



## Community resilience in Walkerton, Canada: Sixteen years post-outbreak

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### ABSTRACT

The implications of a public health emergency on a community may be devastating and long-term. The severity of the implications depends on the gravity of the emergency and the capacity of individuals and communities to respond to and recover from its effects. However, the long-term implications of emergencies are often excluded from disaster management research making it difficult to determine whether communities are truly able to achieve and maintain resilience post-crisis. This interdisciplinary, qualitative study examined the impacts of the May 2000 *Escherichia coli* outbreak in Walkerton, Canada sixteen years post-outbreak on the present-day resilience status of the community. Semi-structured interviews and focus groups were conducted with a purposeful sample of 29 Walkerton community members. The data were transcribed verbatim and coded using conventional content analysis to identify themes inductively. The study's findings reveal the importance of various elements of the social capital dimension in facilitating (i.e., capacity building, positive perspective) and hindering (i.e., ongoing health effects) the community's collective resilience status today both directly and indirectly. Some elements, including local economy, local government, rural community characteristics, preparedness, and reputation act as both facilitators and barriers to the social capital component of community resilience. The findings from this work are critical for designing preparedness and recovery programs for emergency situations, particularly in rural communities. They also suggest disaster management program plans and strategies for rural communities should encompass a proactive, long-term, community-centered approach integrating social capital.

### 1. Introduction

In the discipline of disaster management, community resilience assesses how a community collectively prepares for, responds to, mitigates, and recovers from the implications of a disaster using its inherent strengths and assets [1–6]. This is typically achieved by combining and mobilizing various forms of tangible and intangible resources, also referred to as capitals, when needed within their existing institutional and relational contexts [6–8]. Eight key types of capitals are essential in achieving community resilience following a disaster: social, human, physical, cultural, political, economic, natural, and preparedness [2,4–10]. The greater the diversity of these capitals, the more likely a community is to be resilient in overcoming the implications of a disaster [6,11].

Social capital examines the components of social organization, such as networks of civic engagement, the norms or reciprocity that arise from them, local civic identity, and the trustworthiness and values shared among individuals that promote collective action and

cooperation for mutual benefit [2–9,12–15]. Social capital has strong predictive power of recovery in disaster management, where it “may trump the degree of infrastructure damage, the underlying socio-economic status of a community, and the amount of aid received by an area” [[16], p. 366]. Social capital is especially instrumental in its contribution to developing other types of capitals in rural communities [17–20]. There are three forms of social capital that aid communities in the event of a disaster: bonding social capital; bridging social capital; and, linking social capital [8,21]. Bonding social capital comprises the intra-community connections within a community, such as the relationships among immediate family members, close friends, and neighbourhood ties [8,21]. Bridging social capital involves inter-community relationships with individuals external to the community [8,21]. Finally, linking social capital includes relationships with individuals in positions of power external to the community [8,21,22].

From a public health perspective, these three forms of social capital can lead to positive population health outcomes. For example, social capital is associated with higher levels of self-rated health [23,24],

Abbreviations: CEMC, Community Emergency Management Coordinator; *E. coli*, *Escherichia coli*; HiREB, Hamilton Integrated Research Ethics Board; PTSD, Post-traumatic stress disorder; WCWC, Walkerton Clean Water Centre

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improved mental health [25], reduced cardiovascular and cancer mortality [26], and lower suicide rates [23]. The public health sector plays a strong role in implementing interventions aimed at building social capital, which is an integral component of disaster and emergency preparedness. [16,27–29]. As such, Wulff [16] argues that the public health sector should take on a leadership role in promoting disaster resilience.

Studies examining the contributions of social capital to community resilience have largely focused on crisis conditions (e.g., [30–34]), but comparatively fewer studies focus on understanding what drives the ability of a community to recover from emergencies under post-crisis conditions (e.g., [35,36]). However, this non-crisis understanding is important towards designing preparedness and recovery programs for emergency situations.

This paper examines the social capital dimension of community resilience in the context of a public health emergency under post-crisis conditions. The rural community of Walkerton, Canada was selected as a case study in which qualitative methods were used to identify elements of social capital that facilitate and/or hinder community resilience 16 years after the crisis occurred, under post-crisis conditions.

## 2. Case study community: Walkerton, Canada

A case study permits a unique way to investigate a phenomenon (community resilience) within its real-life context in a small geographical area (Walkerton) [37]. Walkerton represents a non-vulnerable, rural community. It is located within and governed by the Municipality of Brockton in Ontario, Canada. In May 2000, a water contamination outbreak occurred after *Escherichia coli* (*E. coli*) O157:H7 and *Campylobacter jejuni* were discovered in the community's drinking water [38–40]. Heavy rainfall contributed to excess runoff of livestock fecal contaminants from agricultural fields into a shallow municipal well that inadequately chlorinated drinking water [39,40]. This event resulted in 2321 cases of acute gastrointestinal illness, over 750 emergency room visits, 65 hospital admissions, 27 confirmed cases of hemolytic uremic syndrome, and seven deaths [38–40] within a population of approximately 4800 [39].

In response to the event, the Government of Canada called a public inquiry, led by the Honourable Dennis O'Connor, to identify the causes of this disaster [40], as well as to examine the broader issues surrounding drinking water safety in Ontario [41]. Research was later conducted following the outbreak to examine: the political [42–44], institutional [42–44], environmental [45], and socio-ecological [46] factors leading up to the event; social capital during the tragedy [30]; health implications for residents who became ill [38,47]; prevention strategies [48,49]; and lessons learned following the outbreak [39,50]. However, there have not been any long-term studies investigating long-term resiliency of the Walkerton community, and whether residents were collectively able to achieve or maintain resilience over time under non-crisis conditions.

## 3. Methods

A qualitative research study was designed to assess the contribution of social capital to community resilience post-outbreak [51]. Ethics approval for this work was granted by the Hamilton Integrated Research Ethics Board (HiREB) (Certificate Number 2016-1934) (Appendix A). Purposeful sampling was used to select English-speaking individuals who resided or worked in Walkerton both at the time of the outbreak and at the time the data were collected for this study. As the outbreak occurred 16 years prior to this study, participants were required to be older than 16 to ensure they had experienced it. No exclusion criteria were posed with respect to gender, socioeconomic status, health status, ethnicity, culture, religion, race, mental or physical disability, or educational level, all of which contribute to a richer understanding of the research problem.

Various individuals, organizations, and interest groups were invited via e-mail to participate in this study. Due to a poor response rate, snowball sampling was used as a subsequent strategy to gather participants. Two Walkerton residents played a vital role in assisting the researchers in recruiting participants. Twenty-nine individuals participated in this study (Appendix B includes the gender and age categories, and current occupation; Appendix C includes the demographic data collection instrument). Face-to-face, semi-structured interviews were employed as the mode of qualitative data collection, and were conducted either one-on-one or in a focus group. Twenty-three individuals opted for individual interviews, while six individuals chose to participate in focus groups (of two) due to time restrictions. The focus group participants were known to each other; they were partners in two cases and co-workers in the third. All interviews were conducted in a mutually agreed upon location between the participants and first author between November 14th and December 7th, 2016 in Walkerton, Ontario, and ranged from 35 to 75 min in length.

The interview and focus group guides (Appendices D and E, respectively) were developed to determine the participants' views of community resilience and the elements that facilitated and hindered community resilience 16 years post-outbreak. The interview guides included prompts regarding elements of human, physical, cultural, political, economic, natural, and preparedness capitals in addition to social capital. It must be noted, however, that the intention was not to quantify these capitals but rather to determine community members' perceptions of these capitals, which are important underpinnings of social capital.

Conventional content analysis was employed, using the qualitative data analysis software NVivo for Mac (QSR International Version 11), to inductively code the transcripts, create categories based on similar codes, and identify overarching themes and patterns. All transcripts were reviewed repeatedly by the authors to enhance the understanding of the data collected [52]. Open coding was used to condense the data into preliminary analytical codes. Memos were used to assigned codes to document the researchers' initial thoughts during the analysis [53]. Axial coding then organized similar codes into larger categories [54]. Selective coding was the final step, which examined the previously established categories of codes to identify core themes or patterns among participants' responses that were relevant to the study's objectives [55]. Credibility, dependability, confirmability, and transferability were achieved through purposeful sampling, prolonged engagement, triangulation, member checking, researcher reflexivity, low-inference descriptors, constant comparison, an audit trail, and audio recorded data [56–58].

## 4. Findings and discussion

Table 1 shows the principal and sub elements acting as facilitators, barriers, or both, in relation to community resilience in post-crisis Walkerton as identified by the participants. The following sections discuss each of these principal and sub elements as they relate to social capital.

### 4.1. Facilitators to present-day community resilience

#### 4.1.1. Capacity building

In response to Justice O'Connor's reports [40,41], the Government of Ontario established the Walkerton Clean Water Centre (WCWC) in the community to place Walkerton as a leader in training, technology, and research for drinking water. The WCWC plays an instrumental role in Ontario through enhancing the knowledge, skills, and practices surrounding safe water management, including disaster preparedness and recovery. The staff are recognized as competent leaders in developing safe water management plans and strategies in Ontario. Such capacity building elements also serve to strengthen social capital in the community, particularly with respect to improving Walkerton's local

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