing on the patterns of interactions between various system elements at different levels and times. Importantly, complexity theory helps to call attention to the influence of facets which are not as easily identifiable, such as the underlying ways we understand and approach each part of an intervention (Clark, 2013; Clark, Briffa, Thirsk, Neubeck, & Redfern, 2012).

CAS are made up of diverse agents capable of learning, adapting, and responding to changes generated through their interactions with other agents. An agent may be an individual, such as a victim or perpetrator of IPV, a collective, such as a health care organization, or a process, such as a particular intervention (McDaniel & Driebe, 2001). As agents interact, they mutually adapt in response to change generated. For example, the patient seeks help and the health professional provides a particular set of interventions and support. Over time, the repeated patterns of interaction between agents self-organize into new forms or behaviors; the patient may experience reduced violence and the health professional may increase in capability and confidence. Such self-organization may eventually generate the emergence of new system properties or structure, which constitute sustainable health system responses to IPV (Gear et al., 2017; McDaniel et al., 2013).

However, the nonlinear nature of the interactions between agents creates fundamental uncertainty about how things will unfold. Multiple outcomes are possible depending on how the agents interact and respond to change (Begun & Kaissi, 2010; Crabtree, 2010; Lanham et al., 2013). Small changes may lead to big effects when the initial change is reinforced by other agents and equally, big changes may have little or no effect when change is undone by other agents (McDaniel et al., 2013). Further, the heterogeneity of agents influences their ability to respond to change. Not all agents are the same, they hold both micro-diversities such as personal motivations and ideologies and macro-diversities such as professional discipline or organization, which will influence the interaction and outcomes (Boulton, Allen, & Bowman, 2015). This complexity means CAS are continuously changing but is resistant to prescribed change (Best et al., 2016; Booth, Zwar, & Harris, 2010). Applying complexity theory principles, we conceptualized a sustainable health care response to IPV to be when a care-seeker and health professional interact in a way which increases the likelihood of mutually positive outcomes (Gear et al., 2017).

Although we may never be able to accurately predict what will emerge from a CAS, we can continue to try to understand the different system parts and how they interact to learn more (Clark, 2013). To date, research has generally focused on demonstrating IPV intervention effectiveness using traditional scientific methods that seek to establish cause and effect (such as RCTs; Ambuel et al., 2013; MacMillan et al., 2009). Yet these studies have encountered difficulties in producing positive and consistent findings due to a lack of appreciation for context (Hamberger, Rhodes, & Brown, 2015). In contrast,

qualitative research has proved useful in identifying and exploring the complexity involved in responding to IPV as a health issue (Gear et al., 2017). For example, an Australian study which conducted in-depth interviews with 20 women 6 months after disclosing abuse found that the diversity of women's contexts in their trajectory of abuse, service use, statutory agency contact, prior disclosures, and screening impact challenged the idea that a single standard intervention would be able to provide help for all women to be safe from abuse (Spangaro, Zwi, & Poulos, 2011).

Qualitative research has also called attention to a wide range of intervention outcomes, illustrating the amount of context and complexity conventional outcome measures exclude. For example, Koziol-McLain, Giddings, Rameka, and Fyfe (2008) found asking about IPV could contribute to transforming communities, as women who were screened for IPV went back to their families, friends, and communities and passed along resource information. Spangaro, Zwi, and Poulos (2011) found resource information was used by women with their abuser as an indirect or direct way to name their behavior. In contrast, quantitative outcomes are often measured as an end point of a linear cause and effect and obscure the myriad of factors occurring between an intervention and a possible reduction in violence (O'Campo, Kirst, Tsamis, Chambers, & Ahmad, 2011; Spangaro et al., 2011; Thurston & Eisener, 2006; Tower, 2007).

Research design can also limit information on how health system responses can be integrated into practice sustainably (Decker et al., 2012; Hooker, Small, Humphreys, Hegarty, & Taft, 2015; O'Doherty, Taket, Valpied, & Hegarty, 2016). RCTs provide little implementation information as it occurs (O'Doherty et al., 2016), and research methodologies that account for the impact of contextual factors are scarce (Goicolea, Hurtig, San Sebastian, Marchal, & Vives-Cases, 2015). Increasingly, qualitative research is paying attention to "process information" such as the process of disclosing IPV (Goicolea, Hurtig, San Sebastian, Vives-Cases, & Marchal, 2015; Kelly, 2011), clinical system processes such as scheduling of appointments or care continuity (Narula, Agarwal, & McCarthy, 2012), or research process effects such as unintentional intervention (Hamberger et al., 2014; O'Doherty et al., 2016).

An understanding of the complexity of the research problem is mediated by the choice of theoretical perspective, methodology, and methods. As the field recognizes the complexity of implementing a sustainable, effective health-system response to IPV, different theoretical frameworks are being utilized to capture different complexities. These include realist evaluation (Goicolea, Hurtig, San Sebastian, Marchal et al., 2015), normalization process theory (Hooker et al., 2015), action research (Joyner & Mash, 2012), grounded theory (Ford-Gilboe, Merritt-Gray, Varcoe, & Wuest, 2011), feminist theory (Kelly, 2011), implementation science (Decker et al., 2012), theory of planned behavior (O'Doherty et al., 2016), and complexity theory (Family Violence Death Review Committee, 2014; Gear et al., 2017). Each perspective has potential to emphasize the

diverse complexities involved in responding sustainably to IPV within health care. Viewing our research problem as a CAS enables us to explore the interaction between these many diverse elements that give rise to the complexity of the problem.

The Methodology

Reconceptualizing the research problem as a CAS focuses our attention on the interaction between agents and the communication that takes place between them (Jordan et al., 2009). Consistent with complexity theory, our theoretical perspective (poststructuralism), and research problem (responding effectively and sustainably to IPV in health care), we chose to adopt a pragmatic approach to discourse analysis, viewing discourse as a CAS (Jordan et al., 2009; Larsen-Freeman & Cameron, 2008; The "Five Graces et al., 2009). As agents interact within a CAS, they act and react to the contribution of the other, influenced by their individual diversities. Over time, these dynamic patterns of interaction may self-organize into routinized ways of interacting, leading to the emergence of dominant discourses (Jordan et al., 2009; Larsen-Freeman & Cameron, 2008; The "Five Graces et al., 2009). From this perspective, discourse is not static but continuously emerges from the dynamic patterns of interaction between multiple agents. The prevailing discourse(s) shapes what we accept as being real at a particular point in time, affords it legitimacy and authority, and influences our approach to future agent interaction (Cheek, 2000; Larsen-Freeman & Cameron, 2008; The "Five Graces et al., 2009).

Discourse simultaneously shapes individual and organizational meaning, values, and identity and blocks alternative ways of learning, communicating, and knowing (Cheek, 2000; Larsen-Freeman & Cameron, 2008). For example, the current health response to IPV is dominated by a public health discourse which presents IPV as a modifiable problem with scientifically measurable causes and outcomes (Sweet, 2015; World Health Organization, 2002). This discourse keeps knowledge of IPV tightly defined within a "scientific evidence base" marginalizing other bodies of knowledge which may contribute to a wider understanding of the problem. For example, critics of the public health approach argue it medicalizes abuse, presenting women as the population group in need of the intervention, rather than the perpetrators of the violence (Sweet, 2015; Tower, 2007). Others are cognizant of the simplicity of the public health approach, arguing the approach does not account for the complexities of the problem, such as the context of entrapment the victim faces (Kelly, 2011; Nicolaidis & Touhouliotis, 2006). From a complexity perspective, we can argue the public health discourse functions to inadequately represent and respond to the problem of IPV by limiting the bodies of knowledge it interacts with. This discourse may operate to constrain system agents in developing and delivering an effective and sustainable response to IPV.

We sought to explore health system discourses which shape how health professionals respond, or do not respond, to their patients who experience(d) IPV. Viewing discourse as a CAS allows us to explore much deeper into discourse, to view how diverse agents, such as funders, policy makers, professional groups, doctors or social workers, identify, define, and prioritize IPV as a health issue. We can then explore how these ideas are influenced by their interaction with other agents in the system and how this contributes to, or blocks, the emergence of discourse(s) which influence sustainable responses to IPV. Our research approach suggests agent interactions at multiple levels will influence the sustainability of an IPV response, meaning there is no one definitive solution to the problem (Gear et al., 2017; Shani & Mohrman, 2012; Wiltsey Stirman et al., 2012). Instead, the CAS approach allows us to strategically intervene in agent interactions to accelerate the emergence of discourses which underpin sustainable IPV responses (Gear et al., 2017; Mohrman et al., 2012). For example, discourses that value IPV responsiveness could be promoted with specific agents (G. P. Martin, Weaver, Currie, Finn, & McDonald, 2012), through initiatives such as health promotion posters which advise patients their health professional can help or health professional education on how responding effectively to IPV can improve the overall health of families.

The Method

We selected document analysis and participant interviews to access discourses operating at both the health system and practice levels. Concurrent use of these two methods provides potential to explore the interaction between health-system levels, exposing gaps between parts of the system which challenge sustainable IPV responsiveness (Braithwaite, 2010; Rapley, 2007). Beginning the process with document analysis can provide an understanding of the context in which interview participants operate and help to inform interview questions (Bowen, 2009; McDaniel et al., 2013). Similarly, participant interviews can call attention to how document discourses were being interpreted, manipulated, and adapted in practice by health professionals.

Document Analysis

Documents respresent an aspect of reality at a particular point in time, providing a static illustration of discourses in play (Cheek, 2000; Rapley, 2007). Rather than analyzing the content of documents, we chose to focus on the function(s) of documents, as understanding the content alone, does not show how a document is used and applied by system agents (Prior, 2008). Focusing on a document's function illustrates what they do rather than what they say, enabling an understanding of how documents are positioned and manipulated by agents across different parts of the system (Prior, 2008). Document function(s) can be elicited by reading secondary material such as media releases, websites, or research papers which offer different perspectives of the document under study (Prior, 2008; Rapley, 2007). Secondary material also aids analysis by

placing a time line and context around the selected documents. Examples of questions which may be drawn on to elicit document function(s) include: What is the document's political or ideological purpose? (Shaw, Elston, & Abbott, 2004) How is the document used and integrated into various kinds of knowledge networks? (Prior, 2008) What voices have been heard, or not? (Bowen, 2009) and What is the broader discourse the document sits within? (Rapley, 2007).

For example, the NZ primary health care strategy is a high-level policy document which guides and shapes the health care sector (Ministry of Health, 2001). It was first introduced by the government in 2001 to address health system problems attributed to high levels of patient co-payments specified by general practitioners (primary health-care doctors; Gauld, 2008; King, 2001; Quin, 2009; Tenbensel, 2016). The strategy established an intermediate layer of system organization called "primary health organizations" (PHOs) along with a funding model that provided capitation based on the characteristics of enrolled PHO populations (Ministry of Health, 2001). In this manner, the strategy functioned to regulate patient co-payments and reduce the medical dominance of general practitioners. Analysis calls attention to a hidden political agenda not evident within the text itself which shaped the purpose of the document (Gauld, 2008; Tenbensel, 2016). A second layer of analysis may then be applied to consider what discourses the document function produces, contributes to, or hides. Consistent with a complexity approach, these functional discourses should not be viewed as static, but as exhibiting features of a CAS, illustrating how knowledge is acquired, structured, organized, and changed over time (Boulton et al., 2015; Larsen-Freeman & Cameron, 2008; The "Five Graces et al., 2009).

Participant Interviews

Interviewing frontline health professionals provides opportunity to explore and capture the complexity of responding to IPV in practice. Recruiting a range of diverse general practices and health professionals provides access to different macro- and micro-diversities represented within the complex system of primary health care. As noted, utilizing complexity theory as a qualitative research methodology can facilitate deeper exploration of how system agents interact to produce discourse. For these reasons, use of an interview guide with potential lines of inquiry is not feasible. Simply, the diversity of participants means standardized questions are impractical. For example, a PHO manager cannot comment on how frontline professionals respond to different situations.

In contrast, an unstructured conversational style allows participants to share what they consider important, facilitating wide-ranging responses reflective of different agent macro- and micro-diversities. It also allows for responses beyond the known research problem boundaries, eliciting further complexity, for example, interactions between IPV and different aspects of family harm, socio-economic issues such as housing and mental health, and alcohol and drug issues. The style of complexity-led interviews differs markedly from others such

as phenomenological or narrative interviews. Complexity and diversity can be better elicited by holding a vision of the phenomenon being explored during interviews, that is, our conceptualization of a sustainable response to IPV, and improvising probes to explore participant knowledge and experiences in-depth, for example, what influenced you to respond the way you did? This style can help to achieve rapport, identify local contextual factors, and call attention to agent interactions which are generating self-organization (Lanham et al., 2013).

Preconceived ideas about the phenomenon being studied is a common obstacle for qualitative researchers (Patton, 2002). A qualitative complexity researcher is further challenged as holding certain ideas about an open and constantly changing system is difficult (Jordon et al., 2010). Challenging preconceived ideas about the research problem is critical in working with complex systems which are constantly evolving (Jordon et al., 2010). Researcher reflexivity can be promoted through regular research team conversations which challenge assumptions as they arise, such as why do primary health professionals assume women's refuges (shelters) are full? Is IPV grounded in the public health approach in practice or only in theory?

CAS continuously changes due to agent ability to learn from their interactions with others (Jordon et al., 2010). A complexity-led interview often acts as an agent of change for participants. For example, the interview can prompt participants to review their family violence policy, ask colleagues about how they were responding to violence, or discuss the issue within peer groups. Agent learning itself can increase or reduce diversity (Jordon et al., 2010). A complexity-led interview involves learning by both the researcher and participant as they interact. For example, participant knowledge and understanding of IPV as a health issue may evolve during the interview. Similarly, the researcher's understanding of how health professionals respond to IPV in practice is likely to evolve with each interview.

Discussion

When we design research, we consider what methodologies and methods would best serve to answer the research question. Sometimes there is a well-worn methodological track and few choices are necessary. Other times, the pathway is less clear. The choice of methodologies and methods reflects our approach to the research problem, but we must also critically reflect on how our approach shapes the construction of knowledge and our understanding of the research problem (Cilliers, 1998; Grant & Giddings, 2002; McDaniel, Lanham, & Anderson, 2009; Paterson et al., 2009). Just as research design frames what we understand, it also limits alternative ways of understanding. Different selections of theoretical perspectives, methodologies, and methods can inform different approaches and understanding (McDaniel et al., 2009).

The use of complexity theory for exploring sustainable responses to IPV in health care represents greater fidelity between methodology and research problem than other more

traditional methods (Gear et al., 2017). Qualitative research methods have proved useful in exposing the complexity involved in responding to IPV. However, little is known about applying complexity theory as a qualitative methodology in health-care research. The complexity philosophy—a myriad of continuously interacting elements in an open system—allows an innovative methodological turn by blending diverse bodies of knowledge (Gear et al., 2017; McDaniel et al., 2009). This article considered the implications of utilizing complexity theory as a qualitative research methodology, while presenting a possible framework for exploring and describing the behavior of a CAS.

The next challenge is to explore how complexity theory informs data analysis. Consistent with complexity principles, we expect analysis to be adaptive and responsive to real-time findings as we interact with the data. As our methodology indicates, we seek to understand how discourse emerges from patterns of interaction between agents. Supported by NVivo (V. 11), we intend to bring together the data sources and broadly code for areas of "talk" about IPV, that is, how is IPV talked about? An example could be how do primary health professionals identify the need to ask about IPV? Conversely, an absence of "talk" about IPV within document data may indicate competing discourses. We intend to conduct a second round of analysis to delve deeper into each of the codes to consider how "talk" produces, contributes to, or hides different discourses. Use of NVivo facilitates data exploration in different ways, such as by participant, general practice, profession, or data source. Central to a complexity analysis, we then intend to demonstrate how these discourses interact to promote or challenge sustainable responses to IPV in primary health care.

A strength of our research design is the concurrent use of document analysis and participant interviews. This is likely to produce rich and diverse data, reflective of diverse global and local efforts on health and violence prevention and intervention efforts across time and a range of participants working in diverse communities, with diverse philosophies, across a range of health and allied disciplines, different levels of expertise and with different understandings of IPV as a health issue. Viewing IPV responsiveness as a CAS provides a way to explore the patterns of interaction between data sets without obscuring this diversity. Multiple data sources allow testing for pattern consistency and provide opportunity to inquire more deeply into pattern inconsistencies and surprises (Begun & Kaissi, 2010; Patton, 2002; Thurston, Cove, & Meadows, 2008). In particular, the use of both document analysis and participant interviews allows us to explore how the health-system and general practice levels interact, enabling insights into gaps between policy and practice when responding to IPV.

Our research design also provides different possibilities for data analysis (e.g., as case studies, across disciplines, across the entire data set, or all methods). Conceptualizing discourse as a CAS emphasizes the continuous construction of knowledge and how it is interpreted, manipulated, and adapted by different

system agents. This provides multiple ways to view the problem as well as multiple opportunities for influencing the direction of the CAS. A complexity-informed research design allows us to respond to methodological challenges, findings, and changes as they emerge (McDaniel et al., 2009).

There are limitations to applying complexity theory as a qualitative research methodology. As noted above, a complexity researchers' foe is preconceived notions and ideas about the system under study. Complexity-led interviewing challenges the researcher to identify and query general assumptions and probe into what influences participant thinking in real time. The researcher must also learn to apply knowledge acquired from each interview and explore ideas further with the next participant without leading responses. While these are skills that take time to develop, reflecting on, transcribing, and learning from interviews may help to curb these challenges. Another obstacle for complexity researchers is the tendency toward reductionism. Research design naturally places boundaries around the CAS being studied, for example, a limited number of general practices in one region. Analysis can also be reductive, such as coding practices (e.g., content analysis) that "group" commonalities, therefore obscuring micro- and macro-diversities. For example, coding document content (for audience, publisher, etc.) will not be an effective way to elucidate document function(s) (Jordon et al., 2010; Patton, 2002). Use of complexity theory requires us to be aware of, and articulate, how research design maintains and transforms knowledge boundaries (Cilliers, 2001).

Conclusions

Responding to IPV in health care has proven to be a persistent complex problem internationally. Scientific methods seeking to establish intervention cause and effect often find it difficult to produce positive consistent findings. Increasingly, scholars are utilizing different theoretical frameworks to elicit the complexities of the problem which affect intervention effectiveness and sustainability. This article presented our innovative use of methodology to explore this complex problem.

Although complexity theory is increasingly being used to explore and describe complex health system behavior, little is known about how we can utilize it as a qualitative research methodology in health care research. This article illustrated how a complexity-led approach shaped our theoretical perspective, our conceptualization of the research problem, and our selection of methodology and methods. We demonstrated how our research design opened new opportunities for understanding as well as potential limitations. Our use of complexity theory as a qualitative research methodology advances both complexity theory application and qualitative research design. These insights will be useful to researchers exploring other complex systems, interventions, and problems. We anticipate the use of complexity theory will contribute an innovative perspective to the considerable body of research which seeks to improve health-care responses to IPV.

Acknowledgment

Declaration of Conflicting Interests

Funding

ORCID iD

Claire Gear 🄳 http://orcid.org/0000-0002-1310-0188
Jane Koziol-Mclain 🄳 http://orcid.org/0000-0003-3453-023X

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