2007

A Comparison of the Perceptions of Risk and Health Between Old Order Mennonites and Mainstream Society in the Grand River Valley: A Cross-Cultural Analysis

Ewa Dabrowska-Miciula
Wilfrid Laurier University

Your file Votre référence
ISBN: 978-0-494-38003-1
Our file Notre référence
ISBN: 978-0-494-38003-1

A COMPARISON OF THE PERCEPTIONS OF RISK AND HEALTH BETWEEN OLD ORDER MENNONITES AND MAINSTREAM SOCIETY IN THE GRAND RIVER VALLEY: A CROSS-CULTURAL ANALYSIS.

By

EWA DABROWSKA-MICIULA, M.Sc.

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Doctor of Philosophy

Department of Geography and Environmental Sciences
Wilfrid Laurier University
Fall 2007

ABSTRACT

The role of culture in the geography of health and technological hazard perception research is an important and relatively recent avenue of research. This dissertation contributes to this research by exploring cross-cultural differences in health and risk perceptions and by examining the relationship between health and place. It involves an in-depth examination of perceptions and meanings of health, as they exist in the local context. It is the first geographical research conducted with individual members of the Old Order Mennonite community considering perceptions of health, technological hazard and understandings of environmental risk.

The studied communities are situated at an agricultural/industrial interface near Kitchener-Waterloo, Ontario. For the last twenty years the town of Elmira and its surrounding agricultural lands have been the subject of environmental concerns due to the area's extended exposure to toxic wastes, produced during the manufacture of rubber, highly toxic herbicides and pesticides. These pose significant health risks to the local populations especially to members of the Old Order Mennonite community whose farms are located along the most contaminated tributary of the Grand River in close proximity to Elmira. In the research, perceptions of health, risk and environment are examined in 48 in-depth interviews involving the Old Order Mennonites, women from the mainstream society living in Elmira, and professional and health key informants.

The thesis provides contributions to the research of health geography. Health conceptualizations and health understandings are compared among the groups to reveal culturally-constructed experiences in the local landscapes. Various perceptions of people's well-being in place are explored by incorporating the religious beliefs and associated cultural practices of Old Order Mennonites. Cultural, ethnic and religious isolation of the Old Order Mennonites and their concerns about maintaining strict traditions have contributed to their unique understandings of health in place. Contrasting understandings of local landscapes are presented, the landscape of mainstream society and the therapeutic landscape of the Old Order Mennonites. In this study, the Old Order Mennonites women are found to be empowered by the religious and cultural differences that sustain their different holistic understandings of their health landscape.

The thesis provides contributions to geography of environmental risk research. Drawing on the social amplification of risk framework (SARF) developed by Kasperson, Renn, Slovic and their colleagues (1992), a study framework is proposed to reveal how cultural beliefs and practices and religious values contextualize responses to technological hazards. Incorporated in the framework, are four categories of cultural processes (threats to lives, core values, worldviews and community context) through which the meanings of risk are either amplified or attenuated among the groups. The study proposes a way of

unpacking the black box of culture by using a qualitative based explanation of the dimension of culture that influence risk perceptions.

In summary, the thesis highlights different perspectives on children's and women's health and risk associated with participant ethnicity. From a practical perspective, it informs public health and environmental risk management decision makers of the importance of cultural differences which need to be addressed to reduce inequalities existing in the Elmira area.

ACKNOWLEDGEMENTS

It has been an honour to work and learn with my committee members in the last years.

Dr. Judy Bates, my supervisor, your knowledge, guidance, thoughts and careful consideration have been invaluable to me. Thank you for your willingness to work with me, for asking challenging questions and for your editing of my *almost* final drafts. Thank you for your encouragement, confidence and patience.

Dr. Juanne N. Clarke, I have respected you as a researcher and a teacher for many years. Thank you for bringing your medical expertise into the area of geography. Thank you for supporting me in moments of excitements and frustration.

Dr. Brenda Murphy, thank you for your openness, support and willingness to share your knowledge with me. From the first day of my Ph.D. study, I have been grateful, and continue to be grateful, for your contributions and expertise.

Dr. Susan Wismer, I am thankful for the rich information you shared with me about the community, your generosity, experience and your kindness. You have patiently taught me how to complete the many stages of my research.

I thank the two women, both key informants and research participants. As I cannot reveal publicly your names, please accept my gratitude. With your help I was able to reach the Old Order Mennonite community, and to talk to many community members. Thank you for your trust and confidence in me, and your important contributions to the study.

I thank all the women and families, key informants, who have invited me to their homes and shared the stories of their lives and their experience. Without your trust and willingness to participate I would never benefit as I did. I have learned a lot from you!

The professor of Music Therapy, Dr. Rosemary Fischer, first inspired me to study in a new country, with my new identity. I thank you for that spark of light on the way to intellectual discovery.

I honor the memory of Caryl Ann Browning who passed away a few months ago. Thank you, Caryl Ann, for your support and your last message sent to me: "Success is not a product of spontaneous combustion. You must first set yourself on fire."

I thank the Department of Geography at Wilfrid Laurier University for the support. I express my gratitude to the chair, Dr. Mary-Louise Byrne, the graduate officer Dr. Slocombe and Dr. Hanna and the administrative and map library staff; Thanks Jo-Anne and Pam. Thank you for supporting me during the study and guiding my efforts when needed.

To my family and friends who have listened about my research, my challenges and successes over the years. I thank you all for your love and support.

Thank yous are not nearly enough.

LIST OF TABLES

LIST OF FIGURES

TABLE OF CONTENTS

Chapter 1

INTRODUCTION

1.1 Introduction

This dissertation addresses the need to enhance our understanding of cross-cultural differences in risk perceptions and perceptions of health in place. It involves an in-depth examination of perceptions and meanings of health, as they exist in the local contexts in communities whose population share a different cultural identity (Rosenberg 1998; Elliott 1999; Gesler and Kearns 2002). The perceptions of ethno-religious minority groups of the Old Order Mennonites, separated from other groups by a phenomenon of desired exclusion, are compared with perceptions of the members of mainstream society. This research fills in an important gap since no geographical study has been conducted with the Old Order Mennonite community in the Township of Woolwich, Ontario that considers the perceptions of health and technological hazards in this community.

Old Order Mennonites have developed strong connections to the land through the agricultural work of their families and their community (Bennett 2003). These cultural bonds with the land are important to their experiences of health, illness and safety in place. The chapters of this thesis explore how the concepts of health, landscapes and risk are locally constructed, paying particular attention to the cultural aspects of the relationships. Experiences of health and

landscape are studied to seek to understand the meaning attributed to places and landscapes. Thus, the concept of *places*, "bounded settings in which social relations and identity are constituted," is used instead of *spaces,* referring to analyses conducted by "positivist" geographers (Gesler and Kearns, 2002, p. 5). An alternative way of viewing the links between health and place with the use of therapeutic landscape is used to explain the cultural meanings of health by ethnic minority groups (Wilson 2003).

Numerous geographical studies analyze risk understandings at the local scale, and explore risk factors, risk consequences and psychosocial impacts on peoples' well-being (Baxter, Eyles et al. 1999; Luginaah, Taylor et al. 2002; Burra, Elliott et al. 2006; Haalboom, Elliott et al. 2006). Differences in the perceptions of risk and risk construct have been explained within underlying value systems (Douglas and Wildavsky 1982). Ethnic or gender differences are derived from culturally- based criteria to emphasize certain risks and downplay others (Vaughan and Nordenstam 1991). However, research into understanding the role of culture is limited and it is unknown how conservative, orthodox religious communities might respond to modern risks and severe environmental damage, and how their understandings of technological hazards are constructed.

The research has four main objectives:

1) to examine and compare health perceptions of women from the mainstream society and the Old Order Mennonite community;
2) to examine and compare risk perceptions of three groups of people: mainstream society women, Old Order Mennonite women, and professional key informants from Elmira;
3) to examine how culture influences concepts of risk after major environmental crises;
4) to explore the perceptions of environmental links between children's health and the local environment.

1.2 Theoretical Context

To approach the main objectives of research, this project finds its conceptual base in geographical understandings of health, landscape and risk perceptions. Health geographers have begun to draw upon the work of cultural geography traditions in acknowledging that places have meanings, which are important for health (Eyles 1985; Kearns and Dyck 1995; Kearns and Gesler 1998; Williams 1999; Gesler 2003). Changing perspectives on place "re-emerged" as a "key theme" in health geography, more recently using concepts from humanistic and cultural geography (Curtis 2004). The concept of *place* is not static and is presented as having dynamic and changing meanings over time

(Martin 2003). In other words, each place creates its unique sense through particular social, economic, political, cultural and symbolic interactions which are constructed by people and based on their past and present life experiences. These understandings of place and experience of landscape (a result of interactions between society and physical environment) impact people's health and mitigate the links between health and environment. The study incorporates the landscape framework to examine the aspects of environment and health-place links developed by the communities.

The understanding of risk perceptions and hazard in place requires an examination of meaning, contextual experiences and shared identity within places (Hewitt 1997; Cutter, Mitchell et al. 2000). More recent geographical work has focused on the hazard-related interactions among people and the role of culture in risk communication and risk perception processes (Baxter and Greenlaw 2005; Masuda and Garvin 2006). Because culturally based values can influence understandings of hazard, it has been demonstrated that ethnicity is associated with differences in risk perceptions by diverse groups (Vaughan and Nordenstam 1991; Johnson 2002; Riley, Newby et al. 2006). The risks become meaningful when people interpret them to be that way, even when experts or media have different opinions (Brown 1992). Perceptions of risks are filtered through socially supported worldviews (Douglas and Wildavsky 1982; Tansey 2004). In this sense, the Social Amplification of Risk Framework (SARF) for understanding

risk perception is useful for explaining why certain hazards are given more attention than others (Kasperson, Renn et al. 1994). The specific risk events are interpreted in the social and institutional context in which they occur and information about risks is intensified or weakened via communication channels. People's reactions vary according to the interpretations of the extent of the threat. For example, if the information downplays the threat, then people will assume that the threat to their lives is lessened – an example of attenuation of risk. If on the other hand, the threat imposed by the risk is given extensive coverage in the press and public officials are involved, then the public will react in a much stronger manner in response to the threat. In 1994 groundwater in six districts of West Bengal, India was polluted with arsenic poisoning but the threat imposed by the poisoning was downplayed by the media and by public officials. The population responded by dismissing the potential hazard associated with the risk, an example of the attenuation of risk. In contrast, when the media announced the breakout of a plague in the city of Surat in 1994, 200,000 people deserted the city within hours in a case of amplification of risk (Susarla 2003).

An important element in this framework is culture, which influences interpretations of risk and provides rules of how to select, interpret, and explain behaviour among institutions and individuals as well as experts and communities (Kasperson, Renn et al. 1994). Images of risk and symbolic connotations can be interpreted through the SARF framework which considers the way in which the

portrayal of an event is culturally modified by imagery and symbols. Cultural understandings modify people's perceptions and construct their world views. For example, in some situations of risk, people will blame government agencies or corporations, in other situations, people may believe that the situation will be resolved by the appropriate authorities (Pidgeon, Kasperson et al. 2003). The amplification or attenuation effects are usually visualized using the analogy of a stone dropping into a pond. This illustrates the scale of the impact, or ripple effect, that accounts for the secondary and tertiary consequences that may spread the impact far beyond the initial event. A good example of this process is the terrorist attack of 9/11 that had dramatic social, political and economic consequences on a global scale. Where a single risk event impacts people of differing cultures living in close proximity to one another, the framework provides a useful tool for analyzing different interpretations of risk. Individual behaviour will vary according to cultural interpretations of risk – for some the threat of risk will be amplified, for others it will be attenuated. For this particular study a new framework was developed. Four categories of culture (threats to lives, core values, worldviews and community context) are explored to demonstrate which variables contribute to either low or high risk perceptions. High risk perceptions are associated with risk amplification processes and low perceptions with attenuation of risk.

The study focuses on women and children because they are vulnerable members of the Old Order Mennonite community facing severe environmental hazards. The different gender roles in a patriarchal community, differences of exposures, metabolic differences, smaller body mass and multiple pregnancies can be identified immediately as a few of the many factors contributing to vulnerability.

1.3 Methodological Context

The use of qualitative methodology in geography permits an examination of perceptions of health and risks in the context of place in exploratory research. Two qualitative methodological approaches were employed in the study design, grounded theory and ethnographic methodology (Hay 2000; Quinn-Patton 2002). The analytical approach used was inductive and data driven and allowed the researcher to respond to new information as it emerged from the data. Thus, the focus of this research was to build a theory about a basic social process: explaining people's understandings of hazards, health and local environment and their relationship to culture in place. In the local community context, the ethical norms of pluralism and multiculturalism guided the interviews (Horlick-Jones, Sime et al. 2003; Nazroo 2006).

While using qualitative methods in their research geographers attempt to link the psychosocial and geographical aspects of health and environment on a

community scale (Baxter, Eyles et al. 1992; Eyles, Taylor et al. 1992; Elliott, Taylor et al. 1993; Wakefield 2002). Perceptions of health and environment are examined in 48 in-depth interviews involving the Old Order Mennonites, women from the mainstream society living in Elmira, and other key informants, all from the Township of Woolwich. The inclusion of the conservative Old Order Mennonites as a minority group in this study is critical because their families have resided in the local area for two centuries yet despite the documented environmental hazards they had not been contacted previously by any government or health organization (Conestoga-Rovers & Associates 2003). The main methodological challenges that were faced by the researcher were to gain the participation of the ethno-religious community of people whose traditional and distinctive belief system forbids their participation in "worldly activities." Not only are the culture and practices of Old Order Mennonites different from mainstream society, but this particular community also seeks separation. Thus, this research was intrusive by its design as the Old Order Mennonites are neither willing to be contacted at all by the members of the mainstream society, nor are they willing normally to participate in research projects. The main rationale to justify this research inquiry and to ask for this community's inclusion in the study was the lack of information about hazards, health and other environmental links in place. This research will provide the missing information as well as examine the diverse patterns of this minority group's perceptions of risk and health

experiences. The appropriate methods were selected to explore ethnic differences and examine ethnic inequalities in place (Nazroo 2006).

1.4 Structure of the Thesis

The thesis is structured as a collection of works submitted to scholarly journals. Figure 1.1 presents an outline of the work and shows each chapter positioned within the overall research project.

Chapter 2 provides background information about the ecological landscape of the study site consisting of the town of Elmira and the surrounding agricultural area, and explains how the environmental contamination of the area has become a social problem for members of mainstream society. The opinions of the Old Order Mennonites are unknown. Chapter 2 details the history of Elmira and provides an explanation for the selection of the Township of Woolwich as the study site. The brief history of the events presented in this chapter explains the environmental crisis, groundwater contamination and contamination of the Canagagigue Creek, and stresses the crucial role of local media in the communication of risk to the local communities.

Chapter 3 discusses the methodology used to compare perceptions of health, risk, and the environment among members of the mainstream society residents of Elmira with a conservative group of Old Order Mennonites living in the surrounding agricultural areas in the Township of Woolwich.

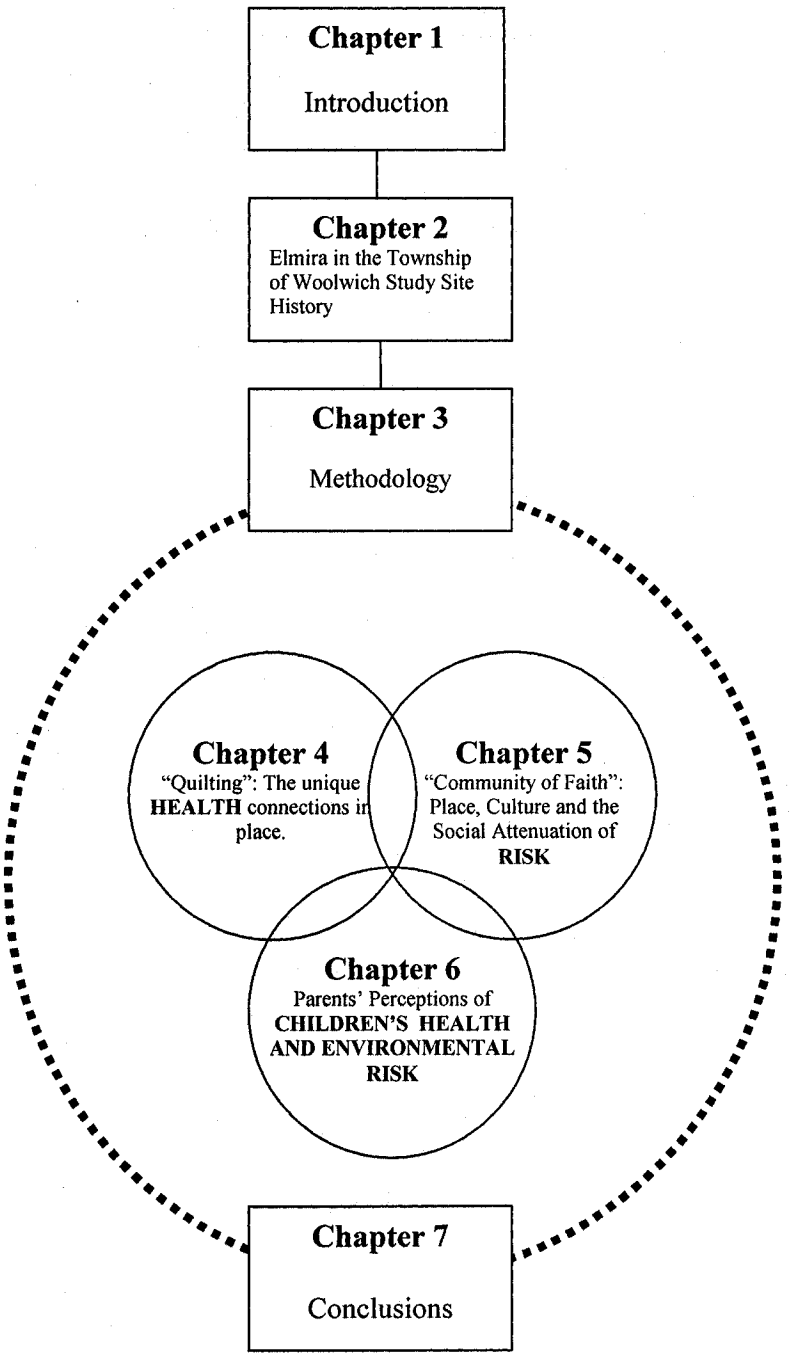

Figure 1.1. Overview of thesis.

The three subsequent papers (Chapters 4, 5 and 6) merge together the main aspects of the research, each of them drawing on the aspects of a specific theory and having specific research questions to comprise a unique section of the study.

Chapter 4 introduces the research and explores how health is understood in the context of the mainstream society and in the context of the ethnic minority community of Old Order Mennonites in Ontario. This community preserves separate ethno-religious beliefs and distinctive practices and defines its ethnic identity within its biological, cultural and historical boundaries (Clarke 2004; Good Gingrich and Lightman 2004). Specific links with place and land have been developed in separate places where these communities reside: in the urban centre of Elmira and the rural area along the Canagagigue Creek. Central to this chapter is the need to establish an understanding of local landscape and the links between perceptions of health and place by the different communities. The perceptions of women from Elmira and the women of the Old Order Mennonite Church are contrasted and challenge the understanding of the local landscape in the Township. of Woolwich.

Chapter 5 focuses on exploring the role of culture in risk perceptions in the local context. The culturally isolated community of Old Order Mennonites and their orthodox, religious way of life and agricultural family lifestyle have been threatened with modern technological environmental hazards. The participants'

narratives and the key conceptual issues are discussed in reference to the Social Amplification of Risk Framework (Pidgeon, Kasperson et al. 2003). The process of risk communication and risk understandings is explored in this case study to reveal how cultural differences frame risk perceptions by the local communities.

Chapter 6 takes a broad approach to local perceptions of children's health and the environmental links. The perceptions of children's health by mothers from a closed, ethno-religious Old Order Mennonite community are contrasted with the perceptions of mothers from mainstream society. The spirituality and concerns about maintaining strict traditions among Old Order Mennonite mothers contribute to their unique understandings of their children's health and environmental links in place. This chapter emphasizes the need for inclusivity in research and calls for environmental equity by including the perceptions of an ethnic minority group in the study.

The final chapter, Chapter 7, draws together the three papers presented in the thesis. Its main focus is to summarize the overall implications and contributions of this work and to discuss the study challenges faced during the research. The thesis ends with a discussion of further directions in research in the area.

1.5 References

Baxter, J., J. Eyles, et al. (1999). ""Something happened": the relevance of the 'risk society' for describing the siting process for a landfill." Geografiska Annaler **81**: 91-109.

Baxter, J., J. Eyles, et al. (1992). "The Hagersville tire fire: Interpreting risk through a qualitative design." Qualitative Health Research **2**(208-37).

Baxter, J. and K. Greenlaw (2005). "Explaining perceptions of a technological environmental hazard." The Canadian Geographer **49**(1): 61-80.

Bennett, E. (2003). "Emancipatory responses to oppression: The template of land-use planning and the Old Order Amish of Ontario." American Journal of Community Psychology **31**(1/2): 157-171.

Brown, P. (1992). "Popular epidemiology and toxic waste contamination: Lay and professional way of knowing." Journal of Health and Social Behavior **33**(267-281).

Burra, T., S. J. Elliott, et al. (2006). "Effects of residential exposure to steel mills and coking works on birth weight and preterm births among residents of Sydney, Nova Scotia." The Canadian Geographer **50**(2): 242-255.

Clarke, N. J. (2004). Health, Illness, and Medicine in Canada, Oxford University Press.

Conestoga-Rovers & Associates (2003). Human Health Risk Assessment for Canagagigue Creek. Waterloo, Ontario, Conestoga-Rovers & Associates: 80.

Curtis, S. (2004). Health and Inequality. Geographical Perspectives. London, Thousand Oaks, New Delhi, Sage.

Cutter, S. L., J. Mitchell, et al. (2000). "Revealing the vulnerability of people and places: A case study of Georgetown County, South Carolina." Annals of the Association of American Geographers **90**(4): 713-737.

Douglas, M. and A. Wildavsky (1982). Risk and Culture: An essay on the selection of technological and environmental dangers. Berkeley, University of California Press.

Elliott, S. J. (1999). ""And the question shall determine the method"." Professional Geographer **51**: 240-243.

Elliott, S. J., M. Taylor, et al. (1993). "Modelling psychosocial effects of exposure to solid waste facilities." Social Science & Medicine **37**(6): 791-804.

Eyles, J. (1985). Senses of Place. London, Silverbrook Press.

Eyles, J., M. Taylor, et al. (1992). "The social construction of risk in a rural community: Responses of local residents to the 1990 Hagersville (Ontario) Tire Fire." Risk Analysis **13**(3): 1993.

Gesler, W. M. (2003). Healing Places. Lanham, Maryland, Rowman & Littlefield

Gesler, W. M. and R. A. Kearns (2002). Culture/Place/Health. New York, Routledge.

Good Gingrich, L. and E. Lightman (2004). "Mediating communities and cultures: A case study of informal helpers in an Old Order Mennonite community." Families in Society: The Journal of Contemporary Social Services **85**(4).

Haalboom, B., S. J. Elliott, et al. (2006). "The risk society at work in the Sydney 'Tar Ponds'." The Canadian Geographer **50**(2): 227-241.

Hay, I., Ed. (2000). Qualitative Research Methods in Human Geography. Victoria Australia, Oxford.

Hewitt, K. (1997). Regions of Risk. Essex UK, Longman.

Horlick-Jones, T., J. Sime, et al. (2003). The social dynamics of environmental risk perception: implications for risk communication research and practice. The Social Amplification of Risk. N. Pidgeon, R. E. Kasperson and P. Slovic. Cambridge, Cambridge University Press.

Johnson, B. B. (2002). "Gender and race in beliefs about outdoor air pollution." Risk Analysis **22**(4): 725-738.

Kasperson, R. E., O. Renn, et al. (1994). The social amplification of risk: a conceptual framework. Environmental Risks and Hazards. S. L. Cutter. Englewood Cliffs, Prentice Hall: 112-123.

Kearns, R. A. and I. Dyck (1995). "Towards culturally safe geographies of health and healing." Health and Place **1**(3): 137-147.

Kearns, R. A. and W. M. Gesler (1998). Putting Health into Place: Landscape, Identity and Well-Being. Syracuse, NJ, Syracuse University Press.

Luginaah, I., M. Taylor, et al. (2002). "Community responses and coping strategies in the vicinity of a petroleum refinery in Oakville, Ontario." Health and Place **8**(177-190).

Martin, D. G. (2003). ""Place-Framing" as place-making: Constituting a neighbourhood for organizing and activism." Annals of the Association of American Geographers **93**(3): 730-750.

Masuda, J. R. and T. Garvin (2006). "Place, culture, and the social amplification of risk." Risk Analysis **26**(2): 437-454.

Nazroo, Y. Y. (2006). Health and social research in multiethnic societies. London; New York, Routledge.

Pidgeon, N., R. E. Kasperson, et al., Eds. (2003). The Social Amplification of Risk. Cambridge, Cambridge University Press.

Quinn-Patton, M. (2002). Qualitative Research and Evaluation Methods. Thousands Oaks, Sage.

Riley, D. R., C. A. Newby, et al. (2006). "Incorporating ethnographic methods in multidisciplinary approaches to risk assessment and communication: Cultural and religious uses of mercury in Latino and Caribbean communities." Risk Analysis **26**(5): 1205-1221.

Rosenberg, M. (1998). "Medical or health geography? Populations, peoples and places." International Journal of Population Geography **4**: 211-226.

Susarla, A. (2003). Plague and arsenic: assignment of blame in the mass media and the social amplification and attenuation of risk. The social amplification of risk. N. Pidgeon, J. Kasperson and P. Slovic. Cambridge, Cambridge University Press: 179-206.

Tansey, J. (2004). "Risk as politics, culture as power." Journal of Risk Research **7**(1): 17-32.

Vaughan, E. and B. Nordenstam (1991). "The perception of environmental risks among ethnically diverse groups." Journal of Cross-Cultural Psychology **22**(1): 29-60.

Wakefield, S. (2002). Social capital and environmental risk: understanding responses to adverse air quality in Hamilton-Wenthworth. Department of Geography. Hamilton, McMaster University.

Williams, A. (1999). Place identity and therapeutic landscapes: the case of home workers in a medically underservised area. Therapeutic Landscapes: The Dynamic Between Place and Wellness. A. Williams. New York, University Press of America.

Wilson, K. J. (2003). "Therapeutic landscapes and First Nations peoples: and exploration of culture, health and place." Health and Place **2003**(9): 83-93.

Chapter 2

ELMIRA IN THE TOWNSHIP OF WOOLWICH

2.1 Introduction

The purpose of this chapter is to offer background information about the study site and to provide a foundation for the analysis of people's understanding of environmental hazards. This chapter contextualizes the environmental crisis which occurred 1989 in Elmira in a synopsis of history from the 1940s to the present. The summary leads into the analysis of people's responses to risk and hazards 15 years after the major water crisis, and is further discussed in Chapters 4, 5, and 6 with respect to the Social Amplification of Risk Framework (SARF) and people's understanding of place.

The history discussed in the following chapter is predominantly based on media communication to the local communities. The local newspapers (*The Elmira Signet, The Elmira Independent, Woolwich Observer and The Kitchener-Waterloo Record)* documented the technological hazards confronting the local population and were the main source of information for local residents.

2.2 Study site selection

Elmira, a town located in Woolwich Township approximately 14 km North of Kitchener-Waterloo, is the primary study area for significant reasons (Figs. 2.1 and 2.2). For more than five decades, Elmira has been the subject of environmental concerns due to its industrial history that has resulted in toxic groundwater, toxic sediments and air contamination.

In 1989, the Ontario Ministry of Environment (MOE) detected high levels of contaminants in the drinking water and two main drinking water supply wells were permanently shut down in Elmira. However, it is not known for how long nor to what levels of contamination the affected communities were exposed. It is also unclear what potential health hazards exist (Brown 1992; Schettler, Solomon et al. 2000). The concerns are serious, and the long-term remediation of the contaminated municipal aquifer[i] was ordered by Ministry of Environment in 1991. The Township of Woolwich, the Waterloo Regional Community Health Department, and the local environmental organizations, Assuring Protection for Tomorrow's Environment (APTE), and the Environmental Hazards (EH) Team together with the Ministry of Environment, the Regional Municipality of Waterloo, and executives of the (Uniroyal) Crompton Chemical Company through the Crompton Public Advisory Committee (C.P.A.C) have been working towards the remediation and protection of the local environment.

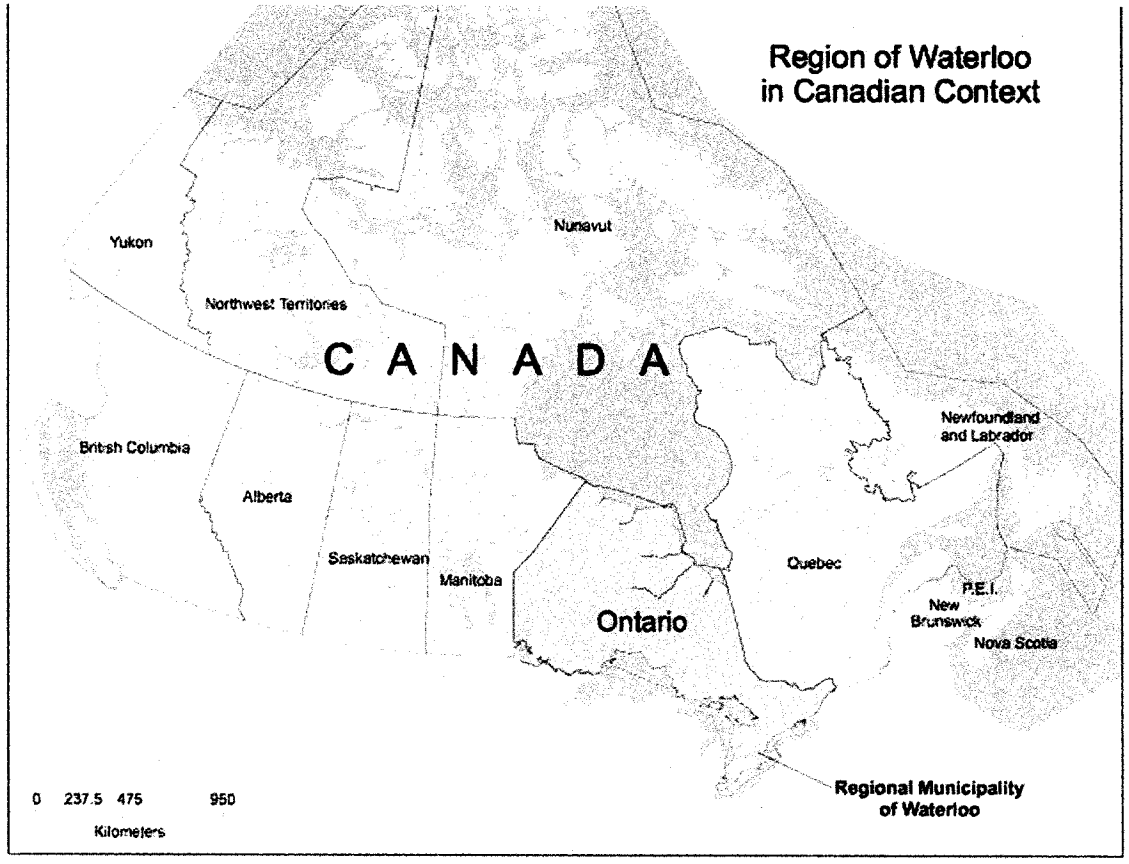

Fig 2.1. Region of Waterloo in Canadian Context. DMTI CanAtlas [NAIS]. Markham, Ontario: DMTI Spatial Inc., [2005]

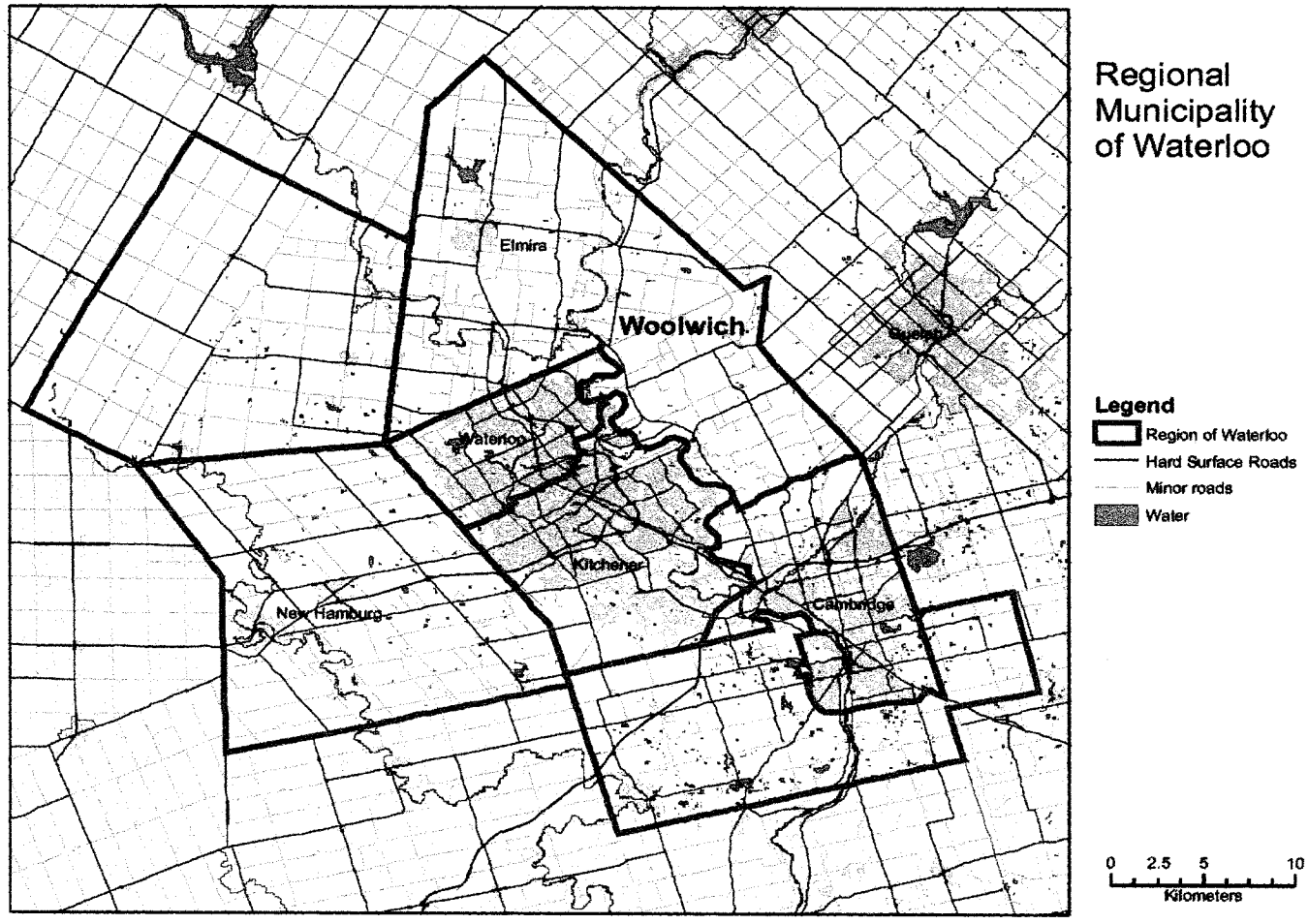

Fig. 2.2. Township of Woolwich, Ontario. Canada. DMTI CanMap Streetfiles [ONTARIO]. Markham, Ontario: DMTI Spatial Inc., [2005]

The local landscape is differentiated by the presence of large settlements of Mennonites living in rural communities surrounding Elmira. These communities have been extensively exposed to water and sediment contamination (Jaagumagi, Lomas et al. 1987; Awad and Hayton 2004). No geographical study of these communities was conducted to analyze their concerns and responses to technological hazards. A short history of the local contamination and a brief description of the physical environments provide the necessary background to the following case study.

2.3 Township of Woolwich – Community Profile

Woolwich Township is one of four rural municipalities surrounding the cities of Kitchener, Waterloo and Cambridge. The Township is known for its large Mennonite community, the annual Spring Maple Syrup Festival in early April, and for the historic covered bridge located in West Montrose. Originally, Huron Indians occupied the region. In 1784, the British government granted the tract to the Mohawk, who "later sold 45,000 acres to a company representing the Mennonites" (Wismer, 2000, p.72). Around 1800 Mennonite families began to arrive in Conestoga wagons to establish farms. By 1840 there were nearly 1000 Mennonites living in the Waterloo area (Fretz 1989). Several progressive and conservative branches of the Mennonites live in the township. The Old Order Mennonite people form the largest conservative group of about 2300 members

practicing the Anabaptist faith and a specific life philosophy, which can be readily identified as those who use the horse and buggy (Peters 2003).

The Township of Woolwich covers an area of about 330 square km. Table 2.1 provides the selected Census Characteristics (2001). The population of the Township is about 18,201 people. The major settlement areas are in Elmira, St. Jacobs, Breslau, Conestogo, Maryhill, Bloomingdale, Heidelberg, Floradale, Hawkesville, Winterbourne and West Montrose (Figure 2.2 Township of Woolwich). The rural character of the area is depicted by a population density of 55.8 persons per square kilometre in Woolwich, compared to 320.4 persons per square km in the Waterloo Region (Census 1996, 2001).

Table 2.1. Selected Census Characteristics (2001)

Characteristics	**Ontario**	**Woolwich**
Total population (2001)	11,410,046	18,201
Total population (1991)	10,084,885	16,758
Land area (square km)	907,655.5	323.99
Population density per square km	12.6	55.8
Age proportion <14	19.57	20.8
Age proportion > 65	12.9	14.0
Education level of population: Less than grade 9 Trade Certificate or Diploma College University	 8.73 10.18 23.68 26.28	 19.6 11.5 19.6 19.8
Average family income	$73,849	$83,007
Percentage of owner-occupied dwelling	67.8%	82.4%

Source: Statistics Canada (2001)

The proportions of urban and rural density have not changed noticeably in the last five years. Approximately 67% of households (4794 households) are located in these towns or villages and about 32% (2246 households) are located in more rural locations (Canada Post, 2004). The largest town, Elmira, had a population of 7,712 residents in 2003 (Ontario Population Report, 2003).
The population in the Township has aged lately and 14% of the residents were 65 years and over compared with 12.9% in the province of Ontario in 2001. Noticeably, the population in the Woolwich Township has more than double the ratio of residents with less than grade 9 education compared with Ontario (19.6 % compared with 8.73). As higher levels of education are not required for the majority of farming positions and some apprenticeships in these areas, the real difference in the Townships is based on the strict tradition of ceasing the education of Old Order Mennonite children at grade 8. The high average family income[ii] in the Township, much higher than in the rest of the Ontario, directly refers to cultural differences and points to the economic and cultural phenomena existing in the area. In mainstream society, a higher income is usually associated with higher education, however, within this community due to cultural differences, families are able to earn higher incomes through hard work on their farms without finishing high school. Family income in Woolwich Township was $83,461 and exceeded the average family income of $73,849 in Ontario (Statistics Canada, Census 2001).

High proportions of Woolwich Township residents own their dwellings (82.4), indicating a high level of ownership among the rural population. The Woolwich Healthy Communities Survey of Households found that individuals and families with low income must often leave the Township to find affordable housing (Woolwich Community Health Centre 2005).

A large number of people living in Elmira are attracted to the area by the predominantly rural characteristics. Many residents work in Kitchener or Waterloo and their presence in Elmira significantly changes the township's general statistics and brings other value systems into the residents' lives (Wismer 1999; Waterloo Region Community Health Department 2001)). Nonetheless, all these communities, urban or rural, were confronted with an environmental crisis generated by industrial actions of the local chemical factories.

2.4 Site history

The knowledge of local history is critical to an understanding of environmental hazards in place. Elmira's chemical manufacturing plants have played a critical role in the history of the communities surrounding the town and in the local populations' understanding of risk and hazard. A brief history of events as they happened in Elmira is presented in Table 2.2. They occurred slowly over a time span of more than fifty years and, as the table illustrates, they represent a complex amalgamation of events that transformed the communities'

loyalty and confidence in the chemical manufacturing industry into a humanitarian crisis and an environmental conflict situation which has become known as Elmira's 'toxic waste' problem (Bullock 1998). The purpose of the table is not to provide a documentation of local contamination but to highlight the environmental changes that have occurred in the local landscape.

Elmira's industrial history continues to touch the lives of many people: the residents of Elmira, employees of the plants and their families, local businesses, newcomers to the community and the lifetime residents of the rural communities surrounding the town. The children, who played in the yards in the 1940s and 1950s when pesticides were commonly sprayed in the town and those who swam in the Canagagigue Creek from the time of the plant's opening, are now the seniors who were interviewed in this case study. Their personal stories, their subjective experiences of risk, and their attitudes concerning those risks are embedded in the social, political and environmental history of the township.

In 1917, the Consolidated Rubber Company started production in Elmira. As a consequence of difficult economic situation in the country in 1929, the factory closed and moved to Quebec. However, the building remained intact. In the early 1940s, an American firm expressed interest in establishing a plant in Ontario. In return for opening the plant in Elmira, Naugatuck Chemicals Ltd. (Naugatuck) was offered a tax freeze worth $5,000 per year for a ten-year period. The company insisted on and received these economic concessions[iii] for several

years. Encouraged by the township's council, Naugatuck started its operation in 1941 at the site of the former Consolidated Rubber Company. The plant was welcomed by the community and offered a promise of continued prosperity to the town (Bullock 1998).[iv]

Table 2.2. A Brief Chronology of the Events in Elmira

Date	Event
1917	Consolidated Rubber Company starts its production.
1928	Closure of the company.
1941	Naugatuck Chemicals Ltd. begins its operation
1946	Elmira advertised as a "weed-free town" and a home of pesticides, DDT, 2-4 D
1946	First reports of food contamination and an abnormal testing of tomatoes[v]
1947	Over 90 percent of Elmira's property owners sign up to spray their lawns with locally produced pesticides
1950	Reports of air pollution and "unpleasant smells" Announcement of the first environmental plan: "Disposal of Chemical Waste Problem for Elmira Plant"
1953	Naugatuck workers' strike closes the plant
1953	The first concerns about pollution of the Canagagigue Creek, running through Naugatuck property and flowing into the Grand River. High counts of coliform bacteria. Ontario Health Department concludes that Elmira Township must construct a new sewage disposal plant to protect the Grand River – drinking water source for many communities.
1956	The Naugatuck company triples its size; economy is booming
1957	Naugatuck produces about 85 different chemicals in 10 buildings. It is called the most diversified chemical plant[vi]
1960s	Documented complaints in the local newspapers about odour, greasy soot, filthy children
1965	A new sewage treatment plant constructed (12 years after the recommendation from the Ontario Health Department) with the capacity to serve a population of 5000
1963	Science recognizes the devastating effects of pesticides on wildlife
1964	Air and water pollution bring strong comments from population, dying fish in Canagagigue creek
1965	23 cattle died from drinking water contaminated with carbon tetrachloride from Canagagigue Creek; loss and damage of 60 acres of land that had to be fenced along the river[vii]
1966	Run-off from Elmira's sewers is beyond the treatment of the new sewage facility; Industrial waste from the chemical plants is continuously dumped into the Canagagigue Creek
1969	Various reports documenting the damage to Canagagigue Creek and proposals to build dams to stop pollution[viii]
1971	Uniroyal introduces an "anti-pollution program" for its employees. It becomes evident that the underlying economic message of the program is to inform local government agencies that if regulations become too restrictive the plant will

	move out of Elmira.
1973	Uniroyal builds a new system to remove toxic phenols from the waste before discharging them to the Elmira sewage plant.
1978	Newspaper reports about bad tasting water[ix]; problems with smell; extensive testing of water for bacterial contamination is conducted.
1980	First concerns about health issues and speculations about cause-effects health issues: "a large number of skin rashes reported by a local doctor"[x]
1981	Increased problems and speculation about possible contamination from the town's dump to Elmira's water supply[xi]
1982	MOE sets up a 12 member technical committee to review the air and groundwater contamination problems
1982	Formation of Citizen's Environmental Advisory Committee (CEAC), also including MOE officials, representatives from Uniroyal (they refused to attend) and local television reporters
1982	CEAC opposes Uniroyal plan to release the water into the Canagagigue Creek
1983	Dioxin detected in shallow test wells on Uniroyal property
1983	Concerns with dioxin in local newspapers; A range of opinions from minor concerns to "absolutely terrifying"[xii]
1984	Accidents in the chemical plants, hospitalization of workers and rising public concerns[xiii]
1985	New chemicals are produced in Elmira resulting in the reduction of sulfur dioxide emissions
1986	Uniroyal sells the chemical plant for $760 million dollars to Avery Inc.[xiv]
1987	Major concerns about removal of hazardous waste from the Uniroyal site; 800 hazardous drums instead of 500 were buried at the property[xv];
1989	The plant is sold back for 800 million dollars to Uniroyal
May	The Uniroyal plant closes to receive MOE approval to build and operate a waste incinerator at the Elmira plant
Aug.	Chemical spill, unknown amount of toluene released into the atmosphere causes damage to approximately 130 vehicles[xvi]
	Residents annoyed by Uniroyal's lack of responsibility and denials that spill had ever taken place[xvii]
	Citizens concerns about health effects[xviii]
Sept.	Offensive smells from Uniroyal and problems with noxious odours spurs opposition to proposal to build a waste incinerator[xix]
	Formation of local environmental group Assuring Protection for Tomorrow's-Environment (APT-E)
Nov. 14	Water crisis in Elmira; detection of N-nitroso-dimethlamine (NDMA) critically exceeding guidelines[xx]; Shut down of two municipal wells by MOE

1989	NDMA contaminant found in two private wells, near the wells that have been shut down
	Uniroyal asked to abandon hazardous-waste incinerator proposal until the problems with water are solved[xxi]
	NDMA found at 2000 ppb in Uniroyal's wastewater entering the Elmira sewage-treatment plants and in effluent discharging into the Canagagigue creek at 50 ppb[xxii]
	MOE issues the first emergency control order against Uniroyal
	The plant complies with MOE restrictions as "this is the only thing to do as a corporate member of this community"[xxiii]
	Control Order by MOE; Regional Municipality of Waterloo and MOE demand that Uniroyal complete cleanup of its property
	Uniroyal initiates legal action to challenge the Ministry authority to prohibit use of the Elmira sewage plant"[xxiv]
1990 Jan. 26	Environmental Appeal Board accepts terms, and production at Uniroyal resumes[xxv]
Feb.	NDMA in wastewater exceeds limits agreed to with MOE
	RMOW chair makes arrangements for water to be trucked for Elmira's residents
	RMOW decides to construct a watermain from Waterloo to St. Jacob/Elmira to provide residents with safe water
April	Construction of water pipeline completed
1991	Submission of Spill Reduction Plan (SRP) by the company to MOE
	A number of charges brought by MOE against Uniroyal. For example: Uniroyal spilled 900 gallons of NDMA contaminated water at 300,000 ppt into the Canagagigue Creek and caused Waterloo to close 9 municipal wells[xxvi]
1993	Agreement reached between Uniroyal, Community, RMOW and the province regarding the remediation, sources, risk levels, and responsibility for the contamination
1999	Elmira's residents and the Community Health Department meet several times to examine residents' concerns about health effects
2003 Feb.	Human Health Risk Assessment Prepared by CRA Ref. No. 11725 (9) Elmira study shows excess cancer risk for employees and downstream creek users.
2006 July	Explosion at Crompton/Chemtura Chemical plant after 11:00 p.m. Another fire at the plant[xxvii]

During the first years of operation, the plant produced Aniline Oil, Thiokol[xxviii] and other chemicals needed to make rubber products for World War

II. Several articles in the local newspapers reported the community's pride in the new facility. Its new products mirrored the excitement of post-war technical development. In 1945, the plant started production of the insecticide dicholorodiphenyltrichloroethane (DDT)[xxix] and the pesticide 2-4-dichlorophenozyacetic acid (2-4 D or 2,4-D). The local media quickly quelled the community's initial concerns regarding the toxic residues from the chemicals.[xxx] Residents were assured that the chemicals were harmless. In 1946, the township announced a new marketing plan that would advertise Elmira as a "weed-free-town", the home of the pesticides 2,4-D. Consequently, in 1947 following the promotional campaign, over 90 percent of Elmira's property owners signed up to have their lawn sprayed to control the weeds (Table 2.2). The pesticides were commonly sprayed on all public property and on over 90 percent of private lawns. The township took pride in its local chemical industry.

Following World War II, there was little public awareness in the local communities of the toxicity of certain chemicals and their possible long-term effects (Brown, Zavestoski et al. 2001). A lack of knowledge left people generally unconcerned about having the chemicals on their skin or clothing and breathing them in the air. Even later, during the 1960s, when the US Army contracted Uniroyal, previously Naugatuck, to produce chemical herbicides for use in the Vietnam War, the issue of the production of the chemicals did not constitute a serious environmental concern among local residents. The company began

manufacturing the strongest systemic (or hormonal) herbicides invented - a particular mixture of the chemicals 2,4-D and 2,4,5 T, commonly called 'Agent Orange'[xxxi]. Agent Orange was used by the US Army to destroy enemy crops and to defoliate vegetated areas in the jungle. The product was not only extremely toxic itself, but its manufacturing process created extensive environmental hazards through the ongoing production of dioxins (CCME 1999; Palmer 2004). The various impurities and toxins which resulted from the pesticide's production were unidentified or unknown chemically at that time. Dioxins and phenolic chemicals were the regular byproducts associated with the production of Agent Orange which was manufactured in Elmira until approximately 1971 (Regier 2004).

The community's concerns regarding the quality of the local food were first reported in *"The Elmira Signet"* in 1946. Local residents expressed concern with the abnormal taste of locally-grown tomatoes (Table 2.2). The "mystery" of ill-tasting tomatoes was solved quickly by conducting a "scientific test" in the plant. readers were told that the taste was unconnected to pollution from the plant. The issue was dropped as people seemed content to believe what they were told, that the taste was not traceable to the chemicals produced in town.

In 1950, Elmira's residents were presented with a plan entitled "Disposal of Chemical Waste Problem for Elmira Plant"[xxxii] by the company. This was the era in which scientific knowledge was expanding rapidly and was generally

favourably received by mainstream society. It was also the era in which people believed strongly in the benefits of technological progress (Steingraber 1997). Their dissatisfaction with the noxious odours in the town, and their general concerns about safety were appeased with the local newspaper article entitled, "2-4 D Not Dangerous if Directions Followed"[xxxiii] which indicated that people should follow basic hygiene rules when using the product.

By the 1950s, Elmira had attracted several manufacturing companies, including the Elmira Shirt and Overall Company, the Great West Felt Company and the Elmira Furniture Company. However, Naugatuck was the largest local employer, having tripled in size since its opening, and had the strongest economic impact in the community.[xxxiv] The local media inflated the importance of Naugatuck to Elmira, and particularly the town's dependence on it (Bullock, 1998) leading local citizens to tolerate the frequent odours, spills and "greasy soot making laundry and kids filthy."[xxxv] For its part, Naugatuck ensured good relations with the town's residents by sponsoring sport teams, participating in blood donor drives, promoting cancer awareness programs, and organizing community picnics (Bullock, 1998, 51).

The issues surrounding the contamination of water were publicly acknowledged in 1953. A number of communities relied on the Grand River as their main source of drinking water so the Canagagigue Creek, which is a tributary of the Grand and runs through Naugatuck property, was checked by the

Ontario Health Department following complaints. Tests detected unacceptably high levels of bacterial contamination in the Canagagigue Creek which led the Ontario Health Department to recommend that Elmira Township construct a new sewage disposal plant to protect the water[xxxvi] but which ignored the industrial contamination. In spite of the evidence of chemical contamination, local politicians felt that Elmira's industries did not contribute substantially to the pollution of the Grand River in comparison with other communities along the watershed and decided not to follow the provincial Health Department's advice. The council informed the general public of their decision through the local newspaper: "Canagagigue Almost 'Safe', Why Spend $150,000 –Council."[xxxvii] It was not until twelve years later, in 1965, that a new sewage treatment plant was built in Elmira with a capacity to serve a population of 5,000 people (Bullock, 1998, 53).

During the 1960s, Rachel Carson's groundbreaking work "Silent Spring" highlighted the devastating effects of pesticides on wildlife. The local newspaper *The Elmira Signet* informed Elmira's residents about the new regulatory processes concerning the use of pesticides[xxxviii] and people learned about the dangers of organic chemicals and the environmental damage caused by their use. At about the same time, there were several published reports linking chemical spills in Canagagigue Creek to the death of fish and of cattle drinking water from the Creek (Table 2.2, Bullock 1998). By now the sewage treatment plant had been

built, but within only one year of its construction, the new waste treatment facility was found to be unable to treat the industrial water from Naugatuck, and run-off from Elmira's sewage was beyond its capacity[xxxix]. The result was that the industrial wastewater from the company continued to be dumped into Canagagigue Creek (Bullock, 1998). Two years later, the environmental damage was so severe that proposals to build dams to stop the pollution and to begin a program to protect the environment appeared on the front pages of local newspapers and continued to do so over the next decade (Table 2.2).

In the late 1960s, the company, by now renamed Uniroyal[xl], continued to demonstrate a lack of concern over water quality. The company's attitude led to the gradual erosion of the previously established relationship of trust with the public (Bullock 1998). The local media reported the plant's position regarding the "anti-pollution program", in which the underlying message was to inform local government agencies that if regulations became too restrictive, the plant would move out of Elmira. Playing on the town's dependence on the company, Uniroyal's management announced that: "One of the prices we do not want to pay for a better environment is the loss of our jobs or the means of earning a living" (Bullock, 1998, 56).

The early 1980s saw growing concerns about health issues, intolerable water quality, poor sewage treatment, and offensive smells from Uniroyal (Table 2.2). People became concerned about chemicals from the town's dump leaching

into Elmira's water supply, and possible leaks from the plant's toxic waste pits. Dioxins and DDT were already detected in the shallow wells near the plant and concerns about their harmful effects were reported to the community (Fig. 2.3) 2.3). The number of complaints to the Ministry of Environment (MOE) about air quality was growing and air pollution tests were conducted in 1981. The results showed 20 chemicals, many of them listed as hazardous, present in Elmira's air.[xli] The concentration of organic chemicals drifting in the air could be so strong at times that the paint on cars was damaged at the plant's employee parking lot (Bullock 1998, 58).

In 1981, the MOE ordered Uniroyal to clean up the contamination on its property and recommended that the company begin a process of pumping out the contaminated water under its property for industrial use (ibid). The company did not comply and the spills to the Creek continued. As a result, in January 1982, Uniroyal pled guilty to spilling over 9000 pounds of organic chemicals into the Canagagigue Creek in November 1981 and was fined a mere $2,500 for the spill (ibid).

Concerns from the public over health problems rose after a number of accidents in the chemical plant. For example, leaks of hydrogen chloride gas, the hospitalization of four workers and the explosion of a tank on the plant's property were reported in the local paper[xlii]. Also, as time progressed, the public learned about the impacts of dioxins on human health. Previously the Ministry had

argued that the level of dioxins present in Elmira were in quantities too small and "causing little alarm" but subsequently, in the opinions of some scientists, the levels were considered to be "absolutely terrifying" (Bullock, 1998, 62). The local newspaper played an important role in educating Elmira's residents on the technological hazards and risks to human health associated with organic toxic chemicals. By 1981 the potential hazards of chemical production in the town led council to express its fears that Elmira was in danger of becoming the next Love Canal.[xliii] Finally, knowledge of the contamination of the local area became widespread and the public's awareness of environmental issues increased.[xliv]

Town residents frequently reported offensive odours to the MOE and demonstrated dissatisfaction with the way the Ministry was handling their complaints (Bullock, 1998). In 1982, the Citizen's Environmental Advisory Committee (CEAC) was established to review the groundwater contamination problems and discuss possible solutions to technical procedures (ibid). For example, CEAC opposed Uniroyal's proposal to pump treated contaminated water into the Creek since the company refused to reuse it as industrial water. The CEAC committee expressed its concerns that the pollutants entering Canagagigue Creek might endanger water quality for the communities downstream.

Testing and monitoring of air and water continued during the 1980s and showed high levels of phenols in wastewater both from Uniroyal and the town, which failed to meet the MOE standards.[xlv] Letters published in the local press

asked about the relationship between poor water quality and the contaminants but the public was assured that the "water was safe even though little was known about the contaminants" (Bullock 1998, 58).

Environmental problems were becoming a significant problem in Elmira. In 1985, Uniroyal announced plans to remove buried drums containing hazardous material from the plant's property. The following year, in May 1986, the media announced that the Uniroyal Company had been sold to Avery Incorporated[xlvi] for $760 million. The change of ownership did not resolve the issue of the stored hazardous wastes. In the summer of 1987, 800 drums of hazardous chemicals were excavated at the property and the problems of waste disposal became urgent. For the first time, Uniroyal's technical manager expressed the need for a new hazardous facility in Canada (Bullock, 1998, 63). Two years later, in April 1989, the management of Uniroyal purchased the plant back for $800 million and closed it in order to receive a MOE approval to construct a waste incinerator at its Elmira property (Cameron, 1991). According to Bullock (1998) Uniroyal's project to build and operate a waste incinerator at the Elmira plant had been planned for at least last three years and the MOE had already approved the project in principle (64).

The company's relations with the public worsened throughout the 1980s due to concerns with air quality. Exceptionally foul odours were produced from emissions of sulphur gas and the Elmira Independent newspaper reported

numerous complaints from residents. [xlvii] They were particularly annoyed by the lack of responsibility demonstrated by the company in refusing to acknowledge that a spill of toluene that had damaged more than 130 cars in the town (Bullock 1989). General dissatisfaction with Uniroyal and its environmentally damaging operations led to strong community opposition to the proposal to build an incinerator. A group calling itself Assuring Protection for Tomorrow's Environment (APT-E) made up of environmental activists argued that problems with the wastewater treatment at Uniroyal proved that the liquid waste incinerator should not be built in Elmira (Cameron, 1991, 142).

The controversy over construction of the incinerator was halted in November 1989 due to a more urgent problem – the discovery of the toxic chemical N-nitroso-dimethylamine (NDMA) in the drinking water (Table 2.2). The water crisis in Elmira drastically altered the perception of environmental hazards and people's understandings of place. It became evident that local residents knew that they and their children had been drinking water contaminated with NDMA, a substance which was considered a "suspected" human carcinogen at that time. [xlviii] By the end of November 1989, the Regional Council established a Community Health Committee in Elmira to deal with the crisis and established an information phone line for the public (Bryant, 1998). People were advised not to drink the water and arrangements were made for portable showers to be brought to town because exposure to NDMA in the shower was considered high

due to skin absorption and respiration. Unfortunately, many people did not follow the advisories and continued to drink the tap water since the smell and taste were no worse than usual (ibid).

In 1989, further tests revealed that not only was the drinking water heavily polluted, but also serious problems existed with Uniroyal's wastewater entering the Elmira sewage-treatment plant. NDMA was found at the level of 2000 parts per billion (ppb) in wastewater samples while the allowable limits of dimethylamine (DMA) were not to exceed 0.5 ppb (Bullock 1998). The effluents discharged into Canagagigue Creek were measured at 50 ppb (ibid). These levels prompted the Ministry of the Environment to issue its first emergency Control Order against Uniroyal (Cameron, 1991). The Control Order was intended to safeguard the flow into the Canagagigue Creek, and to protect the water in the Grand River. Despite the severity of the environmental pollution, the plant submitted an appeal to an Environmental Appeal Board hearing and was allowed to restart its operation on January 26, 1990 while the hearing continued (ibid). It was only after the local protest group ATP-E brought in an expert[xlix] from a cancer research institute in Maryland who was able to identify the carcinogenic effects of NDMA, that a strongly worded reprimand was issued against Uniroyal (Bryant 1998). In 1993 an agreement was reached between Uniroyal and the Regional Municipality of Waterloo (RMOW) and Uniroyal "agreed to pay $3 million to the RMOW for a new alternative long-term water supply, and an

additional $700,000 toward other costs incurred as a result of the water crisis (Bullock, 1998, 75).

In early March 1991, the RMOW released figures relating to the costs of the 1989 water crisis in Elmira. At more then $30 million, the final bill was substantial and included $6.4 million for a hydrogeology study, $3.0 million for the Waterloo to St. Jacob's pipeline, $3.4 million for the ultraviolet treatment facility, $2.3 million for the water supply study, $1.9 million in legal costs and $910,000 for the pipeline pumping station, among other expenses (Cameron 1991). The chemical company paid the cost of the pipeline and the local and provincial government covered other expenses.

In April 1991, the construction of a pipeline bringing water from the main Kitchener-Waterloo water supply was completed and most citizens of Elmira were no longer exposed to NDMA in their drinking water. Remediation of the contaminated aquifers has become an environmental priority and the work will continue for the next 30 years in Elmira. The cleanup of the groundwater entering the Canagagigue Creek began in 1995.[1] Monitoring of the entire remediation process is being undertaken by the Uniroyal/Crompton Public Advisory Committee, which has been holding regular meetings in Elmira since 1993. Public involvement and the community's stewardship are evident at the CPAC meetings. The local groups hire their own independent environmental consultants to work with the company's experts and the other agencies involved to obtain second

opinions on the technological aspects of cleaning the toxic chemicals from the contaminated aquifers.

Since 1991 Uniroyal has faced numerous charges with respect to further environmental infractions. For example, in 1991 the company spilled 900 gallons of NDMA contaminated water into the Canagagigue Creek which resulted in the temporary closure of nine municipal wells by the Region of Waterloo (Table 3.2). Yet Uniroyal paid a fine of only $16,000 to compensate for the damage caused by the spill. Since then the company has been charged with other minor environmental violations and improper storing of toxic wastes at the property (Bullock, 1998).

Recent fires at the site in June 2004 and in 2006 are a constant reminder to Elmira's citizens of the danger created by the manufacturing operations of the Crompton/Chemtura[li] Chemical Company. Residents are advised to follow the "Shelter-in -Place' alert, which is a part of the regular risk management emergency plan for the town. Sirens and bells now sound immediately after environmental emergencies occur and a special emergency phone line has been established to contact the citizens and advise them about procedures to be followed. Fundamental concerns exist around the safety of the local children. During a Shelter-in-Place alarm, citizens are advised to remain at home and to keep windows closed to shut out toxic emissions from the burning chemicals. Despite these safety precautions, there are still concerns regarding the

effectiveness of the procedures and the efficiency of the emergency response. In particular, there is concern that because there are no full-time employees at the town's fire hall, a siren has to be activated on the company site rather than from the town fire hall.

Since 1993, the residents of Elmira have been requesting a local health study to determine if their health profile is different than that of other communities. An Industrial Air Emissions Survey was completed in Elmira in 1999 which showed that of about 800 respondents, a total of 268 people reported health effects due to industrial air emissions (WRCHD, 2000). However, a health study specific to the town of Elmira has not been conducted despite ongoing requests from several groups in the community. The Waterloo Region Health Department analysed general epidemiological data and trends of morbidity and mortality trends for many specific endpoints (e.g. asthma, cancer, birth defects) in Woolwich Township and did not find statistically different results in comparison with the rest of the province (Waterloo Region Community Health Department 2001). These analyses were conducted on the township's population of about 15,000 residents, but the data for the population of Elmira were not reported separately due to concerns about confidentiality issues.

The Township of Woolwich has implemented several programs such as the Healthy Communities Program in the communities surrounding Elmira to

enhance the health of its citizens (Wismer 2000). The Woolwich Community Health Centre (WCHC), located near St. Jacobs, expanded its services to respond more effectively to the needs of the local citizens. WCHC is an innovative facility, which recognizes the cultural diversity of the many Mennonite communities in the area.

During the interviews conducted by the researcher for this study, participants referred frequently to events listed in the Table 2.2 while describing environmental hazards and their own understanding of the physical, social, and political environments in which they live. It was noted that the actions and involvement of local environmental activists, their dedication to communities surrounding Elmira, and their courage in proclaiming the rights of all residents to uncontaminated air, water and land, positively influenced how environmental problems were handled from 1989 onwards.

The major chemical industries, including Naugatuck/Uniroyal/Crompton operating at the same local site, were responsible for most of the contamination of Elmira's aquifer, and contamination of local water, air and soil. However, other smaller chemical plants in the town contributed to the hazardous contamination of the environment and created additional technological hazards. Among these were Varnicolor Chemical Ltd., Heinz Pet Food, Sulco, Procast, Nutrite Inc., Scavenger and a few smaller companies.

Manufacturing operations in Elmira have demonstrated that they value profits over ecologically sound practices. After almost 70 years of manufacturing activities in Elmira, extensive damage is evident in the physical environment. The three following subsections, Contamination of Water (Section 2.4), Contamination of Sediments (Section 2.5) and the Contamination of Air (Section 2.6) summarize the environmental degradations and provide more information about the study area.

2.5 Contamination of Water

Three waste streams (solid, liquid waste and wastewater) were associated with production of chemicals for the production of rubber as well as highly toxic herbicides and pesticides, including Agent Orange. The chemical plant produced more than 50 million pounds of specialty products annually. Contamination with Dichlorodiphenylthrichoroethane (DDT), and metabolites Dichlorodiphenyldichloroethane (DDE), Dichlorodiphenlydichloroethlne (DDE), dioxins, benzohexochloride among many other chemicals [lii] is still present in the water and on-site soil. The hazardous wastes were emitted to the surrounding physical environment. In particular, for many decades, wastes were dumped into the Canagagigue Creek and were carried downstream through the farmlands to the Grand River. Hazardous wastes from the industrial site percolated into the soil, were buried in pits, and were carried underground by water currents in the layers of aquifers as well as in the surface water of the Canagagigue Creek. There are

three aquifers under the plant, at varying levels. The aquifer nearest the surface (Upper Aquifer-UA) is highly contaminated. The aquifer below that is the larger aquifer which supplied drinking water for Elmira (Municipal Aquifer- MA). It was also contaminated. The size of the third aquifer, which rests on bedrock under the two contaminated ones (Bedrock Aquifer-BR), is relatively unknown. It could extend from a few miles to a hundred miles and it could cause further contamination of the area.

In November 1989, the Region of Waterloo shut down the two main drinking water supply wells in Elmira after the Ministry of Environment (MOE) detected 40 ppb[liii] of N-Nitrosodimethylamine (NDMA). NDMA is a carcinogenic substance that may constitute a danger to human life or health (Appendix A). There was no standard then in Canada for NDMA, but the US EPA guideline was 14 ppt. Immediately, tanker trucks of water were brought for residents, and some owners of private wells were ordered not to shower in the water. The Region began to build an emergency pipeline from Kitchener-Waterloo.

In December 1989, the MOE issued an emergency Control Order against Uniroyal, prohibiting discharge of wastewater into the Elmira sewage treatment plant until the level of NDMA in their wastewater was significantly reduced. Contamination with NDMA was found in the surface water of Canagagigue Creek and downstream in the Grand River[liv]. Also in 1989, the First Nations reserve at

Ohsweken was force to close its wells, and other municipalities such as Cayuga and Brantford were affected.

In 1991, the MOE issued another Control Order against Uniroyal requiring that the company stop the flow of contaminants off site through all aquifers. It also required that the company clean up the contamination in the Municipal aquifer within 30 years, excavate several pits of waste buried on the site, and investigate and remove dense non-aqueous phase liquids (DNAPLs) from the site.

To conform to these requirements, in 1993, Uniroyal installed three pumping wells on the site to pump contaminated water from the municipal aquifer to be treated and discharged to the Creek. This pump and treatment system was intended to stop the flow of contaminants into that aquifer. The pumping will have to continue in perpetuity to limit the contaminants in the Municipal Aquifer. In 1997, under pressure from APT Environment, the company added 11 pump-and-treat wells along the Creek in the Upper Aquifer to prevent some of the contaminants from this shallow aquifer from running into the Creek and downstream. In 1998, the company excavated two pits of waste buried on the site. However, approximately 11 pits of buried waste remain unexcavated. Also in 1998, the company began a pump-and-treat system from four extraction wells installed off the site to clean the Municipal Aquifer. This off-site system has had many problems and operates only intermittently. Conestoga-Rovers and Associates (CRA), a consulting/engineering company, designed the On-Site and

Off-Site Collection and Treatment Systems of the contaminated aquifers on behalf of the company.

Since the 1990s, about 140 chemicals have been detected in monitored wells. These include not only NDMA but also aniline, toluene, benzene, chlorobenzene and many others. These toxic chemicals are still present in the groundwater and pose a constant hazard. One issue that hampers the long-range remediation of the aquifers under the site is the presence of DNAPLs. DNAPLs are clumps of low-solubility chemicals that sink into the ground and aquifers. They dissolve slowly, providing a continuous source of contamination to the groundwater. They are difficult and expensive to locate and to remove, and there are ongoing discussions at CPAC about how to address the DNAPL problem (CPAC, April 24, 2006). Currently, the DNAPL Investigation Work Plan (CRA, November 2006) outlines additional sampling to be done over the next year to pinpoint and set priorities for DNAPL remediation.

The exposure to NDMA through Elmira's drinking water ended in 1991 with the installation of the pipeline from Kitchener-Waterloo. The exposure to other chemicals might still continue from the shallow contaminated aquifer, which runs into Canagagigue Creek and to the Grand River. Many of the residents are concerned with the cumulative and synergic effects of exposure to organic chemicals taken in by the human body at trace or low-levels and the

scientific uncertainties related to long-term exposure (Jacobson and Jacobson 1996; Jorgensen and Halling-Sorensen 2000; Schettler, Solomon et al. 2000). Further concerns are presented with the regards to the contamination of sediments in the Canagagigue Creek.

2.6 Contamination of Sediments

The MOE's Canagagigue Creek sediment studies revealed high levels of dioxins and DDT compounds in sediments in 1996 and 1997 (CPAC 2003). While the sediments upstream of the Uniroyal property were not contaminated (Figure 2.2 and Figure 2.3), it was found that sediments were contaminated in and along the Creek on the site and downstream of the site to the Grand River. In the early 1950s the entire creek bed on the company site was deepened and the removed material was placed on the west bank of the creek. It is thought that this fill could have been a source of contaminated sediments to downstream areas (CPAC 2003). The presence of solvents, such as toluene, benzene and xylene in the groundwater (CRA1997) enhances the mobility of contaminants like DDT and dioxins.

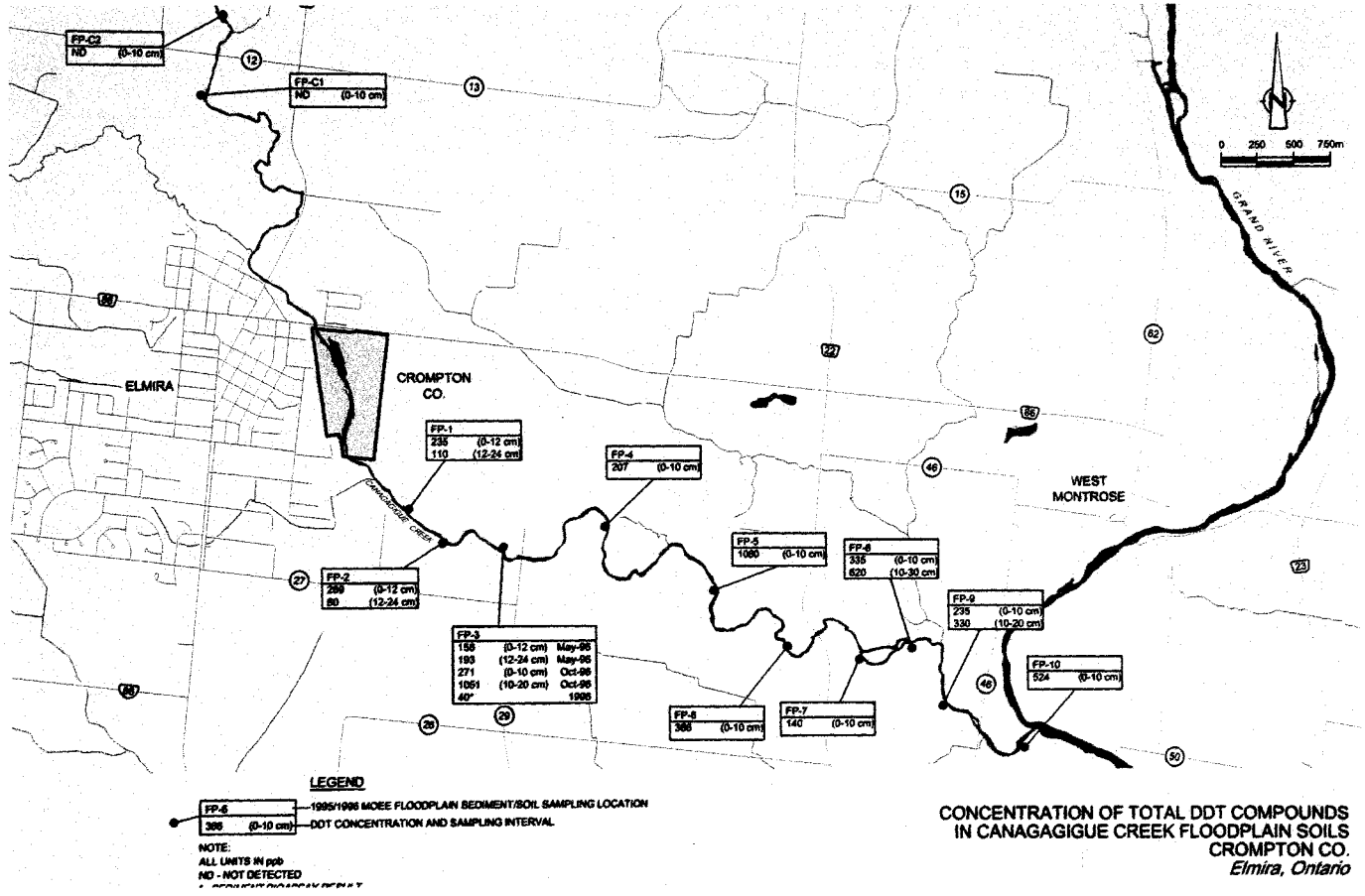

Figure 2.3. Concentration of total DDT compounds in Canagagigue Creek Floodplain Soil (Human Health Risk Assessment 2003).

During the remediation period of 1998 to 2000, part of the northwestern Creek bank on company property, which was a major source of dioxin and DDT compounds via erosion, was excavated and capped. Soil sampling conducted in 2002 showed that the concentration of dioxin and DDT had decreased in the sediments along the Creek. Future monitoring programs will be implemented to confirm the decrease of DDT and dioxin in the Creek's sediments. In 2005 and 2006, the company excavated and capped another portion of the Creekbank on the site. This area was contaminated with high levels of dioxins and DDT. It is hoped that future sampling will find a decrease in dioxin levels and DDT levels in the Creek as a result of these remediation attempts.

2.7 Contamination of Air

The quality of air has been a major health concern for the residents of Elmira for a couple of decades (Table 2.2). Elmira has long been known for the smell of chemicals in the air. In the survey completed by Woolwich Healthy Communities in 1998, the residents commented on air quality and unpleasant odours in the town (WCH 1998). In the late 1990s, there was an extended period of particularly noxious odours from the plant. Four neighbouring families living near the Uniroyal plant were forced to leave their homes on several nights in order to sleep, and they feared for their health. They complained publicly to the company and the MOE, but the situation did not change. The company claimed it

did not know the source of the odours and refused to do air sampling. Finally, the MOE undertook some air monitoring in Elmira, as well as training citizen volunteers from APT to do on-the-spot cartridge sampling in response to complaints. Table 2.3 documents the total number of odour complaints during that period which dropped from about a hundred in 1999 to about 40 in 2001. In 2000, a study of Industrial Air Emissions in Elmira was conducted by the Region of Waterloo Public Health and found that 30% of respondents living in the town were bothered by industrial air emissions. It was stated that 268 people, out of 800 respondents, reported having health effects due to the industrial air emissions (WRCHD[lv], 2000). In the fall of 2000, the most affected four families launched a $7.4 million lawsuit against the company, and at that point, the worst of the odours suddenly stopped. APT and CPAC members believe that the most noxious fumes during the period came from the company's practice of periodically 'dewatering' the sludge from its wastewater treatment in the open air. The lawsuit was ultimately settled out of court, with the company buying the four homes and the families resettling elsewhere. Currently, there are very few complaints about odours from the plant.

In general, air quality in the Waterloo Region is not very good. The Air Quality Index (AQI) is used to advise the public to stay indoors when the quality of air is poor. Smog advisories are in place mainly to protect the health of those with respiratory diseases, children under 18 years of age and seniors. Due to

cultural differences and lack of electronic technology, Old Order Mennonites are normally unaware of the smog advisories. Moreover, members of this community spend the longest time working outside regardless of the air quality.

2.8 Human Health Risk Assessment (HHRA) 2003

In February 2004, Conestoga-Rovers & Associates (CRA) submitted the Human Health Risk Assessment (HHRA) on behalf of Crompton to the Ministry of Environment (MOE). It reported that employees and trespassers at Crompton Company's chemical plant face higher than normal chances of getting cancer (HHRA 2003). In the general population, 395,000 of every one million people will develop some form of cancer and this figure (39%) constitutes the normal rate. The study found that the greatest risk is for onsite trespassers who come in contact with contaminated soil on the plant's east side. At this location, the increased risk of getting cancer is estimated to be 2,600 cases of cancer per million higher. According to MOE regulations, anything more than one case in a million higher than the normal rate is unacceptable.

The Ontario MOE acknowledged (CPAC 2004) that the calculated excess cancer risk from 1.9 to 3.7 cases per million for the Old Order Mennonite families might be based on the underestimated exposures in the Canagagigue Creek floodplain (Conestoga-Rovers & Associates 2003). The MOE recommended that, since the cancer risk is already above the MOE standard, even without

considering the specific behaviour and lifestyle of the Mennonites, additional efforts should focus on remediation of the areas occupied by the Old Order Mennonites (MOE, Comment No. 16[lvi]).

In summary, the calculations of the HHRA confirmed that the carcinogenic constituents of concerns (COCs) generate unacceptably high levels of cancer risk after long-term exposure for local population. More intensive remediation at Elmira site is required to lower the risk to human health to the level acceptable in the province of Ontario.

2.9 Environmental Remediation

Since 1989, the Ministry of Environment and Energy staff, members of UPAC/CPAC (Uniroyal/Crompton Public Advisory Committee) and concerned citizens have contributed to the following improvements:

1) a new water supply for the residents of Elmira from the Kitchener-Waterloo water supply,

2) the excavation of some of the buried wastes on the site,

3) a containment and treatment system for the municipal aquifer on the site,

4) a number of monitoring programs (air monitoring, surface water monitoring, biomonitoring, groundwater monitoring in all aquifers),

5) ongoing negotiations with the company for a Comprehensive Long-Range Plan for the site,

6) the reduction of chemical odours from the plant, and

7) excavation and capping of portions of the contaminated creekbank on the site

It must be noted that the existing contamination, remediation of the environment and the possibility of a major environmental crisis (e.g. fire and explosions at the plant) are ongoing issues in the Elmira area.

A proposal to fence the banks along the Canagagigue Creek to prevent further erosion and distribution of toxic contaminants was recently introduced to the lawyer for the Mennonite community (Canagagigue Creek Watershed Group 2005). The official response to the proposal was not received during the time this case study was conducted. As well, no one in the community had contacted the Old Order Mennonites farmers to explore how they perceive environmental risks.

2.10 Summary

There are still many uncertainties regarding the environmental safety of the Elmira residents and the Old Order Mennonite rural community. The major environmental crises in Elmira took place between 1941 and late 1990s. The existing time lag of 15 years creates an opportunity to revisit the environmental issues and to examine the perceptions of environmental hazard in the area undergoing remediation. The brief history of the events presented in this chapter informs the reader about the ecological landscape of the area and the crucial role of local media in the communication of risk. The next chapters provide

information of the perceptions of health and environmental hazards as experienced by the people living in these local communities.

2.11 References

Awad, E. and A. Hayton (2004). Contaminant monitoring in forage fish and sport fish in Canagagigue Creek near Elmira, Ontario: 1982-2003. Toronto, Ministry of Environment: 24.

Brown, P. (1992). "Popular epidemiology and toxic waste contamination: Lay and professional way of knowing." Journal of Health and Social Behavior **33**(267-281).

Brown, P., S. Zavestoski, et al. (2001). "A gulf of difference: Disputes over Gulf War-Related Illnesses." Journal of Health and Social Behavior **42**(3): 235-257.

Bullock, N. (1998). The Construction and Conceptualization of Toxic Waste as a Social Problem. Sociology. Waterloo, University of Waterloo. **MA**.

Cameron, D. A. (1991). Water Woes. A Policy Analysis of the Elmira Water Crisis. Political Science. Waterloo, University of Waterloo. **MA:** 190.

CCME (1999). Canadian Environmental Quality Guidelines. Update 2 November 2, 2002. Canadian Council of Ministers of the Environments.

Conestoga-Rovers & Associates (2003). Human Health Risk Assessment for Canagagigue Creek. Waterloo, Ontario, Conestoga-Rovers & Associates: 80.

Fretz , W. (1989). The Waterloo Mennonites. A community in paradox. Waterloo, Ontario, Conrad Grebel College.

Jaagumagi, R., T. Lomas, et al. (1987). A study of the effects of in-place pollutants on the bottom water, sediments and sediment-dwelling organisms of Canagagigue Creek at the Uniroyal Chemical Ltd. Plant Elmira, Ontario. Toronto, Ministry of the Environment.

Jacobson, J. and S. Jacobson (1996). "Intellectual impairment in children exposed to polychlorinated biphenyls in utero." N Engl J Med **335**: 783-789.

Jorgensen, S. E. and B. Halling-Sorensen (2000). "Drugs in the environment." Chemosphere **40**: 691-699.

Palmer, G. M. (2004). "The legacy of agent orange: empirical evidence from central Vietnam." Social Science & Medicine **60**: 1061-1070.

Peters, J. F. (2003). The Plain People: A Glimpse at Life Among the Old Order Mennonites of Ontario. Kitchener, Herald Press.

Regier, H. (2004). Elmira's Legacy of Agent Orange and Related Tragedies. Elmira, Unpublished Paper by Professor Emeritus, University of Toronto: 15.

Schettler, T., G. Solomon, et al. (2000). Generations at risk. Reproductive health and the environment. Cambridge, Massachussetts, The MIT Press.

Steingraber, S. (1997). Living downstream: an ecologist looks at cancer and the environment. New York, Addison-Wesley.

Waterloo Region Community Health Department (2001). Summary Health Status of Woolwich Township Residents. Waterloo, Ontario.

Wismer, S. (1999). "From the ground up: Quality of life indicators and sustainable community development." Feminist Economics **5**(2): 109-114.

Wismer, S. (2000). Seeing the Whole Picture. Inspiring Change. Healthy Cities and Communities in Ontario. Toronto, Ontario Healthy Communities Coalition.

Woolwich Community Health Centre (2005). Community Needs and Capacity Assessment. Final Report. St. Jacobs, Ontario.

ENDNOTES

---

[i] http://www.ec.gc.ca/water/en/manage/poll/e_howgrd.htm accessed at 13 Jan. 2006

[ii] A census family is a couple who are married or living common-law (with or without never-married sons or daughters living with them), or a lone parent living with at lease one never-married son or daughters)

[iii] July 10, 1941 "Naugatuck To Employ All Local Help" *The Elmira Signet*

[iv] Nerrida Bullock, 1998 pages 47-79

[v] Sept. 12 1946 "Ill Flavoured Tomatoes Not Traceable to Chemicals" *The Elmira Signet*

[vi] Oct. 17, 1957 "Nagatuck' Most Diversified Chemical Plant" *The Elmira Signet*

[vii] Nov. 10,1965 "Cattle Death Question Also Compensation Matter" *The Elmira Signet.*

[viii] Aug. 26, 1970 "Canagagigue pollution among the worst in country" *The Elmira Signet*

[ix] April 12, 1978 "Officials Admit Elmira Water Has Abnormal Taste *"The Elmira Independent"*

[x] April 9, 1980 "Elmira still has water problem" *The Elmira Signet*

[xi] Nov. 19, 1980 " Ordinary garbage at Woolwich dump causing ground pollution" *The Elmira Independent"*

[xii] Mar. 23 1983 "Preliminary testing indicates minor concerns about dioxin *"The Elmira Independent";*
April 13, 1983 "Dioxin is a serious threat, but it is not yet a cause for alarm here *"The Elmira Independents"*
[xiii] June 27, 1984 "Leak of hydrogen chloride gas put 4 Uniroyal staff in hospital *"The Elmira Independent"*
[xiv] May 20, 1986 "Uniroyal chemical will be under new ownership" *The Elmira Independed*
[xv] Aug. 1987 "Final count of buried drums at Uniroyal could be 300 over the original estimate
[xvi] August 1, 1989 "Malfunction at Uniroyal results in localized chemical fallout" *The Elmira Independent*
[xvii] October 3, 1989 " Toluene fall-out did not damage the cars in Elmira says Uniroyal Chemical official" *The Elmira Independent"*
[xviii] August 15, 1989 letter to editor : "Are bad smells from Uniroyal dangerous to health?" *The Elmira Independent*
[xix] September 12, 1989 "Problems with 'wetox' at Uniroyal show why incinerator not welcome'. *The Elmira Independent"*
[xx] exceeding the U.S. Environmental Protection Agency's guideline of .014 ppb
[xxi] November 25, 1989 "Uniroyal Chemical asked to abandon hazardous-waste incinerator proposal *"The Elmira Independent"*
[xxii] Dec. 21"MOE suspects DMN was in the ground water under Uniroyal Chemical before the south wells were found contaminated" *The Elmira Independent"*
[xxiii] Jan. 9, 1990 :Uniroyal complies with MOE restrictions; most processes continue" *The Elmira Independent"*
[xxiv] Jan. 23 1990 "Uniroyal Chemical forced to stop using the Elmira sewage plant" *The Elmira Independent"*
[xxv] Jan. 30 1990 "Uniroyal can resume using sewage plant" *The Elmira Independent*
[xxvi] Mar. 26, 1991 "Uniroyal dumps 900 gallons of DMNA wastewater into Canagagigue creek" *The Elmira Indipendent*
[xxvii] July 20, 2006 "Explosion at Chemtura" *Elmira Independent*
[xxviii] June 17, 1943, "Naugatuck Now Producing Vital Thiokol Rubber" *The Elmira Signet*
[xxix] Information about the chemical substances are included as Appendix 1.
[xxx] March 21, 1946 "Re Weed-Killer" *The Elmira Signet*
[xxxi] The stripes on barrels containing a particular mixture of 2,4,-D and 2,4,5-T were orange, hence the name 'Agent Orange'
[xxxii] October 5, 1950 "Disposal of Chemical Waste Problem For Elmira Plant" *The Elmira Signet"*
[xxxiii] August 30, 1951 "2-4 D Not Dangerous if Directions Followed" *The Elmira Signet"*
[xxxiv] April 23, 1953 "Chemical Workers On Strike Close Naugatuck Plant Down" *The Elmira Signet"*
[xxxv] April 27, 1957 "Housewives Irate, Greasy Soot Pollutes Air, Washday Spoiled, Children Filthy" *The Elmira Signet*
[xxxvi] October 15, 1953 "Test Shows Bacteria Count Too High in Canagagigue Creek" *The Elmira Signet*

[xxxvii] October 22, 1953 "Canagagigue Almost 'Safe', Why Spend $150,000 – Council" *The Elmira Signet*
[xxxviii] July 10, 1963 "Water Pollution Control Plant Opens June 9" *The Elmira Signet*
[xxxix] Dec. 29, 1965 "One Major Problem Facing New Council a Headache" *The Elmira Signet*
[xl] In September 1966 the Dominion Rubber Company including Naugatuck changed its name to Uniroyal Chemical
[xli] Sept. 9 1981 "Air pollution test shows 20 chemicals over Elmira, including some hazardous ones" *The Elmira Independent"*
[xlii] July 25, 1984 :Two Uniroyal workers escaped in time to avoid serious injuries from explosion: *The Elmira Independent*
[xliii] Aug. 19, 1981 "Chemicals 'could be' contaminating Elmira water" *The Elmira Independent*
[xliv] Nov. 2, 1983 "Elmira's residents want information, action on Uniroyal" *The Elmira Independent*
[xlv] July 16, 1980 "Uniroyal official annoyed by comments on chemical wastes" *The Elmira Independent*

[xlvii] Oct. 6, 1987 "Uniroyal waste clean-up must be halted; odour problems must be resolved first" *The Elmira Independent*
[xlviii] In 2003, NDMA was considered a "proven" human carcinogen and it was added to the Environmental Health Protection Act.
[xlix] Dr. William Lijinsky, Cancer Research Institute, Frederick, Maryland
[l] Aug. 21, 1995 "Uniroyal to start cleanup of Canagagigue this year" *The Elmira Independent*
[li] Crompton Chemical Company was renamed Chemtura in 2006
[lii] Crompton Public Advisory Committee, 2004

[liii] ppb – parts per billion; ppt – parts per trillion
[liv] Also in 1998, the company began a pump-and-treat system from four extraction wells installed off the site to clean the Municipal Aquifer.
[lv] Waterloo Region Community Health Department (WRCHD)
[lvi] April 30, 2004, Responses to MOE Comments on the Site Specific Risk Assessment for Sediments Crompton Co.

Chapter 3

METHODOLOGY

3.1 Introduction to the Research

The purpose of this chapter is to discuss the methodology used to compare perceptions of health, risk, and environment among members of the mainstream society residents of Elmira with a conservative group of Old Order Mennonites living in the surrounding agricultural areas in the Township of Woolwich.

Two qualitative methodologies were employed in the study design: grounded theory and ethnographic methodology (Dyck 1999; Hay 2000; Quinn-Patton 2002). The methodological design was guided by the ethical concerns of the study. It is important to acknowledge that including this closed community in the study was an intrusive act. Old Order Mennonites have purposely chosen to live their lives separately from the mainstream society, and thus strong arguments had to be presented to persuade this closed community to participate in the research. The extensive contamination documented in the area and the increased cancer risk for the population using the creek downstream from the chemical plant (Conestoga-Rovers & Associates 2003) were compelling arguments which justified my conducting research with the Old Order Mennonites women in this marginalized community.

The first qualitative methodology used in this study was a three-year period of participant observation from 2002 until 2005. I made regular visits to the community, participated in public meetings, and attended meetings of the CPAC (refer to Crompton/Chemtura Public Advisory Committee, Chapter 2). This long period was beneficial in making personal connections with community leaders. After the three year period, I was able to identify tensions and gain an understanding of the impact of the local environmental crisis. The knowledge developed during that time, combined with open house visits to the chemical plant after the recent fires in 2006, allowed for a better understanding of the physical environment in the area. During the time of participant observation, I decided that the Old Order Mennonite ethnic minority group should be the primary focus of my field research given the length of time and the severity of contamination to which this group had been exposed.

3.2 Study Design

The research design involved the identification of three groups of individuals whose participation in the research was critical. The first group included professionals working in the community and in the health care field in Elmira. Information from this group was needed in order to gain a full understanding of the potential health problems that could arise as a result of the prolonged period of contamination to which members of the Elmira community

and Old Order Mennonites in the region had been exposed. A second group was comprised of women in the mainstream community in Elmira whose perceptions of health and risk would be compared with those of the Old Order Mennonites to determine how culture plays a role in conditioning such perceptions. The third group consisted of women members of the Old Order Mennonite community living in close proximity to the Canagagigue Creek in Woolwich Township that had experienced the most severe levels of contamination. Old Order Mennonites do not normally participate in research projects or in state programs (Good Gingrich and Lightman 2004; Hall and Kulig 2004) so the period of participant observation, attendance at the various meetings of concerned citizens of Elmira, and the time taken to gain the trust of one or two members of the Old Order Mennonite community who assisted me in the research were essential before I was able to identify and interview Old Order Mennonite women. This project anticipated conducting 10 to 15 interviews with Old Order Mennonite women which was a significant and unique feat as in the past nobody had conducted a similar research study with this group.

Interviews with the three groups identified were conducted in stages. This research design was intended to increase flexibility in case members of the Old Order Mennonite community refused to participate in the study. Applications to the Wilfrid Laurier University Research Ethics Board were submitted and approval to interview members of each group was granted as follows:

i. April 19, 2005, group I, to conduct the interviews with health professionals and community leaders;

ii. July 19, 2005, group II, to conduct the interviews with mainstream society women; and,

iii. October 18, 2005, group III, to conduct interviews with Old Order Mennonite women.

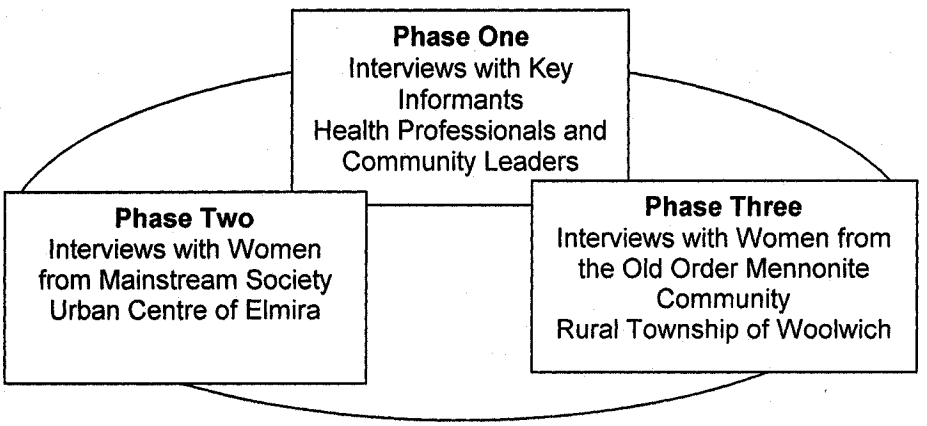

Figure 3.1 Three phases of semi-structured interviews: Phase One with Key Informants, Phase Two with Women from Mainstream Society, and Phase Three with Women from the Old Order Mennonite Community.

3.3 Study Groups

1) Who is the mainstream society in this case study?

Members of the mainstream society live a modern lifestyle. All participants in this group were required to be employed in paid employment outside the home. Participants were not excluded if they had been, or currently were, connected with the chemical company largely responsible for the contamination of the local area . To ensure a deep understanding of local issues, the research participants were required to have lived in the area for a period of at least 10 years.

The members of the mainstream society were further divided into a group of health and medical professionals and community leaders, and a group of women living in the urban centre of Elmira. Professionals and community leaders were asked questions about their perceptions of risks, and their knowledge of community issues based on their experiences, practices, and contacts within the community. They were not asked to provide personal information regarding their health and/or the health of their children, but to provide their opinions based on their experiences in the local communities.

The members of the group referred to as mainstream society women were asked questions regarding their perceptions of risk associated with the contamination and to provide information regarding their children's health. In addition they were asked to provide detailed demographic information including

year of birth, for themselves and their children. The cultural differences, education, and lifestyles that these women had were not very different from the members of the group called key informant professionals. The mainstream society women were not asked questions related to their professional experiences within the community.

All participants from the mainstream society were of Caucasian descent. Thirty members of the mainstream society sample were born in Canada , while three women were born outside the country (two key informant professionals, and one woman living in close proximity to the plant). The members of mainstream society were asked to provide basic demographic information about their education and the length of time they had lived or worked in the community.

2) **Who are the Old Order Mennonites in this case study?**

There are about 25 different Mennonite groups in Canada (Epp 1994). I planned to reach a very specific group of Old Order Mennonites, who belong to the Old Order Mennonite Church in Ontario. The purpose of including this group was to determine the role played by culture in conditioning perceptions of risk.

Although many Mennonite groups are considered Old Order because of their lifestyle that includes the use of the horse and buggy as their primary method of transportation, the responses of other groups such as the David Martins group, the Elam Martin group, the Hoovers, or the Orthodox Mennonites group may

differ from the Old Order Mennonite Church in Ontario due to slight variations in their cultural practices. The conservative groups should not be assumed to be homogenous though there is much resemblance among some groups of old order Mennonites or Amish (Peters 2003). This Old Order Mennonite Church group was selected because the group includes farm families, including practicing farmers, living in the closest proximity to the Canagagigue Creek, both upstream and downstream from the chemical plant and in the rural area close to the plant.

There are approximately 2,700 Old Order Mennonite Church members living in the Township of Woolwich (Old Order Advisory Group, 1999, Community Report, May 2005). The Old Order Mennonites are of Swiss/German origin, and their ancestors arrived in the Waterloo area in the year 1800 from Pennsylvania (Horst 2000).

3.4 Sample Recruitments

Due to the cultural differences existing among the various local communities, diverse methodologies were employed to identify potential participants from each of the cultural groups.

The key informants and professionals were selected in a purposive sampling to ensure that the sample was "information rich" (Limb and Dwyer 2001; Skelton 2001). The key informants were identified from a list of health, government, and community organizations that operate locally. Individuals were

invited to participate through an introductory letter and a follow-up telephone call to determine their willingness. This group was composed of family physicians, community nurses, public health professionals, a midwife, and four local community leaders. A range of professionals was required to ensure that all areas of concern could be addressed; health professionals, in particular, have very specific areas of expertise and might not have been able to answer questions concerning the risks to health posed by environmental contaminants for women and for children. Consequently, I selected different participants to address different concerns. One key informant declined to participate in the study, citing a busy schedule as the primary reason. Individuals among the selected professionals then proposed the names of three other possible participants and one of them identified another person (Snowball Level 2) who might have valuable information regarding the concerns of the study (refer to Table 3.1).

Women comprising the mainstream group were identified through a mix of sampling techniques: self selection in response to advertisements, and through a combination of purposive and snowball sampling methods. On July 30, and again in August of 2005, two advertisements and one short notice of research were placed in the community newspapers, *The Woolwich Observer* and *The Independent*, to reach the women living in the urban centre of Elmira and to seek their participation (Appendix B).

In response to these advertisements, five women from the mainstream society volunteered to participate. Using purposive sampling, an additional four potential participants were identified based on location of their homes that were close to the plant. Three of these were invited by telephone to participate in the research following recommendations by one of the self-selected participants. By using a mix of purposive and snowball sampling methods, an additional six women were identified from different geographical locations and different distances from the chemical plant in Elmira. Interestingly, I found out later that the son of one participant, and the husband of three of the women currently worked or previously had worked in the chemical company. One of the self-selected women (not included in Appendix A) was not eligible to participate due to her five-year residency in the area. Two of the women participating in the study had also worked in the local chemical company in the past. A summary of the participants is shown in Table 3.1.

Table 3.1 Sampling methodology and selecting respondents for the research

Group	Methodology	Direct Contact	Snowball Level 1	Snowball Level 2	Total
Key Informants	Purposive	10	3	1	14
Women: Mainstream Society	Self selected from Advertisements Purposive	5 4	3 6	 1	19
Women: Old Order Mennonite	Using "Gatekeeper" Purposive	1 3	11		15
Total					48

As mentioned before, the greatest methodological challenge occurred during phase three of the research. A local community leader, who is also a respected town resident, tried to make introductory telephone arrangements for me visit one of the Old Older Mennonite homes in early spring of 2005. The leader had met an Old Order Mennonite man previously whom she knew was considered to be a 'cultural broker' with regard to local environmental issues as previously he had participated in one of the CPAC meetings in the Township. As the term "cultural broker" applies to informal helpers mediating solutions to problems for this conservative community (Good Gingrich and Lightman 2004), it seemed likely that the success of the study rested upon his willingness to

provide access to the Old Order Mennonite community to ensure participation by women in the research.

When I was ready to begin work on phase three of the study I contacted the community leader and a public health professional and asked whether they would be able to introduce me to members of the community. Both women agreed to make an introductory contact with the Old Order Mennonite cultural broker and a meeting was scheduled for November 16, 2005. The community leader and the public health professional had enjoyed only limited contact with the Old Order community during their almost twenty years of working in the local area. The visit to the Old Order Mennonite home was a special cross-cultural event for all the participants.

During the meeting, I was asked to present the questions to the cultural broker and his wife to obtain their assessment of the appropriateness of the study for their community. I presented the simplified information letter, a consent form, and the questionnaire on women and children's health, along with an interview guide. I was asked a number of questions but by the end of the evening I was informed that the cultural broker and his wife would support me in my study. The wife of the cultural broker became the "gatekeeper" for members of the community[1] and arranged for me to visit the farms that I had chosen based on their geographical location. The 'gatekeeper' was able to speak to a few of the

[1] "Gatekeeper – an individual with a special group status who could lead the researcher to other key informants" (Jackson, 2003, 147).

women after Sunday services immediately following our initial visit, and from these conversations I was provided with the names of six women. In total, the gatekeeper made the initial arrangements for 11 interviews. Subsequently, I made individual arrangements by phone, calling their homes and scheduling a home visit. If the Old Order Mennonite woman was alone, she would take a message and later ask her husband for the most convenient time for the interview. It was interesting to note that in all cases the wives followed the formal procedure of confirming the arrangements for house visits with their spouse.

Frequently, before the dates of interviews, I drove out to the farm to familiarize myself with the local area. Only once, a meeting had to be rescheduled due to the participants' change of plans as the family need to drive some new furniture to their married daughter and did not want the furniture to get wet on a buggy.

I was late for one interview, but the participant was fully aware of the circumstances. Due to heavy snow, my car slipped off the edge of the road and ended up in the field. Five Old Order Mennonite men who were building part of a house for their parents to retire to (a so-called "doddy house") helped me and pushed the car out of the ditch. That particular interview was very successful and seemed to break the cultural 'ice'. Thereafter, I felt that individuals did not question my temporary presence in their community.

After interviewing 12 Old Order Mennonite women, I decided to try another method to gain the participation of more Old Order Mennonites. By this time I had gained the trust of the community to such an extent that the gatekeeper gave me a copy of their church book with all the names, birth dates, and addresses of the Old Order Mennonite community living in the Region of Waterloo. At that time, I felt comfortable in the community and directly approached two single Old Order Mennonite women, whom I informed about my project in their community. They agreed to participate in my study and provided me with additional information regarding women's health issues in their closed community. A summary of participants from the Old Order Mennonite community is provided in Appendix C.

3.5 Data Collection Instruments and Process

1) Mainstream Society

Prior to entering the community I prepared a list of topics to be covered during the interviews with selected members of mainstream society. The interviews with key informant professionals were conducted in homes or in professional offices and lasted from approximately 40 to 90 minutes. As described in the previous section, the questions pertained to their personal opinions about risk and background information and context regarding the health issues of women and children affected by the industrial contamination.

The interview guide is presented as Appendix E. The key informants provided information-rich data and I was able to learn more general information about women and children's environmental health issues. The perceptions contributed by the key informant professionals were used to inform Chapter 5 of the thesis on Risk, and their observations were important to complete and enrich the chapter regarding local perceptions of health and environmental links. The information from the key informant professionals was not used in Chapter 4 (Therapeutic Landscape) as that chapter has focused on people's understanding of their personal health experiences in the local environment.

Detailed analysis of the interviews with the key informants led me to prepare a comprehensive plan of research with women from the mainstream society in Elmira. The preparation involved creating a list of topics and interview questions which could be used both with the mainstream group and with the group of Old Order Mennonites in order to compare perceptions of risk and health across cultures and ethnicities. The question guide and a short questionnaire are attached as Appendix F and Appendix G respectively.

A mix of closed and open-ended questions were used to provide participants with with a variety of question types. Children were not interviewed, but the information obtained from their mothers pertaining to the perceptions of their health was central to the study. This geographical research examined the perceived impacts on women's and children's health in their community context.

The data were collected through a short questionnaire and by tape recording the interviews. All women from the mainstream society granted me permission to audiotape the interviews.

I interviewed 14 key informants representing different professions and living in the community. In interviews with the mainstream group, data saturation was reached after conducting 20 interviews. One participating woman was not included in the analysis since she had not lived in the area for the required minimum of 10 years. Participants were provided with an identification number to ensure their anonymity, for example, W0S19 refers to interview number 19 with a mainstream woman whose participation was gained using the snowball sampling methodology.

2) Old Order Mennonites

The information letter to be used to conduct research among the Old Order Mennonite community and attached in Appendix H was prepared with the help of a woman who grew up in the Old Order Mennonite community, but was no longer a member. She helped draft the letter and explained that the Old Order Mennonites would not understand my desire to speak directly with the women, since women have no secrets in this community. As puritanical principles guide the beliefs around sexual health and pregnancies, I was advised that it was not appropriate to ask questions on these topics. Consequently, I prepared a

questionnaire, which was more appropriate according to their cultural norms to focus on women's reproductive health issues (Appendix G). The face-to-face contact with Old Order Mennonite women permitted closer personal interaction resulting in deeper responses to all the questions.

A few of the Old Order Mennonites tested me to see if I was able to understand their Low German dialect, known as Pennsylvania Dietch. My lack of understanding forced them to use English during the interviews. All of the interviews were conducted in English. Out of respect to the Old Order Mennonites' beliefs about electronic technology in their homes, the interviews were not taped. I took detailed notes, asked the Mennonites to write comments directly on questionnaire, and asked them to repeat points that I considered important.

It is not customary for the Old Order Mennonites to welcome an outsider into their homes. My visits were acknowledged as non-regular events. I was successful in making a written record of the women's responses to questions and often added men's comments as well, so as not to damage the reporting process. After conducting five interviews, the Old Order Mennonites' husbands began leaving me alone with their wives, thus allowing for longer personal conversations

Note-taking creates a serious data limitation and I had only a limited opportunity to note the responses. Immediately following the interviews, I

transcribed my notes, added field notes, and wrote my own reflections. Data saturation[2]was achieved very quickly, after conducting about 12 interviews, but since I was interested in interviewing women from a specific geographical location, I successfully contacted three additional Old Order Mennonite women whose responses are included in the analysis,

Academic research guarantees the anonymity of all participants, and pseudonyms were used while reporting the study findings. Appendix C presents the detailed summary of demographic information on the research participants.

3.6 Data Analysis

The primary method used in the research was that of semi-structured, in-depth interviews. In the local community context, the ethical norms of multiculturalism guided the interviews (Horlick-Jones, Sime at al. 2003). The collected data provided information on five major topic areas: understanding risk, general health perceptions of women and children's health, environmental concerns, and cultural differences among participants. Multiple forms of data were collected during face-to-face interactions with interviews participants, including transcripts of audio taped interviews with the members of mainstream society, transcripts of interviews from handwritten notes, quantitative

[2] Data saturation or redundancy was defined as the point when data collection was terminated because no new information is collected.

questionnaires/surveys of perceptions of children's health by their mothers, handwritten maps and a large number of field notes, and personal observations and reflections. The analytical approach used was inductive and data driven, and allowed me to respond to new information as it emerged from the data. Although the interviews were conducted in three consecutive phases, I constantly compared the data in all three phases for similarities and differences in perceptions.

The transcripts of the interviews with all participants were formatted into text documents and imported into a qualitative software package (NVivo). Line-by-line *coding* was completed using the computer software and the data were classified into preliminary *categories* of ideas called *nodes* (Richards and Richards 1994). During the analysis, 98 nodes were created representing the categories and subcategories of ideas. As the inductive process of studying the data progressed, the "*number of occurrences*" of themes that emerged during the interviews was considered the basic unit in making comparisons between the groups (Baxter and Eyles 1997). It is essential to note that due to the differences of data and comparing handwritten notes with the transcripts of audio recording I had to simplify the "number of occurrences" to the number of "*written and noted occurrences*" in the case of Old Order Mennonites. Due to the structure of data and its limitations, my analyses do not provide information on how many times the respondents repeated their ideas during the interviews.

Since grounded theory research is concerned with constructing theory, each research participant created a new opportunity to develop and add concepts to the theory of the links between health, risk, and environment. The themes mentioned less frequently are not necessarily less important in the study; all data provides valuable information to understand people's responses (Baxter and Eyles, 1997).

The presented quotations in the findings contextualize the thematic analysis. A small number of direct quotations recorded during the interviews with the Old Order Mennonites are presented in the reports. The rationale for choosing a quotation to be representative was based on three criteria. First, the quotation must be situated within a set of important themes that can be compared among the study participants. Second, the quotation must be understandable to a reader from mainstream society, who is not familiar with the ethnographic methodologies used in the study. Finally, the quotation was chosen if it excluded the possibility of identifying a study participant. This latter was especially important as only a very small number of farms are located along the Canagagigue Creek.

The findings from the data analyses included in subsequent chapters compare differences in perceptions; they are not designed to analyze in depth the understandings of a particular group of study participants. In the process of grounded concept integration and modification, the linkages which were made within the data resulted in the production of summary tables, figures, and models.

For example, the therapeutic landscape model (Fig. 4.5) or the model representing perceptions of links between environment and health (Fig. 6.4) simplify and effectively communicate the findings.

The rigour of the research was guided by concerns regarding *credibility* which, as defined by Jackson (2003), refers to the "accuracy of the description of the phenomenon under investigation" (Jackson, 2003; 183). The following data quality measures were implemented to ensure the rigour and trustworthiness of the research:

1) Three ethics reviews (arranged in April, July, and October 2005) were conducted for a specific group of study participants to ensure academic quality of cross-cultural research ethics approval does not ensure this – I would leave it out.

2) Diverse and multi-method sampling was used.

3) Pilot testing of three sets of interviews was undertaken with a few graduate students prior to the fieldwork.

4) All interviews were conducted by me, to maintain consistency.

5) The findings from three interviews were checked by participants to confirm the accuracy of the data.

6) An information session in December 2006 was conducted with the community environmental group to ensure the reliability of the research findings in the local context.

The study results have already had an impact on the community, as can be seen in their actions in developing local environmental policies and procedures to help protect the rural minorities.

In my research, *transferability*, or the ability to generalize or fit the study findings to other settings (Jackson, 2003; 183) was judged by the relevance of emerging themes to other studies of perceptions of environmental risks and health in places. The study findings were linked to the relevant literature. *Dependability,* "which focuses attention on the researcher-as-instrument and the extent to which interpretations are made consistently," was considered to minimize any variability in the analysis of the data (Hay, 2000; 186). Dependability was enhanced since I prepared the questions, conducted the interviews, and transcribed, coded, and analyzed the data. Additionally, a special effort was made to guard against researcher bias in cross-cultural studies so as to ensure *conformability* or in Jackson's words "the objectivity of the data" (Jackson, 2003; 183). While major differences in perceptions of study participants, different level of knowledge and of power, and different values are presented in the study, my position as a researcher is explicitly stated in the thesis to avoid bias.

3.7 Researcher Positionality

In the last section of this chapter, I comment on my own identity and reflect on conducting my fieldwork with the Old Order Mennonite community in the

Township of Woolwich. I conducted my research with the use of ethnographic methods to construct the insider's (*emic*) view of the world (Jackson 2003). By learning what people say and know, I explored their cultural knowledge in place. I learned about people's cultural behaviour at a community and at the household scale.

The two mainstream society women who introduced me to their community members have earned the respect of the Old Order Mennonite community during more than fifteen-years of contact. The Old Order Mennonites knew that I did not represent either the government or the chemical company responsible for contamination. They trusted that theie responses would be reported accurately. One Old Order Mennonite man, who represented their community at the CPAC meeting in 2003, shared his comments with me two years later in the following manner. In response to the report of the Ecological Assessment, he questioned the procedure used in the exposure assessments by asking why: "'They' tested foxes and rabbits for contamination with chemicals. Why did they not test geese swimming all time in the creek water?" (Old Order Mennonite man, farming by the creek). The Old Order Mennonite community has its own way of addressing and responding to local problems. Members believe that their community should avoid mixing with the mainstream "world." Their lack of trust in mainstream society is an additional reason why they prefer to deal with our world, "the world," in their own *separate* ways.

I found that using the Informed Consent Statement form was not culturally appropriate in this case study with the Old Order Mennonite women. Women do not sign forms and it was not customary for the anyone to ask them to do that. A few asked their husbands to sign the forms, and a few passed the forms directly over to their spouses. The fact that I came recommended by a "trusted source" was more meaningful to the families than our signatures on the Informed Consent Statement. In fact, the paper presented a barrier and one woman was even worried that she might break her community's rules. As a result, I stopped requesting signatures on the forms and instead asked for verbal consent.

This research posits multiple concerns of differences, inequalities, and power relations. I had to negotiate a research space for my fieldwork in two places. First, the fieldwork had to be permitted as contextual, ethical, and academic institutional reality. Second, the fieldwork had to be negotiated with the local communities. Approval to participate by Old Order Mennonites was granted in a very complex way as they are not interested in the production of knowledge or in issues of equity. For them it was important to know where I was born, and what language I speak at home (I was born in Poland and speak quite heavily accented English). They did not ask me personal questions during the research but I was able to sense their curiosity about me being an "outsider." One of the researchers with whom I had spoken prior to conducting my research predicted

that the Old Order Mennonites might like the fact that I had come from their "Old World."

The Old Order Mennonites positioned me and my project through their own understandings, and I was "othered" as are all outsiders. Clearly, I am not a Mennonite. The fact that I was wearing simple black dress and black sweater did not make any difference. It was not about my dress or my hair, my education or my car, but ultimately about me being "not them." During the time I spent in their community, I earned a "blurred status in my otherness." Old Order Mennonites joked about it and told me their own stories about meeting people who had never seen a Mennonite. For a short time I was an acceptable outsider, but I knew that such conversation, however humorous, would not change the cultural gap between us.

Being reflexive about my own positionality, I filled an "in-between" status and was aware of my educational privileges, freedom of making choices regarding my future and career, and the socio-economic context of cultural differences. But my position was not perceived by the Old Order Mennonite women as a position of an advantage. I was "othered" not because of my privileges or social and political power, but because I was "modernized" and there was, therefore, no place for me. The religious and culturally structured differences were pre-negotiated for me, and the distances (religious, spiritual, social,

educational, philosophical, political, and physical) could not be bargained in the context on this field research.

At the same time, I needed to guard my curiosity and focus only conducting semi-structured interviews and following the guide approved for me as a researcher. Guided by feminist methodologies which emphasized non-hierarchical interactions and mutual learning, I focused conversations so that I could talk directly to women. I quickly learned that only "good" and "official" responses to questions are husbands' opinions. My interest in children's health perceptions was understood, but the fact that I was not primarily interested in men's opinions was not. Thus, I needed to position myself in the context of the patriarchal field, where Old Order Mennonite men decide, and where *"our women do not have their own opinion."* I believed that the best way to engage in this learning process with the Old Order Mennonite community was to avoid taking any critical approaches.

I did not stop being reflective and I did not shift the research away from my belief in gender equity. In the process, I often wondered how my gender made this community more accessible to me. Were people more willing to speak to me because I am a woman? Did men feel less threatened by this 'outsider' because I am not a man? It appeared that over time, men did perceive me as less of a threat than was originally the case. This is illustrated by the fact that as time progressed during the research process I had several opportunities to be hosted by only women or to be left with women after a short welcome by their husbands.

Despite the topic of conversation which included discussions of women's and children's health which might not have been interesting for men in the Old Order Mennonite community, I felt comfortable meeting with both members present. In time, I became aware that Old Order Mennonite men were much more knowledgeable about environmental issues than women. In my last interview with a single Old Order Mennonite woman I asked if she knew why the women did not speak about the environment. Her response again positioned gender in the centre: *"They think this is their husband's work. Their husbands read the newspapers; they know more about these issues. It is related to their work. Women's role is different."* (Old Order Mennonite Woman, OO15). In the context of my research, where mutual respect and equity are embedded within broader social relations, no other explanations were necessary.

The findings that I report in this dissertation are true to the context of my own positionality. I must state that my subjectivity, an obligation to produce a certain research outcome (a doctoral dissertation), disciplinary boundaries, time limits, and institutional ethical review approvals and the negotiation of a "research space" in the fieldwork create additional layers to the production of knowledge. Reflecting on my positionality through the way "others" constructed their identity helped me more fully engaged in my own reflexivity. My analysis and reporting of the findings will always be interpretive and partial, but without this research

the story of local contamination and links to human health viewed through the eyes of Old Order Mennonite women would be still unknown.

3. 8 References

Baxter, J. and J. Eyles (1997). "Evaluating qualitative research in social geography: establishing "rigour' in interview analysis." Transactions of the Institute of British Geographers **22**: 505-525.

Conestoga-Rovers & Associates (2003). Human Health Risk Assessment for Canagagigue Creek. Waterloo, Ontario, Conestoga-Rovers & Associates**:** 80.

Dyck, I. (1999). "Using qualitative methods in medical geography: deconstrructive moments in a subdispline?" The Professional Geographer **51**(2): 243-53.

Epp, M. (1994). Mennonites in Ontario. An Introduction St. Jacobs Printery, Ontario, The Mennonite Historical Society of Ontario.

Good Gingrich, L. and E. Lightman (2004). "Mediating communities and cultures: A case study of informal helpers in an Old Order Mennonite community." Families in Society: The Journal of Contemporary Social Services **85**(4).

Hall, B. and J. Kulig (2004). "Kanadier Mennonites: A case study examining research challenges among religious groups." Qualitative Health Research **14**(3): 359-368.

Hay, I., Ed. (2000). Qualitative Research Methods in Human Geography. Victoria Australia, Oxford.

Horst, I. R. (2000). A separate people: An insider's view of Old Order Mennonite customs and traditions. Waterloo, Ontario, Herald Press.

Jackson, W. (2003). Methods: doing social research. Toronto, Pearson Education Services.

Limb, M. and C. Dwyer, Eds. (2001). Qualitative Methodologies for Geographers. New York, Arnold.

Peters, J. F. (2003). The Plain People: A Glimpse at Life Among the Old Order Mennonites of Ontario. Kitchener, Herald Press.

Quinn-Patton, M. (2002). Qualitative research and evaluation methods. Thousands Oaks, Sage.

Richards, T. J. and L. Richards (1994). Using computers in qualitative research. Handbook of Qualitative Research. N. K. Denzin and Y. S. Lincoln. Thousands Oaks, CA, Sage Publications.

Skelton, T. (2001). Cross-cultural research: issues of power, positionality and 'race'. Qualitative Methodologies for Geographers. M. Limb and C. Dwyer. New York, Arnold.

Chapter 4

"QUILTING": THE UNIQUE HEALTH CONNECTIONS IN PLACE. HEALTH OF OLD ORDER MENNONITES IN THE TOWNSHIP OF WOOLWICH, ONTARIO

Abstract

Over the last forty years, the town of Elmira, Ontario, and its surrounding agricultural lands have been the subject of environmental concerns due to exposure to toxic wastes produced during the manufacture of herbicides and pesticides. This case study contains the first geographical research conducted with individual members of the Old Order Mennonite (OOM) community that confronts diverse perceptions of health in the contaminated area. Perceptions of health and environment are examined through 34 in-depth interviews with OOM women and women from the mainstream society. This article explores the perceptions of people's well-being in place and broadens the understanding of therapeutic landscapes by incorporating religious beliefs and cultural practices. The findings reveal that the ethno-religious identities of the OOMs lead them to construct their life experiences into a group affirmation of difference, which may mitigate the disadvantages of their physical environment.

"... but we are the Mennonites. My daughter will get six quilted bed covers when she gets married" (Ellen, Old Order Mennonite Women)

4.1 Introduction

Health attitudes and behaviours differ noticeably among cultures and societies. This paper presents contrasting understandings of the local landscapes: the landscape of the mainstream society and the culturally different landscape of the OOMs. OOMs have developed strong links with the land through their culture and lifestyle. Horse and buggy transportation, a traditional way of dressing in black, and a legacy of Mennonite quilt-making in Ontario are symbols of their cultural identity. They believe that it is essential to live differently from the way the mainstream society does in a number of respects. As conservative Christian communities, they have accepted only certain aspects of modernization since the arrival of their ancestors in the Waterloo area in 1786 (Fretz J. 1989; Bennett 2003). Since the OOMs' orthodox lifestyle does not permit higher education and opposes social transformations, three generations work the land together. Thus, their "lifeline is tied to the land" and their human-nature interactions are fundamental to their long residence in the Region of Waterloo and in Canada (Bennett, 2003, p.169). The ethno-religious identity of OOMs is explicitly and implicitly built into the local landscape. Several generations have lived in the area since their arrival in the 1800s and their landscape has developed into a "placial icon" [Hopkins (1990) as quoted by Kearns and Collins, 2006, p. 234] that indicates a heritage site specific to a "regional" identity of the Woolwich Township. As these meanings have cultural and historical values, what underlines

them in everyday life is the robust barrier between them: Old Order Mennonites—"the others,"—and the mainstream society—"the world."

Research on comparing and contrasting health perceptions of closed, ethnic minority groups requires a theoretical framework that can examine notions of pluralism and incorporates multiple voices describing health issues. The metaphor of therapeutic landscape or *places where place itself works as a vector of well-being* has been incorporated from cultural geography and evolved into a wider concept related to the promotion of health (Gesler & Kearns, 2002, p. 5). As Gesler (1992) originally proposed, the specific landscapes not only provide for one's identity, but also provide the social network creating the setting for therapeutic healing. The healing environments, which comprise natural, built, and symbolic attributes of place, create a therapeutic landscape for people and allow healing processes to take hold (Gesler 2003). Research examines the healing powers of natural and built environments and develops them into practical programs, experimental hospitals, and children's or seniors' centres (Kearns and Barnett 1999; Williams 1999). For example, older people in northern England reported health-enhancing benefits after participating in communal gardening programs, and their experiences of natural and built environments contributed positively to their mental well-being (Milligan, Gatrell et al. 2004). Enhanced social inclusion, the development of social networks, combined with the meaning of communal gardening and "a sense of achievement, satisfaction, and aesthetic pleasure from their engagement with nature," developed into "therapeutic landscape" experiences (Milligan, et al., 2004: 1790). A sense of place and

attachment to place, the integration of people, and identification with communities are critical to shaping people's health experiences.

Therapeutic landscapes are linked to people's social interactions by relieving them from the stresses of modern society. Williams claims that a concept of therapeutic landscapes can be extended from healing and recovery and be used in the maintenance of health and well-being (Williams 2002). Wilson (2003), in her research with the First Nations' people in northern Ontario, recognized that indigenous people's spirituality represents an important part of their healing—something that could not be achieved with the Western model of medical treatments. The culturally specific dimensions of First Nations' relationships with the land are connected to both Mother Earth and the Creator, and are central to shaping identity and maintaining the balance necessary for good health (Wilson 2003).

Wilson (2003) also suggests that gender should be examined more fully within the framework of the therapeutic landscape. These analyses are challenging and often point to geographies of exclusion and whiteness. As illustrated in research conducted among members of the Toronto Front Runners, social hierarchies, gender, and racial disparities existing in society are reproduced in the landscape of the sport club, both for the privileged and the disadvantaged (van Ingen 2004). The club is not therapeutic for all its minority members of different sexual orientations and race.

Recent work on multiple perspectives on place (Curtis 2004) provides additional possibilities and competing explanations of place. The five concepts of

landscapes: *ecological*, *materialist*, *landscape of consumptions*, *landscape of social control*, and *therapeutic landscape* provide several possibilities on how perceptions of health and links can be related to place (see also Curtis & Jones, 1998). The "ecological landscape" framework, concerned with the spatial distribution of physical environmental factors, seems to be the most appropriate in understanding the impacts of contaminated air or water on natural environments. As outlined by Day (2006), these landscapes are useful orientation devices to allow place effects to be seen as multidimensional, non-competitive, but contributing to our understandings (p. 250). Thus, work with perceptions of air pollution has often been concerned with material depravation, the experience of inequality, and a lack of opportunities (Wakefield 2002; Baxter and Greenlaw 2005; Wakefield and McMullan 2005; Burra, Elliott et al. 2006).

In public health, the therapeutic framework provides a broad platform to explain the multidimensional relations in women's health. Recent research has examined how the Ugandan government introduced policies and provided facilities to foster a therapeutic landscape for Ugandan women with the help of local newspapers (MacKian 2008). The focus on women's health led eventually to the promotion of alternative therapeutic landscapes, different for women than men, and overcame socio-cultural issues and other physical service delivery problems. While "reading health" creates a meaningful metaphor of the influence of media on individuals, the revised meanings are not enough to guarantee the success of the programs. Information about women's health is further modified in everyday life in the lives of families or communities, and in the workplace or

social gatherings. Ugandan-based studies recognized barriers embedded in places and communities that limited the effectiveness of newspapers in empowering women into developing their therapeutic landscapes (MacKian 2008). Fostering women's health in place is bound by socio-cultural relations of Uganda and is modified by the culturally accepted criteria for healthy environments (ibid).

The symbolic aspects of therapeutic environments consider people's beliefs, creation of meanings, and importance of rituals (Gesler, 2003). In numerous civilizations, place is connected to persistent themes which consider the theological thoughts that God provides for humans (Mazumdar 2004). These spiritual ties with place often have roots in religion and result in religious attachment to land, when staying faithfully on the land is perceived as a high value (Mazumdar 2005). Religious place attachment affects people's perceptions of security in place as demonstrated among the Jewish settlers in the Gaza where people with strong spiritual values developed the means to cope with difficult situations (Billing 2006). The social, spiritual and cultural elements of these environments allow the believer to experience different place effects.

There are gaps in the literature with regard to how geographical landscapes are constructed in reference to a culturally isolated minority—the OOMs. Their concerns about being *separate from the world*, and maintaining strict traditions, such as marrying only within their faith, have contributed to their unique understanding and perception of health in place. The religious doctrine permeates every aspect of community life and dictates acceptable roles and behaviours for men and women of every age (Horst 2000).

This paper has two objectives. The first objective is to examine the understandings of health and environmental links in place in the Elmira area, and the second is to analyze how health is shaped in place by contrasting experiences among women of the mainstream society and women of the Old Order Mennonite Church in the Region of Waterloo, Ontario.

Women were selected because they are the most vulnerable members of these communities facing environmental hazards. The different gender roles in a patriarchal community, higher level of environmental exposures, metabolic differences, smaller body mass on average, and multiple pregnancies can be identified immediately as a few of many factors contributing to their vulnerability. Additionally, in academic research the voices of women have traditionally been underrepresented (Dyck, Davis Lewis et al. 2001), and thus an effort has been made to address that imbalance. Thus, the focus of this paper is the landscapes of women's health.

4.2 Exploring diversity in the local context

Many communities reside in particular geographical locations for generations. In these cases the physical attributes of space, social relations, and cultural attachment interplay in their lives framing their experiences of place. In the Township of Woolwich (Figure 4.1), the communities with common cultures occupy well-defined social structures and have developed social networks in separate neighbourhoods relevant to their moral, spiritual, and cultural values.

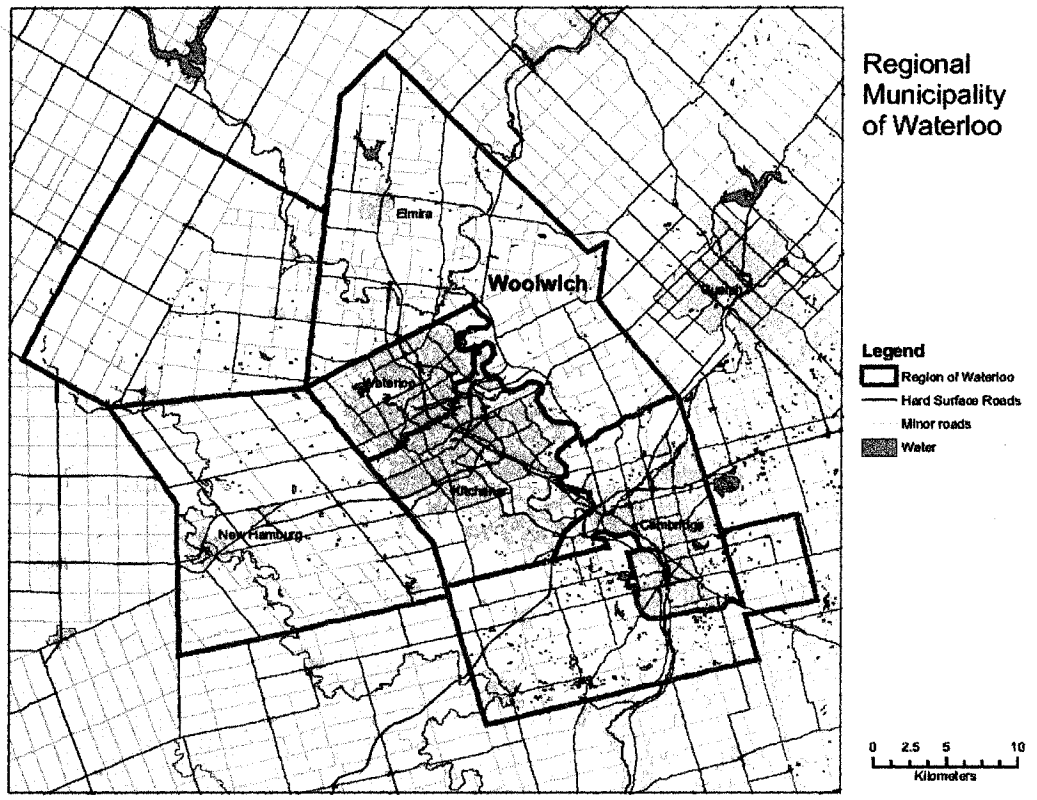

Figure 4.1. Regional Municipality of Waterloo and Township of Woolwich. DMTI CanMap Streetfiles [ONTARIO]. Markham, Ontario: DMTI Spatial Inc., [2005]

The conservative Mennonite participants belong to the official group registered as the Old Order Mennonite Church (Peters 2003). The OOM system of *Gemeinschaft*-like community relations reinforces moral codes and puts the needs of community above the needs of an individual. Interactions among community members are not based on Gesellschaft rationality, competition and calculations, such as exist in the modern world (Tonnies (1963) as cited in Eyles, 1985 p.76). The social and contextual circumstances experienced by people united in a *Gemeinschaft* community frame their place in a way apart (Eyles 1985). OOM families maintain the unique status of their conservative communities at a

high cost. They sustain their own system of self-sufficiency, support their own schools, and maintain a community mutual help system. However, due to serious environmental concerns and extended exposure to toxic waste during the manufacture of highly toxic herbicides and pesticides, OOMs are being forced to confront the issues of modernity within their own minority group.

In reference to ethnicity, culture, and health, geographical research has led to the consideration of bias and social inequalities (Donovan 1984; Dyck 1990; Asthana 1996; Gesler and Kearns 2002; Curtis 2004). Cultural differences among ethnic minority groups and the mainstream society often point to cultural segregation, socio-economic disadvantages, psychological distress and the experience of racism in place (Nazroo 2006). While the First Nations peoples' understandings of place, health and land construct their identity in different physical, symbolic and spiritual ways (Wilson 2003), there is one important similarity in comparison to the Old Order Mennonites: Canada's First Nations people and the orthodox Anabaptist ethnic minorities are viewed by some as leading 'inferior' lifestyles in relation to the dominant social paradigm, and as a result they have been viewed by expendable (Bennett, 2003, p. 170).

4.3 Health Experiences of the Conservative Anabaptists

Socio-medical and geographical research has detailed differences in health among various ethnic groups (Gatrell 2002; Ypinazar and Margolis 2006; Frank 2007). OOMs and the Amish are distinguished from the mainstream society based on *ethnicity*, rather than race. While race is based on biological differences among

people and has social and political constructs, ethnicity refers to a common cultural background (Clarke 2004). Ethnicity includes both the identity and the influence of external factors on the experience of being a member of an ethnic minority group. Aspects may include culture, religion, migration history, geographical location, and social structure (Nazroo 2006). While residential segregation of people may lead to social exclusion and overall negative consequences on health (Kawachi and Berkman 2000), the ethnic-specific effect may offer positive outcomes. For example, minority suicide rates are lower in areas where minority groups are larger (Neelman and Wessely 1999).

Old Order Amish have been found to have a different health experience in comparison with the general North American population. Standardized death rates among the Amish are 19 percent below those of the general population (Hewner 1997; Hewner 2001). According to the Canadian Institute for Health Information (CIHI), OOM children living near Mount Forest[i], Ontario, are stronger and healthier than their peers from the mainstream society (Bassett, Tremblay et al. 2007). Lower hypertension rates, lower mortality and morbidity due to cancer, and lower rates of cardiovascular disease have also been observed in their communities (Hamman, Barancik et al. 1981; Levinson, Fuchs et al. 1989; Fuchs, Levinson et al. 1990). The existing health concerns within the OOM population relate to a relatively high frequency of consanguineous marriages as a consequence of their religious beliefs, which, at times, result in genetic anomalies. Consequently, extensive medical research, especially among Amish communities, is conducted in the field of genetics. In these communities, health concerns related

to genetics focus on diseases such as cartilage-hair hypoplasia, albinism, deafness and maple syrup urine disease (MSUD) among others (McKusick 2000; Falk, Feiler et al. 2004).

The unique health experience of the OOM community and their lower rates of colorectal cancer, neoplasm of the lung, mouth pharynx, larynx, esophagus, and prostate cancer have been reported in epidemiological studies (Troyer 1988). The Old Order Amish from Pennsylvania have a 50 percent lower prevalence rate of diabetes (Type 2) than that of the general U.S. Caucasian population (Hsueh, Mitchell et al. 2000). The scientific research points to the complex interactions between health, human biology, cultural patterns of behaviour, social interdependence between generations, no smoking and restrictions on alcohol consumption, all of which contribute to a better health experience than that of the general population (Hewner 2001). The Old Order Amish are considered the closest in their behavioural practices to the OOMs from Ontario (Wengler 2003).

4.4. Study Site. Elmira in the Township of Woolwich

This research project in Elmira (population 7,712, Stat. Canada 2001), located in the Township of Woolwich, was conducted five decades after the start of an ongoing environmental crisis including the contamination with carcinogenic chemical N-nitroso-dimethylamine (NDMA) of the local supply of drinking water. Due to industrial activities by the local chemical company in the town, the main drinking water supply wells were shut down permanently in 1989, after

levels of NDMA were found to exceed the drinking water guideline by a factor of 400. Exposure to chemical waste products by the farming communities living along the Canagagigue Creek, the most contaminated tributary of Grand River has been on-going for more than half a century. Since the 1940s, citizens have been concerned about tomatoes that tasted "bad"; in the 1960s, residents along the Creek reported dead fish and cattle poisoned with contaminated water; in the 1970s, people noticed a strange taste in the drinking water; in the 1980s, dioxins were detected and numerous chemical spills into the Creek were reported. There was an extended period in the late 1990s when particularly noxious odours from the local chemical plant, Uniroyal, were detected in the town and surrounding area.

The local study of Industrial Air Emissions in Elmira, conducted by the Region of Waterloo Public Health, found that 34 percent of respondents (269 people out of 800) reported adverse health effects due to the industrial air emissions (Waterloo Region Community Health Department 2001). In 2003, the potential health effects of local contaminations were analyzed in the Human Health Risk Assessment. The empirical findings indicated that the chemical plant employees and the downstream Creek users face a much higher chance of developing cancer than other residents (Conestoga-Rovers & Associates 2003). All families farming in the Canagagigue Creek floodplain face higher cancer risks than the average Canadian resident. Even without adjusting for behavioural and cultural differences in the lifestyle of OOMs, the excess cancer risk estimates are from 1.9 to 3.7 cases per million.

It should be noted that the existing contamination, remediation of the environment, and the possibility of another major environmental crisis (fire and explosion at the plant) are ongoing issues in the Elmira area. The possible long-term health effects resulting from human exposure to drinking water and foods containing high levels of NDMA (Nitrosodimethlamine) are unknown. The Environmental Protection Group (ATP) recommends fencing off the floodplain and Creek to reduce the Mennonite families' exposure to dioxin. Indeed, the calculated excess cancer risk cannot be ignored as the ecological landscape plays an important role in understanding the sense of place.

4.5 Methodology

4.5.1 Research Design

Qualitative methodologies were employed in the research design: grounded theory and ethnographic methodology (Quinn-Patton 2002). OOMs do not normally participate in research projects or in state programs as they are known to be a "difficult-to-reach" population (Horst 2000; Good Gingrich and Lightman 2004). This created several methodological challenges as it was unknown whether or not the OOMs would agree to participate in this research. Following detailed preparation, access to the community was eventually granted with the help of community leaders, who identified a "cultural broker" among the OOM community. During the study, the cultural broker's wife served as a gatekeeper and introduced the researcher to the members of her community. This project anticipated conducting 10 to 15 interviews with members of the OOM

community which was a significant and unusual feat as in the past nobody had conducted a similar study with this group.

The interviews were conducted in two stages involving two groups of women:

(1) Group 1 was composed of 19 women from the mainstream society living in the urban centre of Elmira; and

(2) Group 2 was composed of 15 Old Order Mennonite women living in the areas surrounding Elmira and farming along the Canagagigue Creek.

Interviews focused on major topics of general health perceptions and environmental concerns. Socio-demographic information was collected from participants to contextualize their responses. In the local community context, the ethical norms of cultural pluralism guided the interviews (Baylis, Downie et al. 2004). The researcher was aware of the outsider effect that could bias the results and asked for written comments from the women when they were uncomfortable speaking openly about sensitive issues.

4.5.2 Sample

The topographic line used for the sampling purposes was the Canagagigue Creek. Diverse and multi-method sampling was used to ensure that information from various sources and geographical locations would be collected. Individuals living along the river approximately 10 km upstream and downstream from the chemical plant, and 10 km east and west of the plant in the rural areas were included in the sample. Participants, the majority of whom were women, were

recruited through a combination of purposive and snowball sampling methodologies (Hay 2000; Quinn-Patton 2002).

As Table 4.1 indicates, the average age of the women participants from the mainstream society was 56.5, compared to 49.7 years among the women from the OOM community. All OOM women, except one, had an elementary grade 8 level of education,[ii] while 73 percent of women from the mainstream society had graduated from a postsecondary institution.

Table 4.1. Study Participants

Characteristic	Mainstream Society	Old Order Mennonites
Sample Size	19	15
Females	19	15
Males	1	8
Mean Age (Range)	56.5 (26–83)	49.7 (23–64)
Marital Status		
Married/Partner	15	12
Widowed/Separated/Never Married	4	3
Highest Level of Education		
Elementary	1	14
High School	4	-
College/University	14	1*

* All members of the OOM community must have only elementary education. The offending woman was forced to leave the community a few years ago.

4.5.3 Data Collection Instrument and Process

Interviews were conducted from May 2005 until January 2006. The interviews were from 45 to 90 minutes in length and were conducted mainly in the homes of the participants. All women from the mainstream society granted the researcher permission to audiotape the interviews. Interviews with OOM families were not taped because of their avoidance of electronic technology; instead, the researcher took handwritten notes. Participants also filled in a brief questionnaire which was useful for two reasons. First, it served to collect demographic information and a history of major health episodes in their families. Second, it allowed the mothers to write down their opinions, in an effort to overcome cultural constraints when their husbands accompanied them during the interviews.

4.5.4 Data Analysis

The transcripts of the interviews with all the participants were formatted into text documents and imported into a qualitative software package (NVivo). Detailed coding was implemented using the computer software to search for text relating to themes that emerged during the interviews. Numerical summaries of the themes were constructed and analyzed (Baxter and Eyles 1997). Each research participant created a new opportunity to develop and add concepts to the theory of the links between health, place and the understandings of health experience in place.

4.5.5 Ethics

Academic research guarantees the anonymity of all participants so pseudonyms have replaced real names in reporting the study findings. All ethical procedures for informed consent as required by Wilfrid Laurier University were followed.

4.6 Findings

The results are reported in three parts: first, the OOM women's health perceptions are presented; second, the mainstream society women's health experiences in place are outlined; and third, the landscapes from both groups are compared and contrasted.

4.6.1 Old Order Mennonites beliefs about health

OOMs described their understandings of health by referring to God and their traditional role at home and their role within the community. Mennonites live in a space that appears to deny the reality of their existence of living in a highly contaminated environment. In speaking about their health, they presented a universal understanding among the members of the OOM community:

> *People do not understand that health is a great gift from God. Some of our children have health problems and some are healthy (Joseph and Amanda, OOMs, parents of 8 children including two with physical and mental challenges, OOS11).*

Questions about their health were answered, in most cases, in reference to people's fulfillment of roles. This concept was especially evident in the case of

chronically sick women or women of menopausal age, when their roles as mothers have changed:

> *I do not know how my health is. Some people say that I do nothing. Some people say that they will not be able to do so much as I do every day (Ellen, MS, chronically sick Old Order, age 51; OOS3).*

> *I am diabetic. Now I feel much better and I have not taken any pills for the last 4 years. I am taking care of my health. Since I had my youngest son, my oldest daughter started to milk the cows. [Now we have 23 cows]. She wanted to do it and the children have done it since that time. I did not have as much work from that time and I almost do not have a reason to go outside (Rhoda, OOM, age 54; OOP12).*

Often the OOM women directed the interview questions to their husbands to answer. They consider their husband's opinions more important than their own, since it is they who evaluate their role at home and within their community. These opinions influence women's health and their sense of well-being:

> *My husband should answer the question how my health is. I had one kidney removed because of cancer five year ago. Now, I am fine. (Viola, OOM, age 52, OOS2)*

Food is important to maintaining good health and the OOMs produce most of the food they eat. The farming practices of the OOMs connect them with the land not only by being a source of food and economic security but by providing for their children, and their children's children:

> *We hope that the next generations will live in the country too. We hope that the environment stays (healthy) so the next generations can stay healthy on the farm (Rhoda, OOM, age 54, OOP12).*

The description of 'good health' for this ethnic community includes attending to the needs of others before their own. Rhoda describes their function in the community, while being interrupted by a call during the interview:

> *If you want to know what we were talking about this was a woman from Mount Forest. She was asking if I have any work and can I help sell her quilting because she needs money to pay for gas (gas for the stove). Isn't it our role to help other people, when they need help? I will not sell my quilting but I will sell hers (Rhoda, OOM, age 54, OOP12).*

The cultural, social and economic aspects of the connections among the Mennonites were observable in their homes, on farms, and in workshops, where young men and neighborhood children worked and where people felt connected with each other. According to their customs, the youngest son inherits the family farm and he and his family take care of the grandparents who live in the "doddy house" (a smaller house on the farm property). The grandparents are very involved members of the OOMs' families:

> *" I came from a family of 11 children. My youngest brother was a special child. I remember that grandparents were always around his bed. They were with us". (Naomi, OOM, age 23, OOS8)*

Their social links with place have penetrated their lives by constructing meaningful links among church members, among the community of good neighbours and interconnected families.

4.6.2 Mainstream women's beliefs about health

In Elmira's oral history, women talk of people who died young of unusual causes. The understanding of the local landscape is often described in relation to

the waste discharged into the Creek, the polluted groundwater or contaminated air. Evidence of these environmental problems influences the women's perceptions of links to their health:

> *Oh yes, we worried, very much, yeah. As soon as we heard about the issues with the water and all being contaminated, we started hauling our water rather than using water for drinking. I've lived in Elmira 21 years and worked here so I do not know whether my health is affected or not (Erma, mainstream, age 54).*

The women of the mainstream society speak of organs vulnerable to infection through bacteria, viruses, and chemical agents present in the environment. Their health problems are being treated and women's health improves with the appropriate medical treatments:

> *My second daughter has low thyroid and is treated. Her health is very good. I don't know how you assess that other than she has low thyroid, which is treated (Roselyn, mainstream society, age 68).*

Many local families were exposed to chemicals. In the past, the local image of the Canagagigue Creek was described as an *"unhealthy, dangerous and heavily polluted environment"*. The pollutants were present in the water, in the air, and inside people's homes:

> *My mother always knew when we were swimming in the Creek. Our clothes smelled so bad. But I loved it. There was no swimming pool here at that time (Vera, mainstream society, age 54).*

The mainstream society women critically examined the possibility of environmental links to health. Vera's perspective exemplifies their concerns:

> *I would have to say in our crescent and one street over on each side, there have been six diagnosed cancers in the last five years. Four of those have been in the last three years, two deaths already. (What*

age?) The youngest being 20 at the time of diagnosis and the oldest being 58 ... I don't know what the positive aspects would be of our local environments. It makes you wonder why we're still living. (Vera, mainstream society, age 58)

4.6.3. Describing environmental links in women's health

The perceptions of women from the mainstream society and the OOMs differ as their understandings of health are grounded in different theories and value systems. Most OOM women were not interested in discussing the physical environmental hazard, as this is their *"husband's department" (Marlene, OOM, age 48)*. Another OOM woman admits:

> *"We do not even read newspapers; we do not know. We do what the husbands say" (Amanda, OOM, age 56).*

These cultural differences define their reality and they do not question it. It was evident that the only source of outside communication with the Old Order Mennonites, the local newspaper, does not reach the women in their homes in most cases. Women's awareness of environmental problems is limited, yet they have developed insights to their understandings. For example, Laurene explains,

> *I am not really committed to say, 'Oh pollution is bad.' My father was very strong about healthy food and organic farming and I felt he was fanatical about it. I have the same feeling about the people who are really strong environmentalists. I think they are going overboard about it... I think many bodies can tolerate it (Laurene, OOM, age 46, OMP14).*

OOM women participating in the research politely provided answers to the questions, but at the same time, they expressed their overall lack of interest in exploring health/environmental links and further:

"I think that the air is fine. Children are always skating on the pond or at the Canagagigue Creek." (Marlene, OOM, age 48)

I never even smelled the bad smell they were talking about. I smelled far, manure but that's expected. I would say I have never worried about the environment (Barbara, OOM, age 64, OMP14).

In the OOM's community, women perceive their links with the environment through their manual labour on the farm. They value their simple way of life.

I think we are healthy here at the farm. Our immune system is built up. If the city people will get a little dirt they will get sick. If farmers will become as clean as the city people, they will not be able to work on their farms (Minerva, OOM, age 45).

The OOMs women perceive their farms and homes as healthy landscapes:

No, we are healthy here. When I go the city I am always thankful that I live on the farm (Mary Ann, OOM, age 48)

Women's perceptions of environmental links to health are based on their sense of place, not on their knowledge of environmental problems.

Table 4.2. Local Perceptions of Environmental Links to Health

Theme	Mainstream Society N=19	Old Order Mennonites N=15
Air Pollution	15 (79%)	2 (13%)
Drinking water contaminated with chemicals	14 (74%)	2 (13%)
Drinking water contaminated with bacteria	N/A	15 (100%)

Table 4.2 illustrates the disparity between the OOMs and the mainstream respondents. OOMs tend not to be worried about air pollution. Only 2/15 or 13

percent expressed concerns. On the other hand, the majority of the mainstream society informants, 15/19 or 79 percent, consider air pollution to pose a health problem. Similarly with regards to chemical contamination of drinking water, OOM women are unconcerned, whereas 74 percent of the mainstream society women are aware of the impact of chemical contamination and their long-term health effects. However, OOMs are aware of bacterial water contamination as they are obligated to follow the provincial private wells water testing regulations. The water testing procedure is perceived as a non-necessary and time-consuming activity since it takes a "half a day to deliver a water sample by horse and buggy for testing." The general comment is "if the water does not kill us—it must be O.K." (Hannah, OOM, age 34).

Table 4. 3. Local Perceptions of Links to Physical Environment.

Reported Behaviour	Mainstream Society N=19	Old Order Mennonites N=15
Eating locally produced food A: small percentage B: always	 19 (100%) -	 15 (100%)
Exposure to pesticides	11 (58%)	12 (80%)
Length of spent outdoor by children playing and working A: school year B: holiday	 1 to 2 hrs 2 to 6 hrs	 2 to 4 hrs 4 to 8 hrs/ no limits
Swimming in the Canagagigue Creek	5 (26%)	8 (53%)

Table 4.3 indicates that OOMs are not fearful of consuming locally grown or produced food. One hundred percent always eat the food that they or their

neighbours grow with confidence. In contrast, members of the mainstream society purchase food from various sources and are concerned about the safety of their neighbourhood. Families living on farms located downstream from the plant may accumulate more chemicals in their bodies, as they consume the products grown on their farms. In addition, 53 percent of OOM children were permitted to swim in the highly polluted Canagagigue Creek, as compared with 26 percent of children from the mainstream society.

The time that OOM children spend outdoors in the rural environment while playing or working increases significantly their exposure to pollution. OOM children spend approximately twice as much time outdoors than children in the mainstream society, These traditional behaviours have the potential to increase the harmful effects of contamination among OOMs and contribute to inequality in terms of environmental exposure. Still, the OOMs do not perceive their landscape as dangerous to their health and well-being.

During the interviews, members of mainstream society referred to problems of inequity and discussed issues including a lack of knowledge by the Mennonite community concerning the environmental impacts of chemical contamination. In reference to the contamination of the banks of the Canagagigue Creek with dioxins, Nora, a rural resident in the mainstream community, emphasized that:

> *I would certainly not eat fish out of that river. But I think that maybe people need to know a little bit more definitely to be very careful about eating fish out of that river or digging sand by the shore to put in the children's sandbox to play; or using it to lighten the soil in the vegetable garden, things like that, I think more sharing of information is good (Nora, mainstream society 58; WOP18).*

Access to health care among members of the OOM community is limited by the cultural differences and barriers that exist in place. A difference in the utilization of motor vehicles is directly connected to health enhancing or decreasing properties, as is the high prevalence of farm accidents. Several OOM mothers referred to farm accidents, difficulties with getting to the hospitals for help, or to their preference of using naturopathic medicine. The lack of OHIP health insurance was thought by medical professionals to constitute a significant financial barrier to the health of Mennonite women and children. This represents an important aspect of inequality due to the high cost of medical care in Ontario. However, this local inequality was not identified as a problem by the Mennonites themselves. OOMs do not make use of prophylactic or early detection procedures, such as mammograms, and their children rarely receive the full range of immunizations available. The patriarchal relations existing in OOM families, the isolation of rural women, and their limited education and sources of information about environmental hazards were all identified as inequalities by members of the mainstream society.

Despite their preservation of orthodox traditions, OOMs have adopted agricultural technology in their farming practices and they consider the use of pesticides a necessity. They are aware of the toxicity of these chemicals and their long-term effects on the environment:

> *I know that we need companies like Uniroyal. I am farming and now I depend on these chemical products. I would rather not use them if I do not have to. By making and using the chemicals I feel that we are upsetting the balance of nature. We farmers are responsible for the pollution in some water (Malinda's husband, 53, OOM, OOS10).*

We know that the air can be toxic. They teach us not to spray pesticides on windy days in our orchard (Martha, OOM, 59, OOS6).

Despite the culturally different dimensions of the links between health and pesticide use members of both communities share similar perceptions. The link created in place by the OOMs is very much like the one understood by the members of the mainstream society.

A majority of participants from the mainstream society (13 out of 19) worried about the environmental links to miscarriages, cancers, thyroid diseases, asthma, and allergies. Many of them reflected on their lives and often referred to "denying" their existence and a "fear of acknowledging the problem" (Miriam, Mainstream Society, age 48).

Elmira's physical environment has improved noticeably in the last 10 years and is now seen as being cleaner and healthier. For example, the number of air pollution complaints has dropped to about 10 per year, compared to 97 in 1999. Fish are now living in the Creek downstream from the chemical plant and people no longer dwell on the contamination but instead focus on enjoying their lives. Erma explained her understandings of the chemical contamination:

Obviously it is a toxic substance. That's what bothers me I think. But generally in this neighbourhood you have everything okay. Because you know, you look at your trees and everything seems to be okay (Erma, mainstream society, age 62, WOP16).

In the local landscape of the citizen of Elmira, nature is seen as a health-promoting factor that positively affects people's health in place. Thus, through

environmental rehabilitation and the ongoing remediation, the physical landscape has improved and individual perceptions are relatively positive in general.

4.7 Health, culture and understandings

In this study, I have adopted the conceptualization of population health as proposed by Philips (1995). This definition incorporates gender roles and in its holistic understanding of health includes social and cultural differences, feelings, spirituality and behavioural differences mediated by ethnicity, race, age, sexual orientation and disability (Williams and Garvin 2004). This definition is the most appropriate to use because it incorporates a wide range of differences among various ethnic groups. It also encompasses homogenous structures of various ethnic and religious minority groups, where women share their place with different women in their community:

> *Women's health involves women's emotional, social, cultural, spiritual and physical well-being, and it is determined by the social, political and economic context of women's lives and as well as by biology (Phillips 1995), p. 507).*

Moreover, Clarke (2004) points out women are more likely to be ill than men, although this is mitigated by association among variables such as class, race and ethnicity. Women might be marginalized in social, financial and medical contexts and have different health behaviours within local environmental constraints of their communities.

Figures 4.2 and 4.3 illustrate differences in the cultural transformation of meanings of health. The first model (Figure 4.2) describes

the biomedical conceptualization of health used by the mainstream population; the second model, Figure 4.3, illustrates health meanings by Old Order Mennonites.

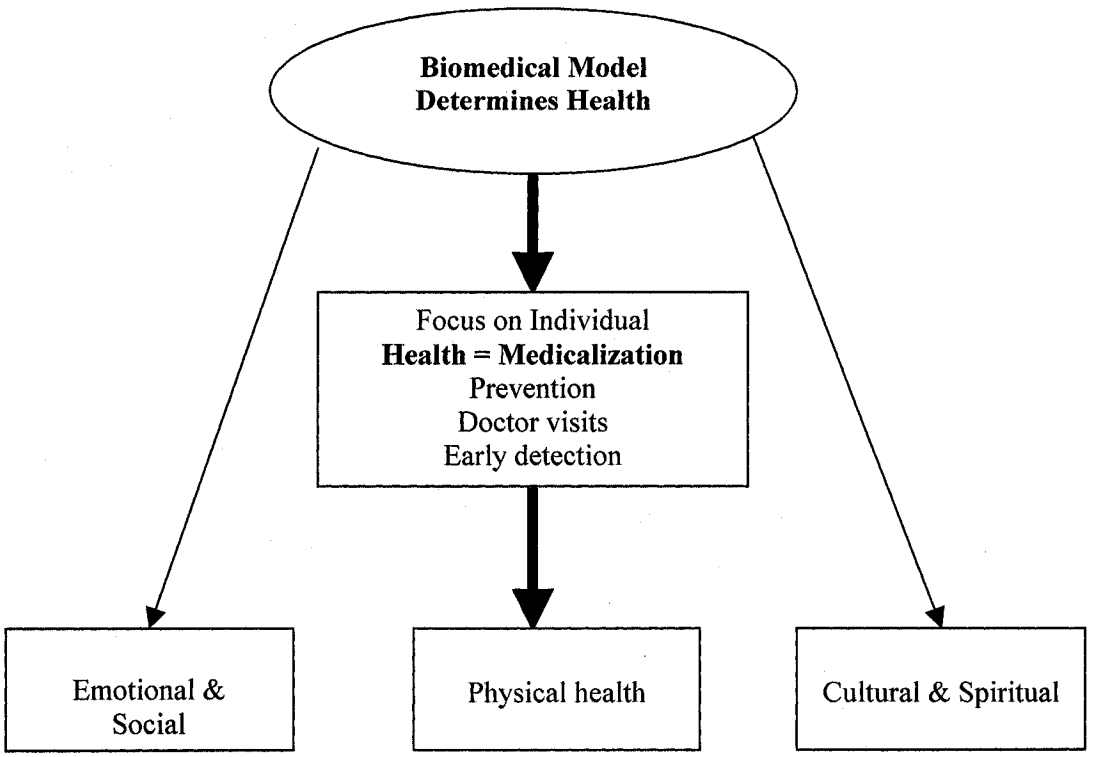

Figure 4.2. Biomedical conceptualization of health by mainstream society - social constructionist model.

Figure 4.2 illustrates how the members of the mainstream society conceptualize health, and how the health landscape is centered on the modern, rationalistic and scientific sense of health located in biology. The human being is understood mainly in terms of biomedicine (Clarke 2004). Even though the emotional, social and cultural and spiritual components are indicated, they are not the central focus of the Western conceptualization of health.

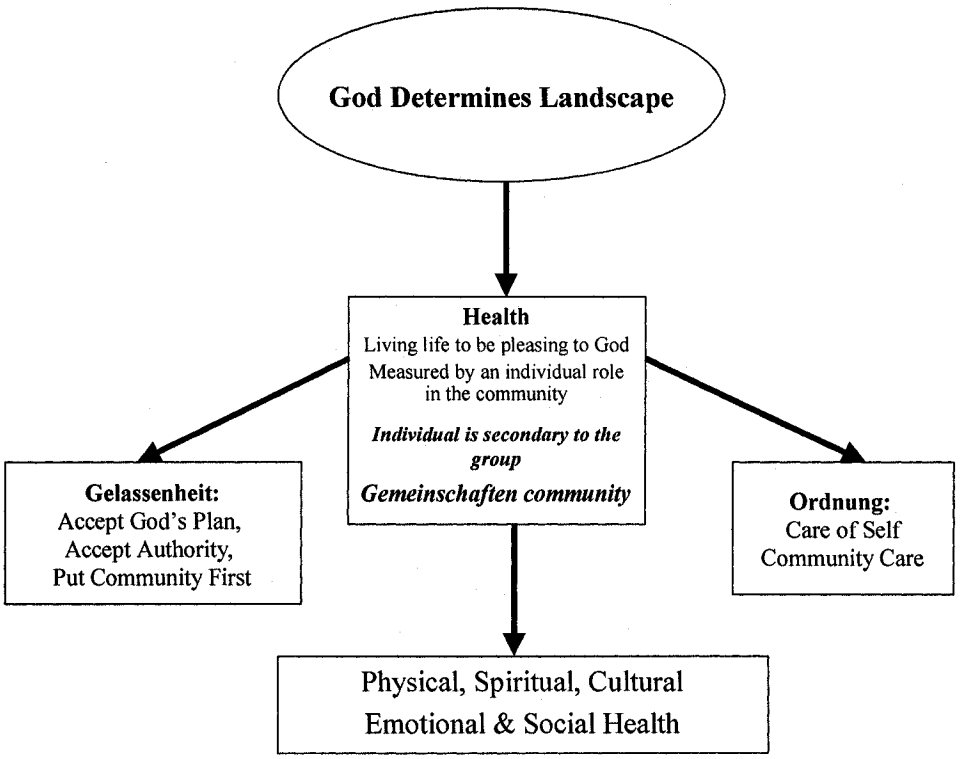

Figure 4.3. Health understandings by the OOMs.

Figure 4.3 illustrates the OOM's landscape and their conceptualization of the meaning of health. Ethnic understandings of health for OOM women are constructed through their religious beliefs, gender roles, behaviours, social rules, and through the cultural meanings of their role in life.

To be healthy means to obey God's rules and to live in orthodox consistency with the belief that God determines their lives and landscapes. The principal orientation in their life is *Gelassenheit*, which is symbolized by the Lamb of God and leads to humility, obedience, and adjusting a personal will to the community and to God (Wengler, 2003, p. 151). Being healthy also means serving the community. Women's roles as mothers, wives, sisters or workers in

their community must be fulfilled to maintain well-being and mental health. The cultural understandings of health sustain OOM life in Christianity and their social structure provides them with a sense of interconnectedness both to people and place.

The health experience of an individual is determined by God (Horst 2000; Wengler 2003). This belief is fundamental and gives meaning to the values in their lives. As their religious beliefs determine their understandings, some are given good health, while others must experience pain, sickness and suffering. This differs from modern society where women's health is usually seen as separate from their religious beliefs. To lead a healthy and meaningful life, the OOMs follow *Ordnung* which comprises formal written statements or simply an unwritten shared fundamental understanding of "how the world works and how the things are" (Kraybill 2001). These rules define the OOMs' way of living and their religious, spiritual, social, economic and health connections within their community. Their way of living may also be seen as having therapeutic qualities as geographical stability in their place mark their everyday landscape.

Religious understandings of OOMs are inseparable from their health and the way they deal with illness. Individuals are obligated to take care of themselves, but God has total control of their lives and without His help, life cannot be restored. This means that their symbolic landscapes that are embedded in their religious beliefs, objects, artifacts and language, and integrated in their lives and in place, have the power to restore health and to cure. Their holistic understandings of health incorporate into their everyday lives a notion that the

body is transitory, the soul is external and heaven is the ultimate focus. These understandings are important in constructing the therapeutic landscape experience in place among the OOMs.

4.8 Discussion

The purpose of this article was to explore how people understand their health in place and how the ethnic identity of OOMs modify and challenge perceptions of environmental links to health. Landscapes in the mainstream society are constructed based on secular knowledge which is often limited in scope. Questions about contamination cannot always be fully answered as the knowledge is uncertain. Figure 4.4 illustrates how a biomedical model of reasoning developed by the mainstream society considers the environmental links to health. While secular mainstream society dwells within a system of positivist beliefs (Clarke, 2004) their options are safeguarded by an interminable sense of uncertainty and ambiguity. In contrast, the OOMs are strengthened by the certainty embodied in their religious beliefs. Their knowledge is differently personified within their community structure. Their community networks provide them with a cohesive sense of interconnectedness and a communal identity. This is reflected in their landscape as having healing and therapeutic effects (Figure 4.5). Within that landscape, people develop positive bonds with both their people and place and maintain strong connections to such a place.

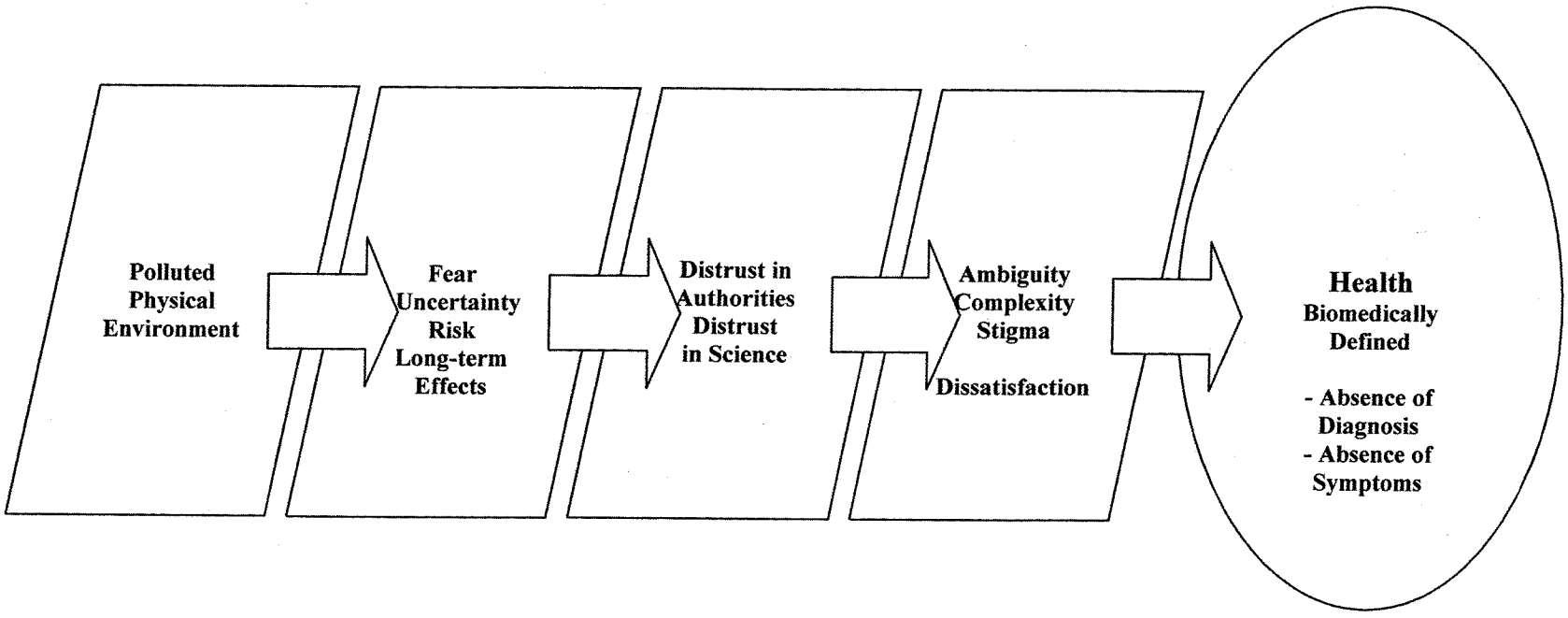

Figure 4.4. Health landscape of the mainstream society women.

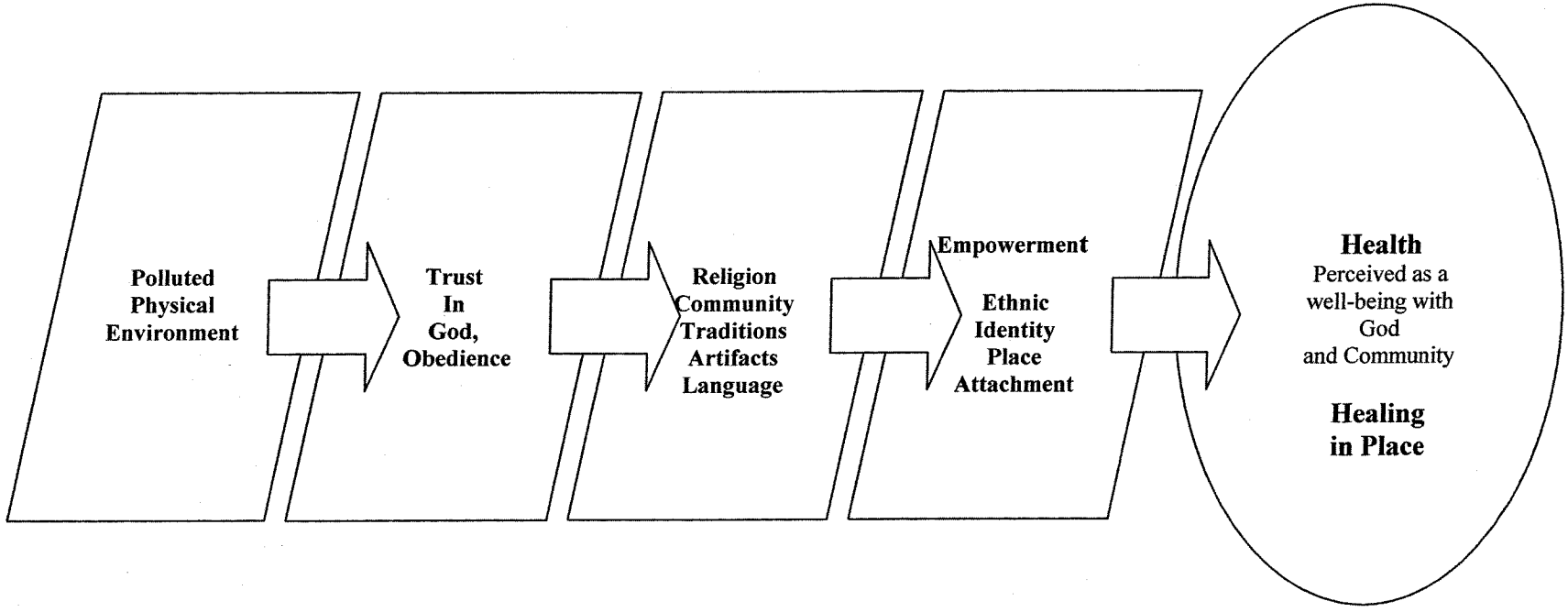

Figure 4. 5. Therapeutic landscape of the Old Order Mennonite women.

Attempts to ensure that the negative image of Elmira did not linger were put in place by the Healthy Community Project (Wismer 1999). Beginning in 1996, it is based on sustainability, consideration of people's well-being, equitable social relations and the quality of life of the whole community (Wismer 1999). Over time, attitudes have changed and mainstream society now has a positive image of the local landscape. "Unhealthy" experiences have been mitigated in the everyday landscape through the ongoing remediation processes. The remediation processes have resulted in healing experiences:

> *I worried about it because it smelt bad. There was not a pleasant odour in this town for a lot of years. I developed asthma, and with adult asthma I had a hard time. I could hardly walk because of the fumes so I moved further into the country. Now, I am here in town (in Elmira) again and I haven't had any problems (Katie, age 55, mainstream, WOS8).*

Elmira's mainstream residents have maintained an ambiguous understanding of their place: a perception of the town as a relatively healthy and unhealthy place at the same time. These findings agree with Wakefield and McMullan's (2004) interpretation of landscapes where health-affirming and health-denying places co-exist in people's lives. Elmira's mainstream residents, like the residents of Hamilton, had to deal with both negative and positive perceptions of their place following an environmental crisis (Wakefield and McMullan 2004).

Women in the mainstream society perceive their everyday landscapes with attitudes common to the post-modern society (Beck 1992) and are concerned with ongoing negotiations for remediation in the Township. The images of a polluted environment are fading due to the ongoing rehabilitation of the environment and

because of economic, social and political changes. Members of the mainstream society decide what makes their environment dangerous or safe; they view their landscape through the same lens as the biomedical model of health. This might result in creating "health-affirming or health-denying" experiences just as has occurred among members of the mainstream society in Elmira.

The research with the OOM community demonstrated that environmental links to health might be viewed as positive. Healing processes in the landscape of OOMs do not depend on the severity of environmental degradation – their landscape is "health-affirming" in their everyday geography. The quilting traditions of the Old Order women do not symbolize merely a particular decorative practice but a culture strongly connected to their everlasting landscape given by God. After baptism, no spiritual connections are made with water, which becomes an ordinary part of the landscape. The contaminated water does not have religious significance and is disconnected from spirituality of OOMs. The environmental damage of the Creek has been caused by the members of the mainstream society, which isolates the Mennonites from the "problem."

The pollution of the Canagagigue Creek encourages an examination of inequalities in order to explain the experiences of Ontario's conservative Mennonites. The obvious differences of culture, gender relations, limited access to political power, the economic disadvantages associated with not participating in government health insurance programs,[iii] and the lack of access to knowledge and resources, are all factors which increase their vulnerability to certain hazards. Future research might explore these aspects further with the use of an alternative

framework; for example, by employing the landscape of social control, but this process might add another dimension to an already incomplete explanation (Day 2006). All frameworks are limited and may not fully explore the complex spiritual factors that connect the culture of OOM women to their religion.

The OOM women's landscape is mitigated by other means. They have developed their own protective mechanisms against the influences of the outside world. Guided by their religious beliefs, they preserve a German language dialect to maintain a distinct life separate from the predominately English speaking society. OOM women are strengthened by the principles of identifying themselves in opposition to the mainstream society, which may add to their empowerment. OOMs reported strong feelings of safety at home in most of the interviews, and a trust that God will protect them in their place because they maintain His will. Furthermore, the self-sufficiency of the OOMs and their own community network, contributes to a strong sense of ethnic identity.

The healthy connections that OOMs share with the local landscape, its therapeutic effects, and the social and economic factors in place all contribute to the construction of an "affirmation of difference" that promotes a sense of deep comfort with their separate identity. This coincides with the experiences of other ethnic minority groups, as already observed by Curtis (2004) who analyzed the social and political dynamics between small groups and members of the larger society. But the OOM landscape is unique in that it helps shape women's experiences of their health.

In their community, OOMs have created meanings of their landscapes that differ from the mainstream society and in so doing they have transformed their everyday landscapes into therapeutic landscapes. They construct the landscape as a healing landscape and focus on spirituality and their own sustainability in place. Their therapeutic landscape is contained in their community's identity and their commitment to a religious lifestyle. The community provides the context in which communal bonds are fostered. Praying together and sitting in the established order in a meeting house (men with men, women with women, and mothers with small children with other mothers) reinforce commitments to a religious community, its traditions and the creation of a particular meaning of place. In the therapeutic landscape of OOMs religion is incorporated in their culture and their way of living. The landscape of the OOMs contains a dimension of a slower pace of life, smaller geographical scale, strong family connections and bonds within their community, as well as their psychosocial attachment. All of these dimensions create their therapeutic experiences in place.

Their beliefs in their safety in place and their religious attachment to place are similar to the findings of Billing (2006). Like the settlers in Gaza who believe that God protects them in place in everyday life (despite the violence, terrorist attacks and tragedies) OOMs do not question their community's position in place. The religious attachment of OOMs to their land allows them to see their place as an ideal home despite the industrial contamination that has polluted their local environment. The failure to perceive their place as safe would be interpreted as failure in their trust in God. God has placed them here and their ancestors have

lived on this land for two centuries. The religious links with place construct their experience of therapeutic landscape.

Clearly, women's therapeutic landscape constructed by OOM women is gender specific, as it relates only to women's health. Their health is culturally embedded in place in their communities and allows women to enhance their health and well-being in their landscape. This research, conducted among a small group of Old Order Mennonite women in southern Ontario, informs other studies on how ethnic minority women are able to structure therapeutic health experiences in place. As MacKian (2008) describes, fostering women's health in place is bound by socio-cultural relations and it is encountered differently at different times and in different places, modified by the culturally accepted criteria for health environments. In this study, the OOM women are empowered by the religious and cultural differences that sustain their holistic understandings of health landscapes.

4. 9 Conclusions – reversing the lens of links to health in place

This paper presents the healing experiences of OOM women in their everyday landscape, which contributes to a deeper understanding of the way this group of minority women have quilted their lives into meaningful connections to place. The social attributes of place in the Township of Woolwich are based on different contextual structures. The social structure of OOMs is very different from modern societies, a difference that contributes to a varied degree of place-health connections. Not only is the OOMs' 'lifeline' tied to the land, but as a

group they are also interconnected with members of the *Gemeinschaft* community.

An important question which arises from this research is how *holistic* is the Western model of health interpreted within the positivist lens of science? What role do spiritual and religious components play? Should the focus be exclusively on physical, mental and emotional factors, or are religious and spiritual aspects central to people's well-being in place? The path to health for the OOMs comprises environmental and spiritual links which combine to create a therapeutic landscape. Spiritual links to place among OOMs reflect complex relations as manifested their cultural conceptualizations of place.

This study explores the concept of affirmation of difference in place by ethnic minority groups. It is not possible to generalize from such a small and non-representative sample that other 'plain people' who are led by their religious beliefs will experience similar therapeutic experiences. However, the homogeneity within the wider community of Old Order Mennonites suggests that other community members likely share similar healing experiences in place.

People's experiences of therapeutic landscapes are essential to their well-being, but they do not protect them from environmental hazards. The rhetoric of affirmation of difference cannot be used to eliminate the possibility of negative environmental impacts on future generations. Effective policies and practices to protect cultural minorities from environmental exposures are essential to their future health and well-being.

4.10 References

Asthana, S. (1996). "Women's health and women's empowerment: a locality perspective." Health and Place **2**(1): 1-13.

Bassett, D., Jr., M. S. Tremblay, et al. (2007). "Physical Activity and Body Mass Index of Children in an Old Order Amish Community." Medicine & Science in Sports & Exercise: 410-415.

Baxter, J. and J. Eyles (1997). "Evaluating qualitative research in social geography: establishing "rigour' in interview analysis." Transactions of the Institute of British Geographers **22**: 505-525.

Baxter, J. and K. Greenlaw (2005). "Explaining perceptions of a technological environmental hazard." The Canadian Geographer **49**(1): 61-80.

Baylis, F., J. Downie, et al., Eds. (2004). Health Care Ethics in Canada. Toronto, Thomson, Nelson.

Beck, U. (1992). Risk Society: Towards a New Modernity. London, Sage.

Bennett, E. (2003). "Emancipatory responses to oppression: The template of land-use planning and the Old Order Amish of Ontario." American Journal of Community Psychology **31**(1/2): 157-171.

Billing, M. (2006). "Is my home my castle? Place attachement, risk perception, and religious faith." Environment and Behavior **38**(2): 248-265.

Burra, T., S. J. Elliott, et al. (2006). "Effects of residential exposure to steel mills and coking works on birth weight and preterm births among residents of Sydney, Nova Scotia." The Canadian Geographer **50**(2): 242-255.

Clarke, N. J. (2004). Health, illness, and medicine in Canada, Oxford University Press.

Conestoga-Rovers & Associates (2003). Human Health Risk Assessment for Canagagigue Creek. Waterloo, Ontario, Conestoga-Rovers & Associates: 80.

Curtis, S. (2004). Health and Inequality. Geographical Perspectives. London, Thousand Oaks, New Delhi, Sage.

Day, R. (2006). "Place and the experience of air quality." Health and Place **13**: 249-260.

Donovan, J. L. (1984). "Ethnicity and Health: A Research Review." Social Science & Medicine **19**(7): 663-670.

Dyck, I. (1990). "Context, culture and client: Geography and the health for all strategy." The Canadian Geographer **34**(4): 338-341.

Dyck, I., N. Davis Lewis, et al., Eds. (2001). Geographies of Women's Health. London, Routlege.

Eyles, J. (1985). Senses of Place. London, Silverbrook Press.

Falk, M. J., H. S. Feiler, et al. (2004). "Cohen Syndrome in the Ohio Amish." American Journal of Medical Genetics **128A**: 23-28.

Frank, R. (2007). "What to make of it? (Re)emerge of a biological conceptualization of race in health disparities research." Social Science & Medicine **64**: 1977-1983.

Fretz J., W. (1989). The Waterloo Mennonites. A community in paradox. Waterloo, Ontario, Conrad Grebel College.

Fuchs, J. A., R. M. Levinson, et al. (1990). "Health risk factors among the Amish: Results of a survey." Health Education Quarterly **17**(2): 197-211.

Gatrell, A. (2002). Geographies of Health. Oxford UK, Blackwell Publishers Ltd.

Gesler, W. M. (2003). Healing Places. Lanham, Maryland, Rowman & Littlefield

Gesler, W. M. and R. A. Kearns (2002). Culture/Place/Health. New York, Routledge.

Good Gingrich, L. and E. Lightman (2004). "Mediating communities and cultures: A case study of informal helpers in an Old Order Mennonite community." Families in Society: The Journal of Contemporary Social Services **85**(4).

Hamman, R. F., J. I. Barancik, et al. (1981). "Patterns of mortality in the Old Order Amish." American Journal of Epidemiology **114**(6): 845-861.

Hay, I., Ed. (2000). Qualitative Research Methods in Human Geography. Victoria Australia, Oxford.

Hewner, S., J. (1997). "Biocultural approaches to health and mortality in an Old Order Amish community." Collegium Antropologicum **21**(1): 67-82.

Hewner, S., J. (2001). "Postmenopausal function in context: biocultural observations on Amish, neighboring non-Amish, and Ifugao household health." American Journal of Human Biology **13**: 521-530.

Horst, I. R. (2000). A separate people: An insider's view of Old Order Mennonite customs and traditions. Waterloo, Ontario, Herald Press.

Hsueh, W., B. D. Mitchell, et al. (2000). "Diabetes in the Old Order Amish." Diabetes Care **23**(5): 595-600.

Kawachi, I. and L. F. Berkman (2000). Social Cohesion, Social Capital, and Health. Social Epidemiology. L. F. Berkman and I. Kawanichi. Oxford, Oxford University Press.

Kearns, R. and R. J. Barnett (1999). Auckland's Starship Enterprise: Placing Metaphor in a Children's Hospital. Therapeutic Landscapes A. Williams. Lanham, University Press of America.

Kraybill, D. B. (2001). On the Backroad to Heaven. Baltimore, Johns Hopkins University Press.

Levinson, R. M., J. A. Fuchs, et al. (1989). "Behavioral risk factors in an Amish community." American Journal of Preventive Medicine **5**(3): 150-6.

Leyden, K. (2003). "Social capital and the built environment: the importance of walkable neighborhoods." Americal Journal of Public Health **93**(9): 1546-1551.

MacKian, S. (2008). "What the papers say: Reading therapeutic landscapes of women's health and empowerement in Uganda." Health and Place **2008**.

Mazumdar, S. (2004). "Religious place attachment, squatting, and "qualitative" research: A commentary." Journal of Environmental Psychology **24**: 87-95.

Mazumdar, S. (2005). "Religious place attachment, squatting, and "qualitative" research: A commentary." Journal of Environmental Psychology **25**: 87-95.

McKusick, V. A. (2000). "Ellis-van Creveld syndrome and the Amish." Natural Genetics **24**(3): 203-4.

Milligan, C., A. Gatrell, et al. (2004). "Cultivating health: therapeutic landscape and older people in northern England " Social Science & Medicine **58**: 1781-1793.

Nazroo, Y. Y. (2006). Health and social research in multiethnic societies. London; New York, Routledge.

Neelman, J. and S. Wessely (1999). "Ethnic minority suicide: a small area geographical study in South London." Psychological Medicine **29**(429-436).

Peters, J. F. (2003). The Plain People: A Glimpse at Life Among the Old Order Mennonites of Ontario. Kitchener, Herald Press.

Phillips, S. (1995). "The social context of women's health: goals and objectives for medical education. ." Canadian Medical Association Journal **152**(4): 507.

Putman, R. (1993). Making Demokracy Work. Princeton, Princeton University Press.

Quinn-Patton, M. (2002). Qualitative research and evaluation methods. Thousands Oaks, Sage.

Troyer, H. (1988). "Review of cancer among 4 religious sects: evidence that lifestyles are distinctive sets of risk factors." Social Science & Medicine **26**: 1007-1017.

van Ingen, C. (2004). "Therapeutic landscapes and the regulated body in the Toronto Front Runners." Sociology and Sport **21**: 253-269.

Wakefield, S. (2002). Social capital and environmental risk: understanding responses to adverse air quality in Hamilton-Wenthworth. Department of Geography. Hamilton, McMaster University.

Wakefield, S., S. Elliott, et al. (2001). "Environmental risk and (re)action: air quality, health, and civic involvement in an urban industrial neighbourhood." Health and Place **7**: 163-177.

Wakefield, S. and C. McMullan (2004). "Healing in places of decline: (re)imagining everyday landscapes in Hamilton, Ontario." Health and Place **11**: 299-312.

Wakefield, S. and C. McMullan (2005). "Healing in places of decline: (re)imagining everyday landscapes in Hamilton, Ontario." Health and Place **11**: 299-312.

Waterloo Region Community Health Department (2001). Summary Health Status of Woolwich Township Residents. Waterloo, Ontario.

Wengler, L. (2003). *Unser Satt Leit: Our sort of people*. Health understandings in the Old Order Mennonite and Amish community. Recreation and Leisure Studies. . Waterloo, University of Waterloo. **MA:** 206.

Williams, A., Ed. (1999). Therapeutic Landscapes. New York, University Press of America.

Williams, A. (2002). "Changing geographies of care: Employing the concept of therapeutic landscapes as a framework in examining home space." Social Science & Medicine **51**: 141-154.

Williams, A. and T. Garvin (2004). "Taking stock: Geographical perspectives on women and health in Canada." The Canadian Geographer **48**(1): 29-34.

Wilson, K. J. (2003). "Therapeutic landscapes and First Nations peoples: and exploration of culture, health and place." Health and Place **2003**(9): 83-93.

Wismer, S. (1999). "From the ground up: Quality of life indicators and sustainable community development." Feminist Economics **5**(2): 109-114.

Ypinazar, V. A. and S. A. Margolis (2006). "Delivering culturally sensitive care: The perceptions of older Arabian Gulf Arabs concerning religion, health, and disease." Qualitative Health Research **16**(6): 773-787.

---

[i] In 1967 the Old Order Mennonites established a new colony 120 km north of Waterloo in Mount Forest, Ontario.

[ii] Old Order Mennonites believe that false doctrine might be learned from 'worldly influences'. Hence they do not permit their children to attend school beyond grade 8. Also, Old Order Mennonite teachers have only a Grade 8 education. Most classes are taught in English but Bible reading, hymn singing and prayers are taught in German. The curriculum emphasis is on reading, writing, arithmetic and Mennonites history.

[iii] Since they do not militarily support the country in the time of war, they believe that they should not take free health care from the country (WCHC, 2005). Thus their decision to refrain from using the Ontario Health Insurance Plan (OHIP) is based on their notion of pacifism.

Chapter 5

THE 'COMMUNITY OF FAITH' AND THE SOCIAL ATTENUATION OF RISK. CASE STUDY WITH THE OLD ORDER MENNONITE COMMUNITY.

Abstract

Clarifying the role of culture within community, society or at global level is central to risk perception research. Examining perspectives and social concerns in different environmental contexts contrasts culturally-mediated vulnerability of people and risk. This case study is the first cross-cultural research conducted with the Old Order Mennonites living in south-central Ontario, Canada, that confronts perceptions of technological hazard and understandings of environmental risk. The concept of culture in the dynamic and flexible systems of western society is contrasted with the "non-changing" orthodox way of life, core values and worldviews of Old Order Mennonites. Drawing on the social amplification of risk framework (SARF) developed by Kasperson, Renn, Slovic and their colleagues in 1988, the study assesses how cultural beliefs and practices, and religious values frame the responses of the study research groups to technological hazards. In this research culture becomes central to shaping the meaning of environmental technological hazard. The findings bring awareness to risk attenuation and amplification processes and reveals culturally conditioned perceptions that exist among members of this ethno-religious minority group.

5.1 Introduction

Current research emphasizes that risk is socially constructed and is influenced by behavioral and cognitive aspects of people's reactions and their interpretations of events (Slovic, Fischhoff et al. 1979; Kasperson and Dow 1993; Sjoberg 2000; Horlick-Jones, Sime et al. 2003). An unacceptable risk for one group or society may be tolerable to others, especially when cultural values, economic and political vulnerability further complicate the issues (Hewitt 1997; Skinner, Alun et al. 2003). The social context shapes people's worldviews and the collective construct of perception of "right and truth depends on cultural categories created along with social relations" (Douglas, 1982, p. 186). Individuals from different ethnic and cultural groups may have a different tendencies to amplify (emphasize) certain risks and attenuate (downplay) others, because the subjective 'meaning' of event results largely from culturally based beliefs and value systems (Vaughan and Nordenstam 1991; Bontempo, William et al. 1997). Trust appears to be critical to perceptions of managerial issues and in handling emergency responses at different geographical scales (Pidgeon, Kasperson et al. 2003). For example, a much higher level of trust in science and government management of nuclear power has been observed in France as compared to the United States, where technology has been a source of social conflicts (ibid). In this matter, different understandings of events emphasize that communication about risk among people, and making sense of events "is

inherently cultural, as each group seeks to advocate a view of risk that conforms to its way of seeing the world" (Masuda and Garvin, 2003, p. 437). Hazard understandings are influenced by social experiences and interactions among people based on their ways of living and their value systems.

Numerous geographical studies have analyzed risk perceptions and explored risk factors, risk consequences and psychosocial impacts at a variety of geographic scales (Cutter 1993; Baxter, Eyles et al. 1999; Luginaah, Taylor et al. 2002; Haalboom, Elliott et al. 2006). Geographers have explored the factors that influence how individuals and groups view and make judgments on the acceptability of risk and communicate hazard perceptions through the examination of meaning and context of place (Eyles 1997; Hewitt 1997; Baxter and Greenlaw 2005). Cultural points of view influence perceptions of well-being and threats to health through ideological values, identity, history, place attachment and religious faith (Curtis 2004). The direct social interactions are particularly evident in small and rural communities, where proximity and social structure facilitate face-to-face constructed meanings that shape public experiences of risk. The influence of spiritual beliefs on risk perceptions is complex and does not show consistent patterns across societies (Billing 2006; Slimak and Dietz 2006). There is limited knowledge of how conservative, ethno-religious communities might respond to modern risks and how their understandings of technological hazard are constructed.

The following study analyzes the links among risk perceptions, culture and the social context of the residents of the town of Elmira and its surrounding agricultural landscape of Woolwich Township. Serious environmental concerns exist in the area due to extended exposure to toxic waste produced during a long history of manufacturing of rubber and highly toxic herbicides and pesticides (Conestoga-Rovers & Associates 2003). Despite the preservation of their traditional way of life and a desire to remain separate from the mainstream society, Old Order Mennonites join their Elmira neighbours in experiencing the impacts of contemporary social, political, economic and environmental issues of modernity.

This field research fills an important gap in our knowledge by comparing the understanding and perceptions of technological hazards by the members of Old Order Mennonite community with the views existing among the members of the mainstream society in the post-modern world. The article has three objectives:

1) to compare risk perceptions among three groups of people: professional key informants, women members of the mainstream society and Old Order Mennonite women;
2) to examine how culture influences concepts of risk, risk understandings and impacts of a major environmental crisis;
3) to investigate the role of culture drawing on the social amplification/attenuation of risk framework (SARF).

Women were selected because women and children are the most vulnerable members of the communities facing environmental hazards (Curtis 2004). The different gender roles in patriarchic community, difference of exposures, metabolic differences, smaller body mass and multiple pregnancies (as having 5 to 11 children is a norm) can be identified immediately as a few of many factors contributing to their vulnerability. Additionally, in academic research the voices of women have tended to be underrepresented (Dyck, Davis Lewis et al. 2001) and thus a particular effort has been made to address that imbalance.

5.2 Theoretical Background

The communication of risk, social processes and differences in ways of knowing among professionals and lay people complicate the measurements of hazards and public perceptions. The social context of places and cultural values in the environmental hazard perceptions of lay people does not isolate risk as a technical problem (Brown 1992; Karmaus 2001; Rippl 2002). Risk communication as an alternative process to exchange information and opinions among individual groups in institutions is culturally modified. Mass media plays an important role in risk communication and in mediating people's responses to hazards (Rippl 2002; Renn 2003). Cultural differences in perception of various risks in cross-cultural communication have been recognized and it is suggested

that miscommunication about the uncertainty of risk is almost guaranteed (Yates, 1989).

Culture influences perceptions of risk (Douglas and Wildavsky 1982). People's experiences exhibit great cultural variations, as risk must be evaluated in context to include a range of social and cultural factors. The context of individual lives shapes people's worldviews and creates cognitive patterns which work like filters in the evaluation of information about risk (Slovic, Fischhoff et al. 1979; Slimak and Dietz 2006). Worldviews or ideologies are important components of culture that contribute to diversity in risk perceptions (Tansey 2004; Baxter and Greenlaw 2005). For example, people with an egalitarian worldview who value equality may take a stand against the introduction of technology because they believe an inegalitarian society is likely to damage the environment and exploit the impoverished.

This case study incorporates the SARF framework developed by Kasperson, Renn, Slovic and their colleagues (1988). This approach has not been commonly used in qualitative risk research and offers an innovative way to analyze the influence of culture on group perceptions of environmental risk. Based on the SARF definition, risk is "in part an objective threat of harm to people and in part a product of culture and social experience" (Pidgeon, Kasperson et al. 2003, p. 61). This definition acknowledges that the positivist view (*expert defined risk*) and the constructivist view (*social construct*) are

modified by different cultural understandings. Risks are interpreted differently as people assign meaning to them according to their personal experiences, demographic characteristics, ideology, home attachment, and religious faith. Risk communication and social linkages underlie amplification and attenuation processes, depending on how the information flow is influenced by culture. Members of cultural groups and other social units codetermine the dynamics and social processing of risk. People examine their knowledge of risk information and alter their imagery of hazards within their social context. These human and cultural factors are prevailing contributors to the overall risk impacts to the community.

Researchers have analyzed risk amplification and risk attenuation processes and have observed differences in people's worldviews underpinning their perception and communication of risks (Masuda and Garvin 2006). In extreme situations, strong ideological and religious convictions result in an attenuation of risk, for example among the Jewish settlers in the Gaza Strip who face frequent risks of terrorist attacks. Here, people with strong spiritual values perceived Gaza as being of low risk and developed the means to cope with the situation (Billing 2006). As demonstrated in Billing's research, the stronger the ideology, place attachment, and home attachment, the lower the risk perception. This significant finding illustrates that people's perceptions are highly influenced by spirituality.

Culture is a not a static variable but is dynamic and is expressed in the nature of social and political relations, as many cultural geographers have examined (Gesler and Kearns 2002; Martin 2003). Recognition of cultural differences among people points to a plurality of understandings, especially in ethnographic studies, as race and gender relations in place influence risk perceptions. For example, in a national survey conducted by Flynn and Slovic (1994) in the United States, women were found to be 25 percent more likely than men and nonwhites were 24 percent more likely than whites, to rate outdoor air quality as a "high" risk to their health. Researchers have noted that similarities in perceptions are often correlated with similarities in social backgrounds, e.g. family structure and preferred relations (Riley, Newby et al. 2006). In addition, research has shown that individuals or groups may mitigate the disadvantages related to race, gender and social status by boosting their self-esteem and enhancing a positive sense of identity (Curtis 2004). This finding has particular relevance for this study since it suggests that a positive sense of identity might mitigate the disadvantages among ethnic minority groups as compared to the mainstream majority.

Baxter and Greenlaw (2005) review the approaches to understanding culture in hazard and risk research in geographical debates. They maintain that culture is an undertheorized black box within the risk perception literature, including the SARF model. They looked at the ways in which a few key cultural

elements including trust, equity and ways of living influence the perceptions of risk within the specific context of three communities affected by a hazardous waste facility (Baxter and Greenlaw 2005). In their study, at the local town or village level, an understanding of culture incorporates a wide-range of people's beliefs as they are embedded in local hazard-related events. They analyzed the concept of threats to ways of life, in a way which takes into account the locally contingent components of worldviews, or assumptions of how the world works, in relation to local environmental hazards (Baxter and Greenlaw 2005). Their analysis explored how residents defined their physical surroundings and social relationships and provided insights into community ways of life. They show how community context influences perceptions of trust or distrust and that environmental equity are fundamental to the perceptions of environmental hazard.

This study begins to unpack the black box associated with culture. Fig. 5.1 outlines the framework developed for this study to illustrate how perceptions of technological hazards are filtered through culture and are amplified or attenuated by individuals. The developed risk framework highlights the role of culture, comprised of four categories through which risk perception is constructed – threats to lives, core values, worldviews and community context.

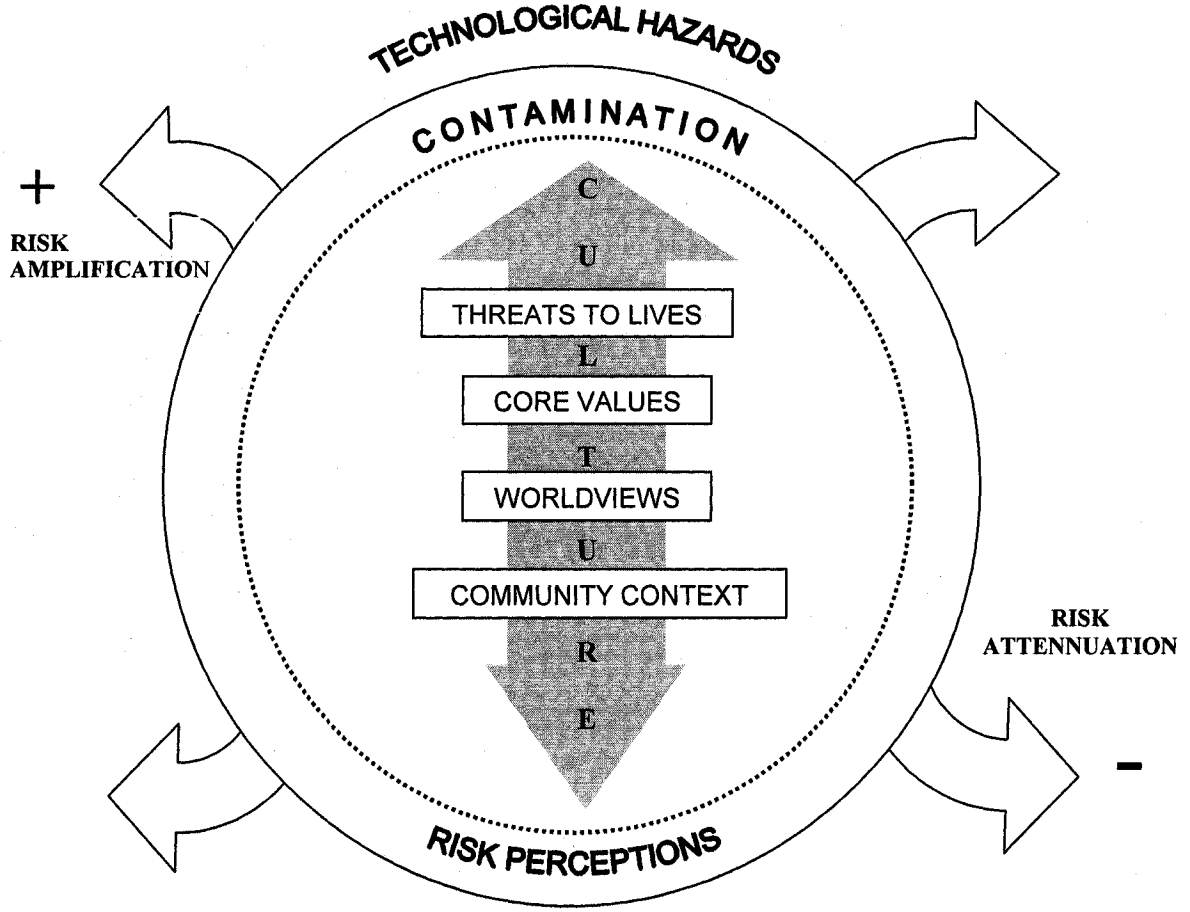

Fig. 5.1. Simplified conceptual framework for understanding cultural differences in risk perceptions in leading to risk attenuation or risk amplification.

The **threats to lives** category is a broad classification concerned with the residents' appraisals of technological environmental hazard in Elmira as it impacts their everyday lives. The three major implications to life of residents are *danger, health* and *safety*, which are linked to personal experiences and community understandings of environmental stressors. Environmental pollution

can threaten security of particular ways of life such as child-raising in a small community, working in industry, farming or retirement. Respondents have linked their personal experiences with chemicals, fires, fish death and terrible odor in the town.

The concept of **core values** such as *attachment to place, ethnic identity and equity* are defined here as comprising a large part of the 'localized rationality'. People perceive and understand the world as relevant to their own value system, which varies significantly among different ethnic groups and it is expressed, for instance, by using a horse and buggy, dressing modestly in black clothing and hats, and marrying only within their own faith.

The separate category of **worldviews** expresses people's concerns about *trust*, *blame* and *acceptance* of risk hazards, which are persistent and value laden (Baxter and Greenlaw 2005). This category is different from the previous one because it considers how people define meanings and experiences in relation to environmental contamination present in the community. For example, lack of trust towards environmental managers and the lack of monitoring information reinforced feelings of disappointment, frustration and anxiety among the town's residents. People feel insecure as the industrial development of the area may threaten their wellbeing resulting in their distrust of the government.

Community context refers to the community characteristics that influence the residents' risk perceptions (Baxter and Greenlaw 2005). Community context

variables include *community networks* and incorporates definitions of *community, community as insurance, economic impacts* to the community and *access to media*. This category includes differences among proponents and opponents of local industrial development in mainstream society, and encompasses the Old Order Mennonite community, with their desire to remain separate from the modern world.

The developed framework is used to explore culturally different responses to technological hazard between Old Older Mennonites and members of mainstream society. It demonstrates that risk perceptions are filtered by these multiple layers of culture resulting in a range of psychological impacts among the different community groups.

5.3 Study Setting

Elmira, a town located in Woolwich Township, is approximately 14 km north of Kitchener-Waterloo, Ontario, Canada (Fig.5.2). Woolwich Township is one of four rural municipalities surrounding the cities of Kitchener, Waterloo and Cambridge and is known for its large Mennonite community, the annual Spring Maple Syrup Festival in early April and for the historic covered bridge located in West Montrose. Different groups or congregations of Mennonites have different histories, and though there is much resemblance among some groups, their culture

is unique within their specific congregations (Fretz J. 1989; Snyder and Bowman 2002; Peters 2003).

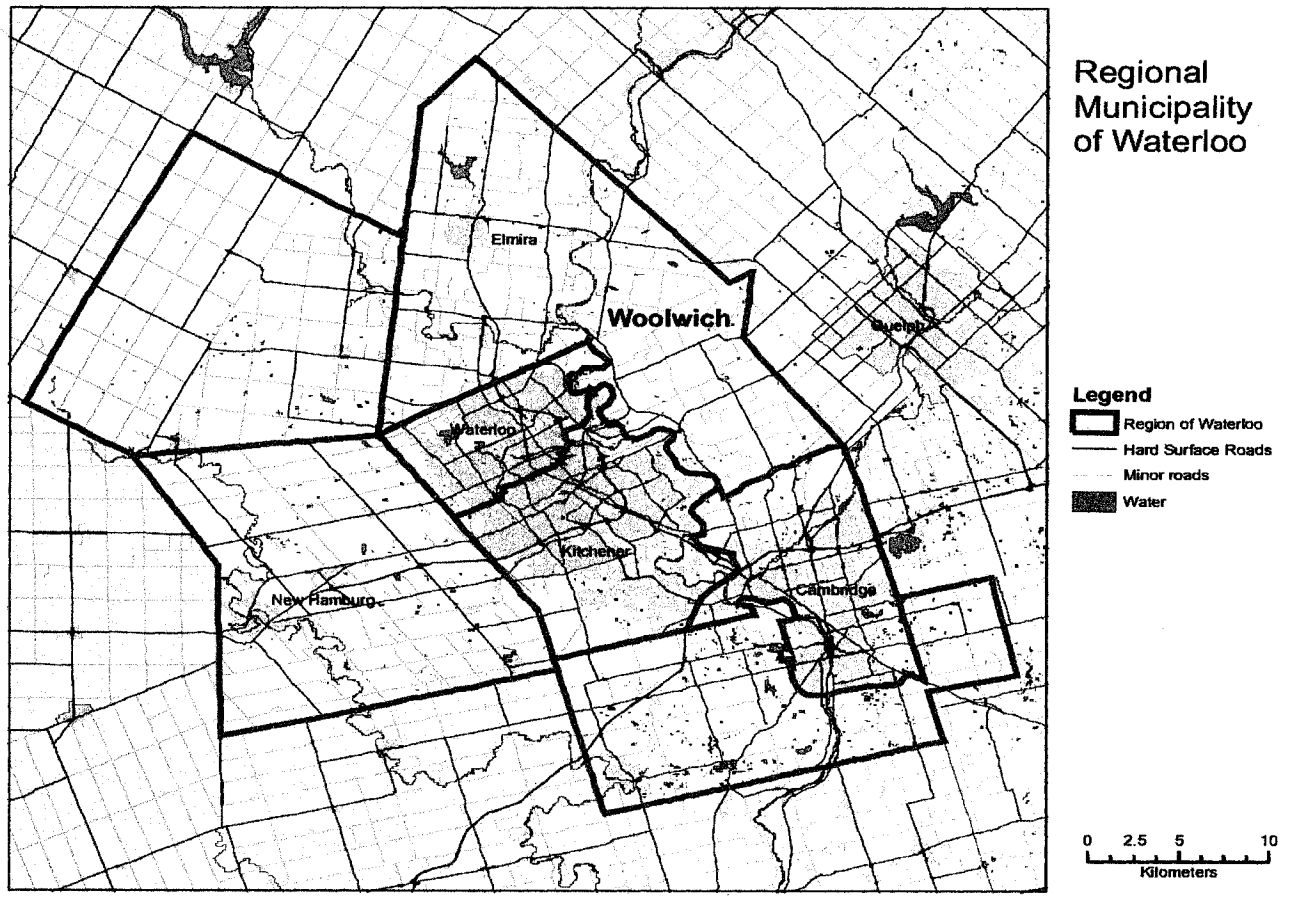

Fig. 5.2. Township of Woolwich. Region of Waterloo. Ontario. DMTI CanMap Streetfiles [ONTARIO]. Markham, Ontario: DMTI Spatial Inc., [2005]

The Old Order Mennonites, who still maintain a horse-and-buggy. This closed and separate ethno-religious community maintains the traditional *gemeinschaft community*[i] structure and regards the authority of God, the Bible and the church leaders higher than the authority of the state (Fig. 5.3). The clear distinction between church and state shapes cultural boundaries differentiating the traditional, agriculture-oriented, religious-bound community, from the technologically-based, secular, mainstream society.

Woolwich Township has been chosen as a primary study area for significant reasons. For more than five decades, Elmira (population 7,712)[ii] has been the subject of environmental concerns due to its industrial history that has resulted in toxic groundwater, toxic sediments and air contamination. In 1989, the Ontario Ministry of Environment (MOE) detected a high level of the carcinogenic chemical N-nitroso-dimethylamine[iii] (NDMA) in the town's drinking water. As a result, the main drinking water supply wells were shut down permanently in Elmira. It is not known for how long nor to what levels of contamination the affected communities were exposed. The local study of Industrial Air Emissions in Elmira conducted by the Region of Waterloo Public Health found approximately 30% of (268 people, out of 800) respondents reported having health effects due to the industrial air emissions (Waterloo Region Community Health Department [WRCHD] 2000).

OLD ORDER MENNONITE COMMUNITY
IN THE TOWNSHIP OF WOOLWICH, ONTARIO

Old Order Mennonites are members of an ethno-religious community in rural Ontario that strives toward autonomy in all aspects of community life (Hostetler 1975; Good Gingrich and Lightman 2004). The Mennonite faith is a Christian religion that traces its origin to the Swiss Anabaptist of the 16th century. Knowing the history of the Anabaptist movement helps to understand culture of the conservative Mennonites and the Amish. Their desire to be obedient of God's will and to avoid sins of the flesh can be recognized in their simple agrarian lifestyle, plain dress, and "horse-and-buggy" transportation. As religion and customs are inseparable, the Old Order Mennonites are guided in their behavior not by their own desires but by the rules and obligation to God and to the needs of the community.

Old Order Mennonite practices maintaining self-sufficiency are grounded in religion. To rely on a secular government for things like emotional or financial security indicates a failure to trust in God (Fast, Leach et al. 2002). The belief that church members should care for each other to "fulfill the law of Christ" has resulted in the principle of non-participation in external social or insurance programs (Douglas 1992; Reyner 1992; Snyder and Bowman 2002). Old Order Mennonites believe that they are to provide for any and all needs of their community. They negotiated with the Government to be exempted from possessing Social Insurance Numbers (SIN), they do not use the Ontario Health Insurance Plan (OHIP), and they accept neither Canada Child Tax Benefits nor Old Age Security payments. These practices distance the communities further and make them responsible for paying 100% cost of health care and other services available to the residents of the province.

The *Ordnung* is a book of rules, which function to foster a God-pleasing life. The religious doctrine requiring the submission of women to men, in a traditional patriarchal social order, permeates every aspect of community life and dictates the acceptable roles and behaviour for males and females of every age (Horst 2000). Work is a gift from God; it is valued and everybody, including children, should work. As a separate language is an effective barrier, the Old Order Mennonites speak a dialect called Pennsylvania Deutsch (not Dutch) (Peters, 2003). Their language is learned at home, used at home and among the community members to maintain a life apart from the English society. The Old Order Mennonites support their own schools, and they limit children's education beyond grade 8 elementary school.

Old Order Mennonites distance themselves from the mainstream society by avoiding electricity and electronic technologies, not using radio, TV or the internet. Electricity, rubber –tired tractors, and telephones are permitted, but often not used by church and community leaders. The Old Order Mennonites have never entered "cyberspace," and they communicate mainly through personal interactions and by traditional mail. While the methods of interpersonal communication create meaningful connections, they also address the broader social context. Within the context, the social capital expressions of values, trust, social norms, along with the social relations themselves, are associated with practical benefits to the individual members of their community. It is implicit that the Old Order Mennonite subculture has much stronger social capital than the members of mainstream society.

Fig. 5.3. Brief Note about Old Order Mennonites in the Township of Woolwich.

It is also unclear what potential health hazards exist in the local area due to the long term environmental crisis (Arbuckle, Savitz et al. 1999; Schettler, Solomon et al. 2000; Schettler 2001; Wade 2001). But it is clear that the residents of the area have been exposed to highly dangerous chemicals in their air, water and soil for a long period of time, probably since the early 1940's when the first chemical plant began production in Elmira.

The large settlements of Old Order Mennonites living in rural communities surrounding Elmira have been extensively exposed to water from the Canagagigue Creek and to sediment contamination (Jaagumagi, Lomas et al. 1987; Awad and Hayton 2004). Despite living along the Creek, the Old Order Mennonites were not contacted to appraise them of the extent of the hazard. This may be because of the differences in culture and the desire of the Old Order Mennonites to remain separate from the mainstream society. The consequences of exposure to the toxins are significant. The Human Health Risk Assessment (HHRA) found that the employees and trespassers at Crompton Company's chemical plant face significantly elevated risks of getting cancer[iv] (Conestoga-Rovers & Associates 2003). With regards to the to the population living downstream, the Ministry of Environment MOE (Ontario) acknowledged that even without considering the specific behaviour and lifestyle of the Old Order Mennonites, families having contact with the Canagagigue Creek floodplain have an excess of cancer risk from 1.9 to 3.7 cases per million, well above the

estimated national figure. It is clear that immediate efforts should focus on remediation of the areas occupied by the Old Order Mennonites (MOE, Comment No. 16[v]).

No single event, even as significant as the contamination of the town's groundwater resources and the resulting water crisis in 1989, can explain people's reactions to technological hazard. Since the 1940s, the ongoing manufacturing operations of pesticides and herbicides in the town have demonstrated that profits were valued over ecologically sound practices (see Appendix 4.1 for a synopsis of the major events). In the 1980s, dioxins were already detected in the shallow wells near the plant and concerns about their harmful effects were reported by the media to the community. In the 1990s, the number of complaints to the Ontario Ministry of Environment (MOE) about air quality in Elmira grew, and air pollution tests resulted in the detection of numerous hazardous chemicals. The media reported extensively on the events, effectively addressed urgent concerns, provided warnings and reassurance, and played an important role in educating the public.

This paper fills an important gap in our knowledge of how perceptions of environmental hazard are filtered through culture. The understandings of environmental hazards by the residents of Elmira and the members of Old Order Mennonite community is essential to these communities well-being in place.

5.4 Methodology

5.4.1 Research Design

Semi-structured in-depth interviews were conducted in the Township of Woolwich from May 2005 until January 2006. In total, 48 interviews were undertaken with 56 research respondents, since some interviewees were accompanied by their husbands. Qualitative methodologies were implemented in sequential stages, involving different groups of people (refer to Chapter 3 Methodology). The study participants were:

(1) 14 Mainstream society key informants, medical and other professionals, living and working in Elmira,
(2) 19 Mainstream society women from the mainstream society living in the urban center of Elmira; and
(3) 15 Old Order Mennonite women living in the areas surrounding Elmira and farming along the Canagagigue Creek.

Interviews focused on understanding environmental risks concerns and understandings of cultural differences in risk perceptions. Socio-demographic information was collected from participants to contextualize their responses. During the interviews, a short questionnaire was distributed to participants, asking them to evaluate their perceptions of the environment as being "concerned, undecided or unconcerned" (Appendix E). Questions were asked about "why" they chose these particular answers and to explain their opinions about environmental hazard in place.

5.4.2 Sample

The topographic line used for sampling purposes was the Canagagigue Creek. Diverse and multi-method sampling was used to ensure that information from various sources and geographical locations would be collected. Individuals living along the river approximately 10 km upstream and downstream from the chemical plant and 10 km east and west of the plant in the rural areas were included in the sample. Participants, the majority of whom were women, were recruited through a combination of purposive and snowball sampling methodologies (Hay 2000; Quinn-Patton 2002). In response to advertisements, five women from the mainstream society volunteered to participate. Since it was necessary to select participants who had lived in the area for a minimum of 10 years, they helped to identify an additional fourteen women from different geographical locations within the Elmira area. Following an extended period of uncertainty, access to the Old Order Mennonite community was eventually gained through a gatekeeper, a woman who is a highly respected individual and who was willing to introduce the researcher to members of her community (see chapter 3). All Old Order Mennonite women, except one, had completed an elementary grade 8 level of education[vi], while 73% of women from the mainstream society had graduated from a postsecondary institution. The average age of the women

participants from the mainstream society was 56.5, compared to 49.7 years among the women from the Old Order Mennonite community (Table 5.1).

Table 5.1. Study Participants

Characteristic	Key Informants	Mainstream Society	Old Order Mennonites
Sample Size	14	19	15
Females	10	19	15
Males	4	1	8
Mean Age (range)	n/a	56.5 (26-83)	49.7 (23-64)
Marital Status			
Married/Partner	n/a	15	12
Widowed/Separated/Never Married	n/a	4	3
Highest Level of Education			
Elementary	-	1	14
High School	-	4	-
College/Undergrad/Post Grad	14	14	1*

* All members of the Old Order Mennonite community must have only elementary education. The offending woman was forced to leave the community a few years ago.

5.4.3 Data Collection Instrument and Process

Interviews with the members of the mainstream society were conducted from May 2005 until January 2006. Interviews with the Old Order Mennonites

were conducted from early November until the end of December 2005, a season when there is less demand on their time from farming activities. The interviews lasted from 45 to 90 minutes and were conducted mainly in the homes of the participants. All women[vii] from the mainstream society granted the researcher permission to audiotape the interviews. Interviews with Old Order Mennonite families were not taped, respecting their avoidance of electronic technology. Due to patriarchal relations existing within this community, eight male spouses were included in the study; however, attempts were made to speak directly with the women.

5.4.4 Data Analysis

The transcripts of the interviews with all the participants were formatted into text documents and imported into a qualitative software package (NVivo). Detailed coding was implemented using the computer software to search for themes that emerged during the interviews. Numerical summaries of the themes were constructed and analyzed (Baxter and Eyles 1997). Within the qualitative content, the rigour of the research was guided by concerns of *credibility*. Credibility was guarded through a process called member checking or reviewing of a few transcripts with the interview participants to confirm the accuracy of data. *Transferability* or "generalizability or fittingness of study findings to other settings" (Jackson, 2003, 183) was judged by the relevance of emerging themes to

other studies of perceptions of environmental risks in place. All interviews were conducted by the same interviewer to maintain consistency and to ensure *dependability,* which focused attention on the researcher-as-instrument to minimize the variability in the research process (Hay, 2000). In this qualitative, comparative and inductive research, each research participant created a new opportunity to develop and add concepts and contributed to understandings of subjective lay evaluations of risk in place.

5.4.5 Ethics

Academic research guarantees the anonymity of all participants and pseudonyms were used while reporting the study findings. All ethical procedures for informed consent, as required by Wilfrid Laurier University, were followed. Consequently the names of all participants have been changed and replaced with pseudonyms.

5.5 Results

5.5.1 Technological Hazard Concerns

The first step was to determine the general perception of risk within the study sample. These appraisals are in response to a question that asked whether or not participants were concerned with the local technological hazard. Most key informants (10/14) indicated their concerns for the safety of the local community

in response to long-term, low-dose exposures to the toxicants present in the environment. Similarly, a majority of women from the mainstream society (15/19) expressed their concerns regarding increased risk in the Township of Woolwich when they were asked directly about their safety in the local environment (Table 5.2).

Table 5.2. People Concerned and Unconcerned about Environmental Hazard in Elmira &Township of Woolwich in 2005.
*One husband joined a woman from the mainstream society
** Eight Old Order Mennonite men participated with their spouses

	Mainstream Society Key Informants *N=14* (%)	**Mainstream Society Women*** *N=19* (%)	**Old Order Mennonite Women**** *N=15* (%)
Risk concerns	10 (71)	15 (79)	2 (13)
Unconcerned	3 (21)	4 (21)	13 (87)
Undecided	1 (7)		
Total	14	19	15

In contrast, the Old Order Mennonite women (13/15) reported "no concerns'. While the farm's location was a major factor in addressing the personal experiences among the Old Order Mennonites, the real difference lies in the cultural understanding of environmental risk. In cases where their family farms were located downstream from the chemical centre of Elmira, they

demonstrated in-depth experience and knowledge of environmental damage of the environment. Nevertheless, the majority indicated that they were not concerned about the risks to their health posed by the chemical pollution. The analysis of the interview transcripts provides an in-depth understanding of cultural difference in risk perception among the local communities and explains why the Old Order Mennonites were not very concerned with technological hazard.

Table 5.3 presents the results grouped into four organizational themes introduced in the framework (selected in reference to Fig. 5.1) and based on the predetermined set of research questions. These are: **threats to lives**, **core values**, **worldviews** and **community context**. In constructing a valid comparison, the themes that emerged from data with the largest occurrence were considered essential and were linked to these categories. The analyses below provide a few examples of the diversity of responses to technological hazard by different cultural groups and help to identify the different cultural understandings of participants.

Table 5. 3. Interview results based on 48 individual interviews conducted in Elmira and Township of Woolwich, Ontario. * These numbers of interviews with couples contain the themes from both respondents

Organizational Themes	**Mainstream Society Key Informants** (N=14)	Interviews N (%)	**Mainstream Society Women** (N=19)	Interviews N (%)	**Old Order Mennonites Women** (N=15)	Interviews* N (%)
Threats to Lives	Danger of local pollutions	10 (71)	Danger of local pollutions	15 (79)	Danger of local pollutions	2 (13)
	Health has been threaten by local pollutions	8 (57)	Health has been threaten by local pollutions	14 (74)	Health has been threaten by local pollutions	2 (13)
	Safety - no reasons to be concerned with pollutions	3 (21)	Safety - no reasons to be concerned with pollutions	4 (21)	Safety - no reasons to be concerned with pollutions	13 (87)
	Weed-free town/ Pesticides are threat	5 (36)	Weed-free town/ Pesticides are threat	11 (58)	Farming practices/ Pesticides are necessary	12 (80)
Core Values	Religious values	4 (28)	Religious values	2 (10)	Faith	6 (40)
	Attachment to place	6 (43)	Attachment to place	16 (84)	Attachment to place	13 (87)
	Family life	3 (21)	Family life	5 (5)	Family life	5 (33)
	Natural environment	6 (43)	Natural environment	12 (12)	Natural environment	7 (41)
	Ethnic identity	0	Ethnic identity	0	Ethnic identity	9 (60)
	Equity	11 (78)	Equity	2 (10)	Equity	2 (12)
	Small town	8 (57)	Small town	13 (68)	Small town	1 (7)
Worldviews	Trusting remediation	2 (14)	Trusting remediation	15 (79)	Trusting God /	9 (60)
	Erosion of trust	6 (43)	Erosion of trust	12 (63)	Erosion of trust to society	4 (27)
	Blame	7 (50)	Blame	9 (47)	Blame	0
	Acceptance	1 (7)	Acceptance	0	Acceptance	6 (6)
	Price of progress	5 (36)	Price of progress	8 (42)	Price of progress	2 (13)
	Activism	8 (57)	Activism	12 (63)	Activism	1 (7)
Community context	Community networks in mainstream society	6 (43)	Community networks in mainstream society	11 (58)	Community networks in Gemeinschaft community	8 (53)
	Community as insurance	3 (21)	Community as insurance	0 (0)	Community as insurance	4 (27)
	Media attention	6 (43)	Media attention	4 (21)	Media attention	7 (47
	Company's town	5 (36)	Company's town	8 (42)	Company's town	0

5.5.2 Perceived Threats to Lives and Technological Environmental Hazard

The broad category of **threats to the lives** of residents includes "danger", "health" and "safety". The theme "danger" was defined based on the responses indicating people's past and current concerns about high toxicity of environmental pollution. Danger and threats to lives have different meaning to different people. The Old Order Mennonites demonstrated their awareness of environmental damage, but they were not concerned with them, as these problems were not related to their feeling of security in place (13/15 interviews). Lucinda, a downstream resident, explains this understanding of the polluted environment:

> *I did not worry much about the plants and the chemicals. I think you were asking if we know, about the problems. Because in our language, to worry means to lose sleep over it. I have never worried about that but I knew about the problems and saw the problems. (Lucinda, Old Order Mennonite, 57; OOS1)*

The definitions of pollution and environmental hazard differed due to culture. The local health and community professionals' perceptions were based on a social constructionist way of understanding risk which was expressed through the use of quantitative studies and based on comparisons to other communities in Ontario. They based their responses on their knowledge of documented contamination, local reports of environmental hazards, on the professional literature, information from the Ministry, environmental charges to

the company, reports in the newspapers and their own perceptions developed through their training and their communication with co-workers, patients, clients, and professional or volunteer work with the local communities.

Many of the informants spoke about "serious and persistent" pollution concerns in the community, about the special collection of documents referring to contamination in the Elmira Public Library[viii], and about the ongoing contamination of the environment being added to the existing contamination of the environment (10 /19 interviews). Arthur describes the understandings of hazards, the impacts to the community and coping strategies:

> *The community is different because the community lived through the man-made disaster. People tried to forget that they needed to buy water and the water was not drinkable during that time. (Arthur, Key Informant; K12)*

The professionals could not always describe the danger and indicated the limits of science and uncertainty of long-term, low-dose exposure and effects. For example, Norma, a health professional, pointed to the lack of information on the long-term exposures in providing answers to the local communities:

> *There were concerns about women if there is a connection between miscarriages and the contamination in the local environment. The major questions are whether the people should be concerned at all and if the concerns about environmental risk can be verified or dismissed. (Norma, Key Informant; K05)*

A majority of women from the mainstream society perceived the local technological hazards as a serious danger, and described their concerns with the chemicals, water and air pollution (15/19). Perception of ongoing environmental damage in Elmira affected people's life satisfaction, their quality of life and raised a wide range of impacts and concerns:

> *The environment was affected negatively by the emissions from the plant and so therefore some of the concerns that I had were long-term effects of that to people. And the fact that there were noxious fumes and now, in later days, we've had some clearing up of that. (Lorna, Mainstream, resident for 32 years, age 83; W0S6,).*

Only a small number of women from mainstream society (4/19 interviews) dismissed the impact of technological hazard and their understandings of risk based on their experiences of health among their family members, their relatives and friends. One of the women from mainstream society, a past employee of the company, referred to the change in people's attitudes toward new technologies, to advances in scientific knowledge, and she provided an interesting understanding of the probability of harm:

> *I know it's been going on for a while. I know that they've been telling us for awhile. Sort of like smoking. Well if I don't get cancer I guess it's alright to do it. It's sort of like playing Russian roulette. Maybe this one will, but maybe it won't. (Verna, urban resident for 41years, age 80; W0P15).*

The Old Order Mennonite women living in the rural area provided different understandings of environmental pollution. They spoke about

environmental pollution by referring to its "bad smell", "hard to breathe air", "many smog days", "car pollution and other poisons". A majority of them (12/15 interviews) described car pollution as a major problem. The "smell from town" was referred not only to emissions from the chemical plant, "stink factory", but also to the burning of fossil fuels in automobiles. For example, Anna describes:

> *My family was coming to visit from Linwood and they said that it was much easier to breath there. When the "highways" were built here the air became much worse. It was not so bad in the past; there was less car pollution (Anna, Old Order, age 56).*

In contrast, gasoline emissions for the Elmira residents posed no perceived dangers for the members of mainstream society. Old Order Mennonite women described the environmental pollution of water as "stinky water". The women also spoke of finding "dead fish" in the Canagagigue Creek.

Discussions of severe damage to the local farms located downstream from the Creek were viewed in a spatialized sense, at a very small local scale (7/15 interviews). Living only about two km downstream from the plant Lucinda argued, "We were safe here. The wind does not blow much in this direction" (Lucinda, age 57, Old Order Mennonite). One of the Old Order Mennonites described how he understood technological pollution, and what impacts it had had

on his family, and what preventive measures the family had to take. He quickly dismissed the concerns about further environmental threats to his family:

> *It was terrible, dirty and smelly water. There were no fish there. In 1964 my father lost 15 cattle. First we did not know what was the reason and we thought that maybe they had rabies. But they didn't. They died because of chemical poisoning by drinking the water from the Canagagigue Creek. Is here the chemicals are at highest concentration. Since that time, for safety reasons, we do not let our cattle to get close to the creek. You can see where the water comes from the plant. Later the plants in the water will absorb the chemicals and it is not bad. (Husband of Malinda, Old Order Mennonite, 53;00S10)*

Four women (4/19 interviews) who did not have any concerns about environmental technological hazards felt safe as they had connections with the chemical company responsible for the contamination of water. Saloma, long time resident, was not concerned, but her understanding was influenced by her son who worked at the plant and who questioned the authenticity of the level of toxicity in the environment.

> *I always used the water, drank the water, but some of them making the biggest fuss about it were buying all the water. Like you could go down to the fire station or buy water. And they were supplying it, but I never did, because like I say that I had somebody working here that disputed all of that. (Saloma, 72, Mainstream: W0P3)*

Efforts were made by members of the mainstream society to identify direct links between the environmental contamination and local health outcomes. In fact, two key informants collected health data on a very local scale to

investigate how residents downstream from the plant had recently died of cancers. Noticeably, a few of the key informants referred to what they believed to be direct links between the local contamination and the incidence of cancer:

> *In the last 10 years there is an increased amount of cancer occurrence in the local area. Since last year four women were newly diagnosed with breast cancer totaling 15 breast cancers in comparison with three from ten years ago. In general, 10 years ago cardiovascular diseases were the number one killer in the Elmira and rural areas, cancer was contributing to about 30% causes of deaths. Now, it is almost equal. (Jane, Key Informant Professional; K03)*

> *I conducted my own study from 1954 to about 1989. Most of my childhood friends who played with me swimming in the Canagagigue Creek had died of cancer. Of course car accidents are also on this list but cancer is very prevalent. (Arthur, Key Informant Professional: K12).*

A few women from mainstream society were also aware of a number of cases of cancer in their immediate neighborhood. Vera exemplified their views:

> *I would have to say in our crescent and one street over on each side, there have been, there have been six diagnosed cancers in the last five years. There are two fully recovered, the 25 year old, my son is just about five years cancer free as is the lady down at the end of the street who would be about 54. And that's within I would say about 100 yards, not longer than a football field away. So I don't know what the positive aspects would be of our local environment. It makes you wonder why we're still living. (Vera, Mainstream, age 54; W0S9)*

The lifestyle of the Old Order Mennonites is different than the mainstream society and they have very different cultural understandings of health among their members. Their cultural difference is visible to us, not only in their dress,

language, and the way of life they live, but also in their cultural-health connections. They believe that their health and well-being is connected to their ability to perform their roles at home and within their community. Even when they are suffering from health problems, they believe they are healthy if they are able to carry out their prescribed roles. Ellen, a chronically sick woman with MS, and Rhoda describe their challenges and health understandings:

> *I do not know how my health is. Some people say that I do nothing. Some people say that they will be not able to do so much as I do every day. (Ellen, Mennonite, age 51; OOS3)*

> *I am diabetic. Now I feel much better and I have not taken any pills for the last 4 years. I am taking care of my health. Since I had my youngest son, my oldest daughter started to milk the cows. I did not have as much work from that time and I almost do not have a reason to go outside (Rhoda, Mennonite, age 54; OOP12)*

The environmental risks to health are rooted in Old Order Mennonite women's traditional roles in the home, a place that is protected against influences from the outside world. A majority of women feel that their role in their home and in their community is not affected by environmental pollution. It appears that they are able to filter the understanding of health and safety through a different cultural lens. As outsiders, we need to be aware of these cultural differences and develop cross-cultural understanding of these links to environmental pollution and health.

In contrast, a large number of interview participants from the town of Elmira expressed their concerns about links between exposure to pesticides and

human health. An awareness of the high toxicity of pesticides has a particular meaning for Elmira's residents (5 key informants, 11 members of the mainstream society). These research participants referred to the reputation of Elmira in the 1950's of being a weed-free town, home of the pesticides DDT and 2-4D. Roselyn explains that:

> *Interestingly enough, I think what happened was in the 50's we were known as the weedless town. And I think that was the kind of control too because Naugatuck went around and sprayed every lawn. There wasn't a dandelion in town and our fame was that we were the weedless town. Little did we know about the impact that would have so I saw the company as almost closed off. (Roselyn, Mainstream, age 68; W020)*

The Old Order Mennonites were not part of the spraying program. Their understandings of environmental risks of pesticides are related to their farming activities. They trust the tests conducted by the experts, and they are aware of their toxicity and their long-term effects to the environment:

> *I know that we need companies like Uniroyal. I am farming and now I depend on these chemical products. I would rather not use them if I do not have to. By making and using the chemicals I feel that we are upsetting the balance of nature. We farmers are responsible for the pollution in some water. (Malinda's husband, 53, Mennonite, OOS10)*

The cultural differences between groups were central to their perceptions of hazard and danger in place. Further differences among participants can be seen in terms of their core values.

5.5.3 Core Values

Core values as an organizational theme refers to principles that people value most in their lives. It includes religious values, attachment to place, family life and ethnic identity among others themes. The links between people's beliefs and risk have emerged in this research as they contribute to environmental impacts on the individuals and the community. The theme religion[ix] was referred to four times during the interviews with the Old Order Mennonites, but the connections between religion and culture were explicit and exemplified in their behaviours. Importantly, for the Old Order Mennonites, faith and God are the greatest values in their lives. The Old Order Mennonites' belief in the ultimate power of their God has created their perceptions of safety in their place. They believe that God creates the reality of their existence and develops a plan for their lives. What further influences their understanding of risk for their community is their religious belief that they must live separately from the world and not to be of the world.

During the interviews, Old Order Mennonites identified their core values including importance of family life (5/15 interviews), attachment to place (13/15 interviews), heritage values (4/15 interviews), and they emphasized pride in their ethnic identity. Their opinions are presented below:

What else is important? I will ask how long can a country survive without Christianity? Lack of faith is the worst problem. Even if the people believe in something there is a hope for them. (Amanda's husband, Old Order Mennonite, OO11).

Yes, our children are better than the children in town. They have a better life on the farm. We provide for their well-being in the future. (Lucinda, Old Order Mennonite, OO1)

We hope that the next generations will live in the country too. (Rhoda, Mennonite, OO12)

A few members of mainstream society referred to a lack of equity and suggested that Old Order Mennonites lack knowledge about the environmental impacts of chemical contamination (2/19 interviews). Old Order Mennonites were perceived as not educated people who cannot develop "understandings of current global issues, and therefore, they are more vulnerable to environmental hazard" (Monica, Key Informant, K01). The patriarchal hierarchy in families, isolation of rural women, limited education and sources of information about environmental hazards were also identified as contributing to the inequalities. In reference to the contamination of water and the creek banks with dioxins, Nora, a rural resident of Woolwich Township, points to inequity and emphasizes that:

I would certainly not eat fish out of that river. But I think that maybe people need to know a little bit more definitely to be very careful about eating fish out of that river or digging of sand by the shore to put in the children's sandbox or using it to lighten the soil in the vegetable garden. (Nora, Mainstream, WOP18)

In contrast, the Old Order Mennonites pointed to the inequity faced by urban residents, because of their city lifestyle (4/15 interviews). They valued the benefits of their traditional lifestyle. They reported:

> *Chemical contamination is one thing. Bacteria are a different problem. The cleaner you get the faster the people will get sick. The city people cannot drink non pasteurized milk. The city people are not able to protect themselves from getting sick. (Minerva and her husband, Old Order Mennonite, 45; OOS9)*

People's perceptions of hazards in the context of community were modified by their core values expressed by the community groups. Further culture-risk connections can be seen in terms of worldviews.

5.5.4 Worldviews

Trust, blame and acceptance of risk are the three themes included in the organizational category worldviews. The main value guiding the worldviews of the Old Order Mennonites' is their trust in God. In response to local environmental hazards, religious beliefs are central and they are used to construct their risk understandings. Risk was attenuated by the Old Order Mennonites when discussing their understanding of such important aspects as faith and trust in God:

> *This is a part of our life to be in contact with the environment, soil and water. We trust that God guards our health. (Malinda, age53, Mennonite, OO10)*

When Old Order Mennonite children suffered from challenging health experiences, they saw this as God, the supreme authority, determining this outcome, not as the problems connected to people's actions. Moreover, the ending of a child's life prematurely is not understood similarly to mainstream society's worldviews. The Old Order Mennonites think differently about losing prematurely born children:

> *Yes, I have five children and I had five miscarriages. Only my oldest daughter is healthy. All my boys had health problems. Maybe it was better that the others did not live. (Ellen, Mennonite, OOS3)*

In this sense, Old Order Mennonites did not see a miscarriage as "a negative thing because it will be better for a child to be in heaven, closer to God" (Arthur, Key Informant, K12).

On the other hand, the key informants and the women from the mainstream society expressed their erosion of trust in the government, the Ministry and other professional institutions (11/33 interviews). One of the residents referred to himself as "a guinea pig for science" or believed that " local chemical industry lobbies the governments to keep the lower environmental standards and is allowed to pollute the environment" (Nick, Mainstream, Key Informant, K10). The members of the mainstream society trusted that local remediation was important in risk remediation and referred often to that theme (17/33).

The theme of activism, in the category of wordviews, was perceived as a risk amplifier, and was essential to the mainstream society members. Many residents expressed their gratitude to the local activists for their "protection and serious work" (Nora, 57, Mainstream) but a few people complained that they had learned "too much about the danger" (Saloma, 72, Mainstream). The increased community concerns led to formation of the *Crompton Public Advisory Committee (CPAC)* and the grass roots community groups *Assuring Protection for Tomorrow's Environment (APT-E)* and the *Environmental Hazard Team (EH)*.

The next theme that was important in constructing people's worldviews in response to local contamination and long-term exposure to carcinogenic pollutants is blame and acceptance. The mainstream society claimed that the company was responsible for the contamination of groundwater and technological environmental hazard (9/19 interviews). There were no issues of blame mentioned during the interviews with the Old Order Mennonites (Table 5.3). They trust God to be protected in place and they accept God's will. Therefore, they did not take any action or try to defend their rights. Unfortunately, they were perceived as the victims but also were blamed for the problems. The members of the mainstream society commented that the cultural behaviour of the Mennonites was not without consequences to other communities and explained:

> *The passive people believe in two German words: Gelassenheit and Gemeinschaft. Gelassenheit means acceptance in general, cceptance*

of God's plan for each life. But in critical interpretation acceptance also means, "stay away from trouble". In this community we observe how pacifism - the pursuit of peace, degrades to passivism - state of being passive. The passive local behaviour does not help to solve environmental problems" (Tom, Key Informant, K07)

The Mennonites passive behaviour was considered to be contributing to the environmental impact to other communities living further downstream in the Grand River area and contributing to the local environmental damage (3/14). The culture-risk connections expressed in practices and behavior of people are deeply embedded in the community context.

5.5.5 Community context

The community structure and social relations are important in an analysis of cultural differences in risk perceptions. The key themes identified here are community networks, community as insurance, company town and media attention. The community context is unique for the members of an orthodox, Gemeinschaft community and for the members of society[x] in the small town. These communities' structures have differed, both in the past and currently. A member of mainstream society, Roselyn talked about the company and described the change in Elmira from an "agricultural town" to a "company town". She provides an interesting perspective of her experience as a child:

It was a company town and we were not part of the company. My father happened to be the church minister so he was respected also. But there was a level of status within that town. It was a company town and it was Naugatuck/Uniroyal. But Naugatuck that was the company that made the town and the people who worked there, particularly those who were the chemists, and the people who were in the management positions, were the elite in the town. So the company was the town, but the town was not all part of the company. (Roselyn, Mainstream, W020)

In the community context of mainstream society, the residents' concerns were often economic in orientation. The environmental "stigma' was associated with the potential for pollution to affect agricultural production in the township and the residents' property values. The environmental stigma and chemical contamination was referred to in local jokes such as "swimming in Elmira's water and glowing in the dark" (Vera, 53, Mainstream, W0S9). Four women referred to this theme (4/19) expressing their concerns.

Women in Elmira highly valued the *community networks* and the dynamics of neighbourhoods and face-to-face relationships contributed to their well-being in the town (11/19 interview):

I think you get a different environment, well there's a different relationship in a small town. I mean people know people who know people and I think that in itself, the social aspects that are more important some times. And I think those factors are very strong contributors to having a long life and healthy lives more so than all the issues about the water, the air and that kind of stuff, personally. (Ella, urban, age43; W0P14)

While the Old Order Mennonite's everyday world extends from one farm to another village, it is paradoxical that with this small geographical scale their understanding of time has no end – it is eternity. Thus, the Mennonites belief that they are must stay *separate* as they are *not of this world,* and this is only a 'temporary place' for them. Why should the Old Order Mennonites worry about the impact of local contamination and how these problems are perceived in reference to eternity? With the use of this measurement of time, the local contamination seemed to be a really unimportant issue.

I did not ask the Old Order Mennonites about their understanding of community values, but I observed them in place. For example, a telephone conversation[xi] with another member of their community took place during my interview with Rhoda:

> *If you want to know what we were talking about is that she has no money to pay for gas [for heating]. She is not married. I told her to deliver to me her quilting. I will help to sell it. Shouldn't we do that to help each other? (Rhoda, Mennonite, OOP12)*

Indeed, in the context of community, the theme *community as insurance* was identified by key informants (3/14 interviews). Due to cultural differences, Old Order Mennonites chose not to participate in the provincial health insurance plan (OHIP) and must pay 100% for their medical bills. This is their religious-cultural choice, but a few key informants protested, "It is unjust to poison the Old Order Mennonites, who later pay their medical bills for their heath problems"

(Monica, Key Informant, K01). The high cost of health care is overwhelming and it is impacting life of the community, since people collect money from all members to help each other. Cultural differences profoundly shape risk experiences of Old Order Mennonites in their communities' context.

In reference to SARF, the disparities in risk communication patterns among the communities were imbalanced due to differences in culture. It is important to consider the *role of media* in risk understanding, since the use of media is culturally-mediated by the local communities. Both groups shared only a single medium of the local newspapers (refer to Appendix A) which informed readers of the environmental hazards and developed their awareness of the environmental crisis. The Old Order Mennonites in their community networks shared stories about dead cattle and ill-tasting tomatoes. The mainstream society's risk perceptions were further modified by information from other sources, such as the Regional Government reports, communication with the employees of the company responsible for contamination, by accumulating photographs of events, listening to the radio, television coverage, watching movies about environmental problems, internet conversations and by the activity of the local environmental groups. The number of communicated 'risk signals' was much higher for the members of the mainstream society than for the Old Order Mennonite community, who did not receive the same amount of information about the environmental hazards nor have similar knowledge about the issues. The

culturally determined ways of communication and networks among the members of various communities contributed to risk amplification or attenuation in the local context in the Township of Woolwich.

5.6 Discussion

Analysing people's responses to risk and recognition of differences has involved a comparison across different groups affected by the same technological hazards. The main comparison was conducted between Old Order Mennonites and mainstream society, with some additional insights provided by professional group when available. The themes from the interviews with the mainstream society women were compared to the themes from the interviews with the Old Order Mennonites. While using the proposed framework, the emerged themes were classified as attributors to risk amplification or risk attenuation processes. Table 5.4 outlines the main themes of high-risk perceptions and low-risk perceptions as referred to by study participants.

Table 5.4. Identified themes comparing high and low risk perceptions associated with risk amplification and risk attenuation.

CULTURE	HIGH RISK PERCEPTION THEMES RISK AMPLIFICATION		LOW RISK PERCEPTION THEMES RISK ATTENUATION	
MAINSTREAM SOCIETY (33 interviews)				
THREATS TO LIVES	Danger of local pollution	(25)		
	Health is threaten by pollution	(22)		
	Pesticides are a threat	(16)		
CORE VALUES	Natural environment	(18)	Attachment to place	(22)
	Small town living	(21)		
WORDVIEWS	Erosion of trust	(18)	Trust in remediation	(17)
	Blame	(16)		
	Equity	(13)		
	Activism	(20)	Community networks	(17)
COMMUNITY CONTEXT	Company town	(10)	Company town	(3)
	Subtotal All Themes -	**179**	*Subtotal All themes* –	**59**
OLD ORDER MENNONITES (15 interviews)				
THREATS TO LIVES			Safety – no reasons to be concerned	(13)
			Pesticides in farming	(12)
CORE VALUES			Faith	(6)
			Attachment to place	(13)
WORDVIEWS	Erosion of trust in society	(4)	Trusting God	(9)
			Acceptance	(6)
			Ethnic identity	(9)
COMMUNITY CONTEXT	Media	(7)	Community networks	(8)
			Community as insurance	(4)
	Subtotal All Themes -	**11**	*Subtotal All Themes* -	**80**

When the residents of the mainstream society recognized technological hazards as a disturbance to the desired cultural attributes, then the risk perceptions are amplified. Eleven themes are associated with risk amplification by the mainstream society: danger of local pollution, threats to health, danger of pesticides, threats to the appreciation of the natural environment and threats to appreciation of living in a small town. The themes also included: the erosion of trust, blaming the local company/authorities, issues of equity, the past status as a company town, and lastly the media's attention. These key ideas across all themes were recorded 179 times (75.2 % or 179/238) throughout the interviews between the two mainstream *society groups.* In contrarst, the Old Order Mennonite group referred to the risk amplifying themes only 11 times (12.1% or 11/91), when discussing their awareness of the environmental damage, information from the local newspapers and their erosion of trust to the mainstream society. These high risk perception themes are outlined in Fig. 5.4, which provides visualization of key themes that contribute to risk amplification. The results indicate that the mainstream society members were six times more likely than Old Order Mennonites to perceive their environment as dangerously impacted by technological hazard.

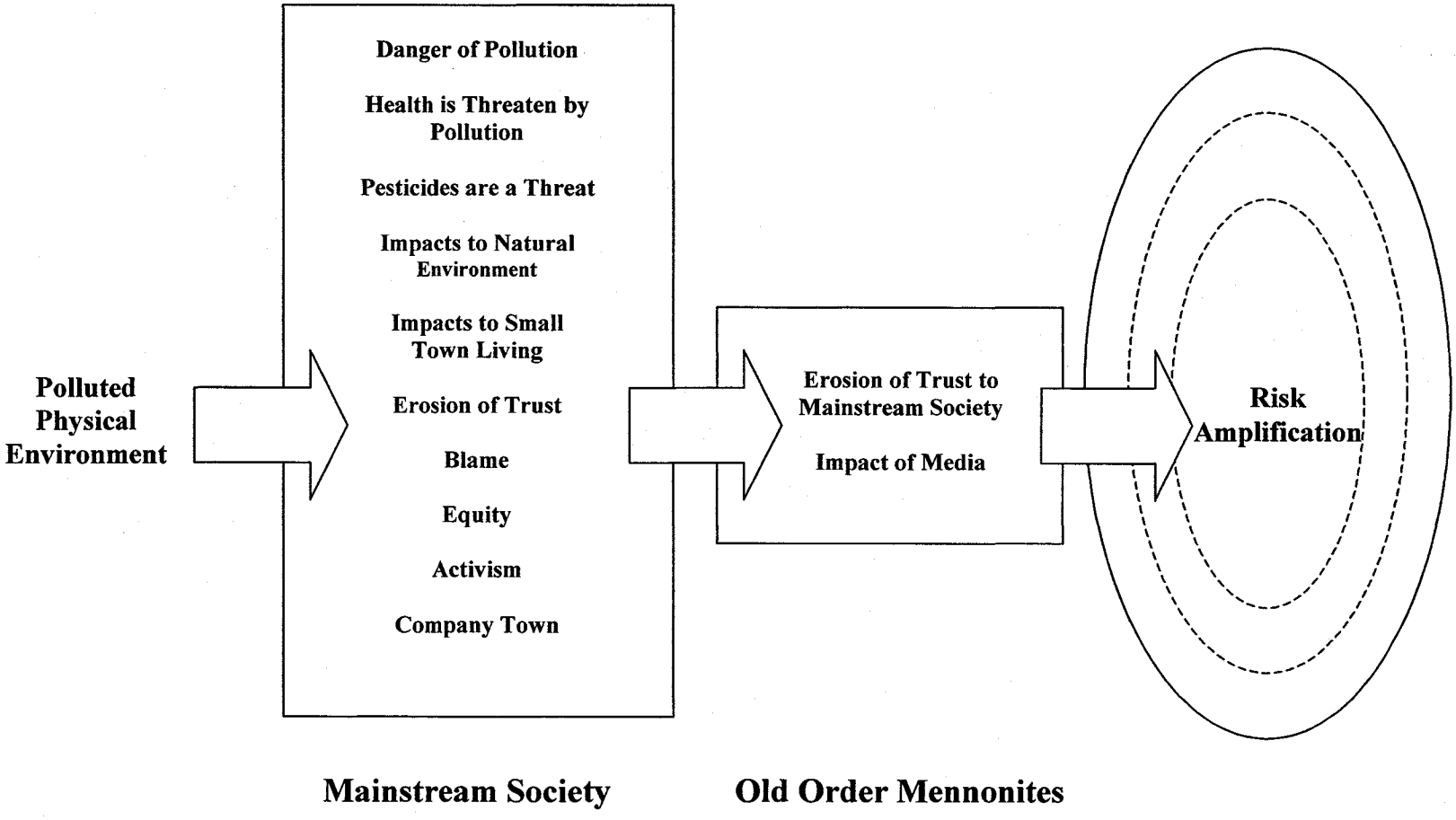

Fig. 5. 4. High risk perceptions of interview participants. The themes outlined in the boxes resulted in risk amplification for mainstream society and the Old Order Mennonites community.

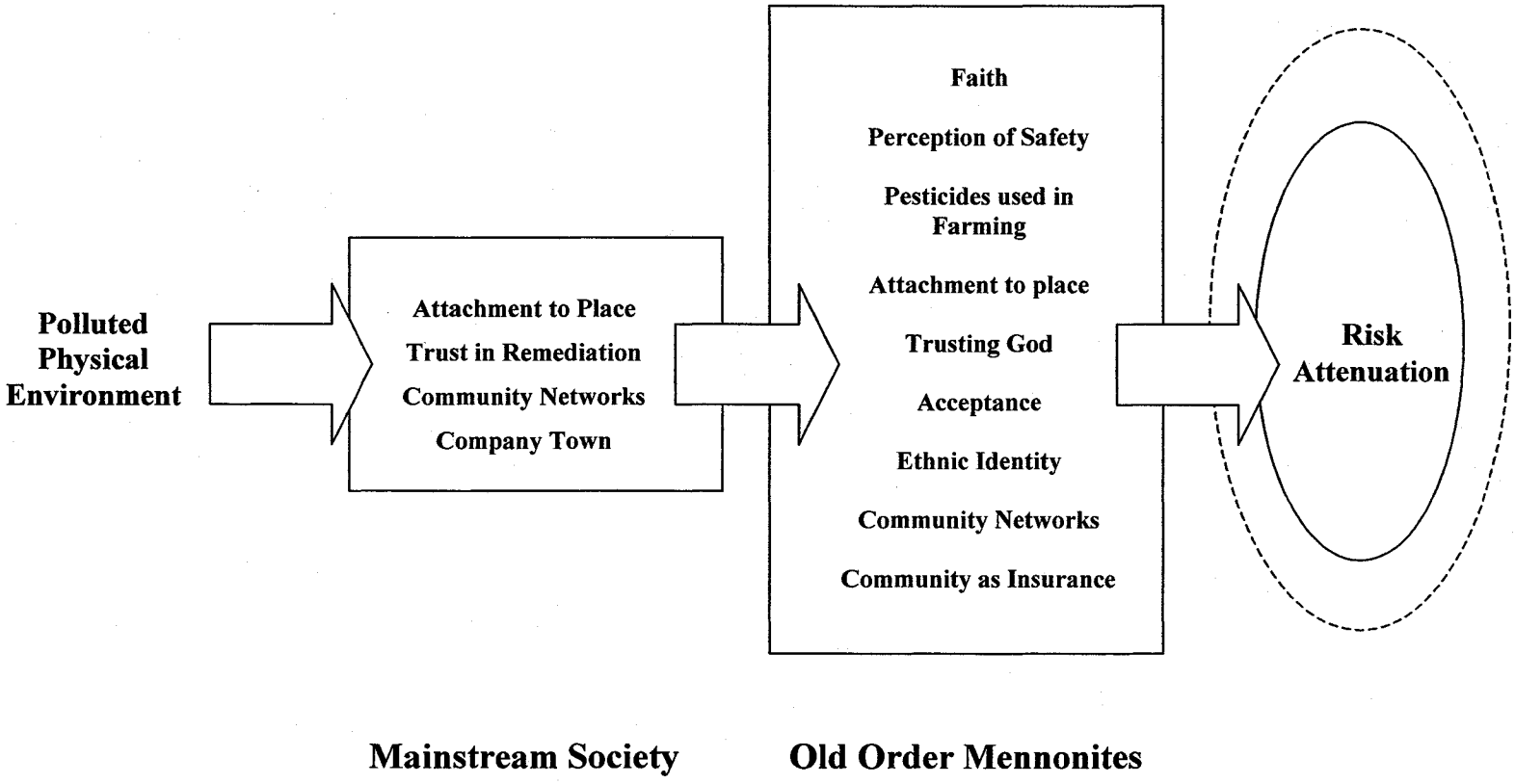

Fig. 5.5. Low risk perceptions of interview participants. The themes outlined in the boxes resulted in risk attenuation for mainstream society and for the Old Order Mennonites community.

Despite their awareness of the physical environmental degradation, the Old Order Mennonites were strong risk attenuators. During their interviews they mainly referred to themes associated with risk attenuation (reported 80 times or 87.9 %). The Old Order Mennonites distanced themselves from the problems experienced by their neighbours in mainstream society. Fig. 5.5 outlines the themes associated with risk attenuation and exposes the contrasting cultural visions of technological hazard, as they exist in response to the same environmental threats on opposite sides of the polluted Canagagigue Creek. Nine themes associated with low risk perceptions were: faith, perception of safety, pesticides used in farming, attachment to place, trust in God, acceptance, ethnic identity, community networks and community as insurance. Old Order Mennonites' attachment to place, their way of life on the farm, and their understanding of cultural identity were especially important. With a strengthened identity, the community members attenuated risk perceptions. The Old Order Mennonites' commitment to their orthodox way of life and affirmation of their ethnic identity contributed to their empowerment in place.

It is quite exceptional to demonstrate how culture influences a construction of risk in the community context in response to the local environmental crisis. In reference to the study framework (Fig. 5.1) the construct of risks among groups was different – because of the dissimilar culture, different threats to the participants' lives, worldviews, core values and community context.

The Old Order Mennonites have a 'covenant' with God and believe that God protects them because they adhere to God's rules and do not violate them. This also means that they are not subject to scientific frameworks of cause (pollution) and effect (body toxicity). This was not an avoidance issue, but a rational choice related to their ideology. Their beliefs are contradictory to the views of many community members.

The members of mainstream society associated four themes with low risk perceptions: attachment to place, trust in remediation, community networks and company town. Since all interview participants were required to have lived a minimum of ten years in the local area, place attachment was not an unknown variable in the study sample and people have established strong roots in the community. Members of the mainstream society perceived their environment as "much safer now" and "under remediation". This significantly contributed to their well-being in their community. Moreover, for the Old Order Mennonites, the theme of place attachment is embedded in their religiosity and their cultural identity. It is believed that religious place attachment is the strongest among all desires to live in a particular location (Mazumdar 2005).

People felt safe despite the possibility of harm. Old Order Mennonites understand the risk through a different paradigm. Similar to Billing's (2006) Gaza study on risk perception, people's ideology and spirituality changes risk perceptions in a way that may be disconnected from reality. In this study, not

only the value system, but also the place attachment through family ties and religious traditions, resulted in risk attenuation in the Township of Woolwich. Attachment to land, farming practices, and their traditional Old Order Mennonite culture forms their perception of risk and reality.

All three cultural groups presented two themes as risks attenuators: community networks and the community as insurance. Strong ties and networks among the long time residents were established within the small town community. Many people have lived in this town for several generations and developed strong levels of interactions. The residents' determination to maintain a vital community was clearly expressed during the interviews. The mainstream society talked about improving the quality of the environment, honoring the past, safeguarding the future, preserving and maintaining cultural resources, and maintaining local cultural heritage. These listed themes account for only a few of the reported community values, which closely relate to the special program established after the Elmira water crisis (Wismer 1999; Wismer 2000). These themes also contributed to the community's empowerment and enhanced the people's perceptions of safety and harmony in their places. The relationships are much stronger within the Old Order Mennonite community where providing for others comes before one's own well-being. This high degree of cultural cohesion contributes to their perception of safety in place.

Old Order Mennonites prefer to remain separate from mainstream society. In reference to the framework (Fig. 5.1), core cultural values influence meanings of risk and might contribute to risk amplification or risk attenuation. In respect to activism, a cultural bias exists that might have a significant importance. When facing environmental hazard, one of the main Mennonite core values, pacifism (the pursuit of peace), was interpreted by local activists as being degraded to passivism (a state of being passive, which constrains their cultural obligation to obedience). In fact, these cultural understandings of acceptance of their destiny (Gelassenheit) contributed to the Mennonites' attenuation of the technological hazards.

People's spirituality, cultural politics, patriarchal relations, sense of trust and acknowledgment of blame, created a multi-complex system of differences among these groups in this particular place. With the use of ethnographic methodologies, a holistic understanding of culture was developed to help comprehend such statements as "pollution is not harmful" and the risk attenuation of the Old Order Mennonites. For the Old Order Mennonites, any perceived links between environmental technological hazard and human safety are largely ignored, instead their perceptions are guided by a belief in a higher power. God's word was always the most important overriding principle within all of the analyzed categories: threats to lives, core values, worldviews and community context. Thus, it is God's will, rather than human impacts on environmental

quality, which has the most powerful influence on their health and safety. For the Old Order Mennonites religion and culture are inseparable.

5.7 Conclusions

The study revealed an important divergence in risk perceptions between the members of mainstream society and the Old Order Mennonites. There are at least three contributions from this study. First, the study provided an example of how cultural understandings of hazards of an ethno-religious minority group are constructed in place and why divergent lay-definitions of risk existed in the context of this study. The framework developed for this study allowed an examination of the cultural variables that affected risk perceptions among different societal groups. Cultural beliefs, values and practices altered the population's perceptions of technological hazards and associated different meanings with the risk events. The fact that the studied communities were so close geographically and so distant sociologically and culturally, added additional value to this research by contrasting the perceptions of environmental technological hazards.

Second, the study confirmed the importance of moral values and trust in the process of risk communication and determining perceptions of risk. Due to cultural differences and religious beliefs, the Old Order Mennonites placed their trust in God, not in human hands. Trust and/or erosion of trust determined what

the participants communicated among themselves in their communication networks. The media coverage of events had an important impact on the local communities, and contributed to risk amplification or attenuation. However, the cultural values and beliefs determined risk interpretations, responses, and the perceived impacts to the local communities.

Third, the findings highlight the importance of qualitative empirical research in examining the relationship between culture and risk perceptions. While this study was limited to one location and had a limited number of participants, it contributes to our knowledge by providing more insights into the risk amplification and attenuation processes. Risk attenuation processes are not well understood in culturally diverse communities, and yet it is clear that all groups attenuate or amplify local hazards. There are not exclusive risk attenuators or risk amplificators, these are always culturally specific. The Mennonite community expressed a distinctive sense of self-identity and strong attachment to place, which contributed to diminishing the perception of the hazards.

The culturally modified perceptions of the Old Order Mennonites deviated from the expert-defined understanding of technological hazards. Since the environmental crises in Elmira, the drinking water wells on Mennonite farms have not been checked for contamination with NDMA or other organic chemicals. It is necessary to communicate to policy makers and risk managers the ongoing need to develop sensitivity to cultural differences in risk understandings. It is also

necessary to provide better preventative measures, including an open risk communication strategy with the communities at risk of exposure. Researchers should take action to inform minority groups about the environmental hazards despite their separation from the world, regardless of difficulties in reaching out to these minorities. The findings that cultural differences and the ethnic identity of the Old Order Mennonites resulted in risk perception attenuation processes that transformed the risky physical space to a perceived safe place cannot be oversimplified. Nor can the findings be used as an excuse to not address the serious environmental pollution issues that continue to exist in the Elmira area. The appropriate environmental policies should be implemented in the Township of Woolwich in order to protect the ethnic minority group from the environmental hazards.

5.8 References

Arbuckle, T., D. Savitz, et al. (1999). "Exposure to phenoxy herbicides and the risk of spontaneous abortion." Epidemiology **10**(6): 752-760.

Awad, E. and A. Hayton (2004). Contaminant monitoring in forage fish and sport fish in Canagagigue Creek near Elmira, Ontario: 1982-2003. Toronto, Ministry of Environment: 24.

Baxter, J. and J. Eyles (1997). "Evaluating qualitative research in social geography: establishing "rigour' in interview analysis." Transactions of the Institute of British Geographers **22**: 505-525.

Baxter, J., J. Eyles, et al. (1999). ""Something happened": the relevance of the 'risk society' for describing the siting process for a landfill." Geografiska Annaler **81**: 91-109.

Baxter, J. and K. Greenlaw (2005). "Explaining perceptions of a technological environmental hazard." The Canadian Geographer **49**(1): 61-80.

Billing, M. (2006). "Is my home my castle? Place attachement, risk perception, and religious faith." Environment and Behavior **38**(2): 248-265.

Bontempo, R. N., P. B. William, et al. (1997). "Cross-cultural differences in risk perception: A model based approach." Risk Analysis **17**(4).

Brown, P. (1992). "Popular epidemiology and toxic waste contamination: Lay and professional way of knowing." Journal of Health and Social Behavior **33**(267-281).

Conestoga-Rovers & Associates (2003). Human Health Risk Assessment for Canagagigue Creek. Waterloo, Ontario, Conestoga-Rovers & Associates: 80.

Curtis, S. (2004). Health and Inequality. Geographical Perspectives. London, Thousand Oaks, New Delhi, Sage.

Cutter, S. L. (1993). Living with risk. The geography of technological hazards. London, Arnold.

Douglas, M. (1992). Risk and Blame. Essays in Cultural Theory. London and New York, Routledge.

Douglas, M. and A. Wildavsky (1982). Risk and Culture: An essay on the selection of technological and environmental dangers. Berkeley, University of California Press.

Dyck, I., N. Davis Lewis, et al., Eds. (2001). Geographies of Women's Health. London, Routlege.

Eyles, J. (1997). "Environmental health research: setting an agenda by spinning our wheels or climbing the mountain?" Health and Place **3**(1): 1-13.

Fast, M., J. Leach, et al. (2002). A descriptive profile of Amish and Mennonite communities in Perth County, Peth District Health Unit: 12-19.

Fretz J., W. (1989). The Waterloo Mennonites. A community in paradox. Waterloo, Ontario, Conrad Grebel College.

Gesler, W. M. and R. A. Kearns (2002). Culture/Place/Health. New York, Routledge.

Good Gingrich, L. and E. Lightman (2004). "Mediating communities and cultures: A case study of informal helpers in an Old Order Mennonite community." Families in Society: The Journal of Contemporary Social Services **85**(4).

Haalboom, B., S. J. Elliott, et al. (2006). "The risk society at work in the Sydney 'Tar Ponds'." The Canadian Geographer **50**(2): 227-241.

Hay, I., Ed. (2000). Qualitative Research Methods in Human Geography. Victoria Australia, Oxford.

Hewitt, K. (1997). Regions of Risk. Essex UK, Longman.

Horlick-Jones, T., J. Sime, et al. (2003). The social dynamics of environmental risk perception: implications for risk communication research and practice. The Social Amplification of Risk. N. Pidgeon, R. E. Kasperson and P. Slovic. Cambridge, Cambridge University Press.

Horst, I. R. (2000). A separate people: An insider's view of Old Order Mennonite customs and traditions. Waterloo, Ontario, Herald Press.

Hostetler, J. (1975). Mennonite Life. Kitchener, Ontario, Herald Press.

Jaagumagi, R., T. Lomas, et al. (1987). A study of the effects of in-place pollutants on the bottom water, sediments and sediment-dwelling organisms of Canagagigue Creek at the Uniroyal Chemical Ltd. Plant Elmira, Ontario. Toronto, Ministry of the Environment.

Karmaus, W. (2001). "Of jugglers, mechanics, communities, and the thyroid gland: how do we achieve good quality data to improve public health?" Environmental Health Perspectives **109**(supp6): 863-869.

Kasperson, R. and K. Dow (1993). Hazard perception and geography. Behaviour and Environment: Psychological and Geographical Approaches. T. Garling and R. G. Golledge. Amsterdam, Elsevier Science Publisher.

Luginaah, I., M. Taylor, et al. (2002). "Community responses and coping strategies in the vicinity of a petroleum refinery in Oakville, Ontario." Health and Place **8**(177-190).

Martin, D. G. (2003). ""Place-Framing" as place-making: Constituting a neighbourhood for organizing and activism." Annals of the Association of American Geographers **93**(3): 730-750.

Masuda, J. R. and T. Garvin (2006). "Place, culture, and the social amplification of risk." Risk Analysis **26**(2): 437-454.

Mazumdar, S. (2005). "Religious place attachment, squatting, and "qualitative" research: A commentary." Journal of Environmental Psychology **25**: 87-95.

Peters, J. F. (2003). The Plain People: A Glimpse at Life Among the Old Order Mennonites of Ontario. Kitchener, Herald Press.

Pidgeon, N., R. E. Kasperson, et al., Eds. (2003). The Social Amplification of Risk. Cambridge, Cambridge University Press.

Quinn-Patton, M. (2002). Qualitative research and evaluation methods. Thousands Oaks, Sage.

Renn, O. (2003). Social amplification of risk in participation: two case studies. The social amplification of risk. N. Pidgeon, R. E. Kasperson and P. Slovic. Cambridge, Cambridge University Press.

Reyner, S. (1992). Cultural theory and risk analysis. Social Theories of Risk. S. Krimsky and D. Golding. Westport, Connecticut, Praeger: 83-116.

Riley, D. R., C. A. Newby, et al. (2006). "Incorporating ethnographic methods in multidisciplinary approaches to risk assessment and communication: Cultural and religious uses of mercury in Latino and Caribbean communities." Risk Analysis **26**(5): 1205-1221.

Rippl, S. (2002). "Cultural theory and risk perception: a proposal for a better measurement." Journal of Risk Research **5**(2): 147-165.

Schettler, T. (2001). "Toxic threads to neurologic development of children." Environmental Heath Perspectives **109**(Suppl 6): 845-1.

Schettler, T., G. Solomon, et al. (2000). Generations at risk. Reproductive health and the environment. Cambridge, Massachussetts, The MIT Press.

Sjoberg, L. (2000). "Factors in risk perception." Risk Analysis **20**(1): 1-12.

Skinner, M. W., J. E. Alun, et al. (2003). "Social and environmental regulation in rural China: bringing the changing role of local government into focus." Geoforum **34**(267-281).

Slimak, M. and T. Dietz (2006). "Personal Values, Beliefs, and Ecological Risk Perception." Risk Analysis **6**(2006): 1689-1705.

Slovic, P., B. Fischhoff, et al. (1979). "Rating the risks." Environment **21**: 14-20, 36-39.

Snyder, L. and S. Bowman (2002). Communities in cooperation: human services work with Old Order Mennonites. Waterloo, Renison College: 38.

Tansey, J. (2004). "Risk as politics, culture as power." Journal of Risk Research **7**(1): 17-32.

Vaughan, E. and B. Nordenstam (1991). "The perception of environmental risks among ethnically diverse groups." Journal of Cross-Cultural Psychology **22**(1): 29-60.

Wade, M. (2001). Human health and exposure to chemicals which disrupt estrogen, androgen and thyroid hormone physiology. Ottawa, Environmental Health Directorate. Health Canada.

Waterloo Region Community Health Department [WRCHD] (2000). Industrial Air Emissions in Elmira. Final Report. Waterloo, Waterloo Region Community Health Department
and University of Waterloo.

Wismer, S. (1999). "From the ground up: Quality of life indicators and sustainable community development." Feminist Economics **5**(2): 109-114.

Wismer, S. (2000). Seeing the Whole Picture. Inspiring Change. Healthy Cities and Communities in Ontario. Toronto, Ontario Healthy Communities Coalition.

ENDNOTES

[i] *Gemeinschaft community* refers to a traditional, agricultural-oriented, pre-industrial community, which is perceived as an organic totality, where people are connected with each other and the common goal is a primary value. Within this structure a group of church leaders governs in the name of values common to the entire group.
[ii] 2003 Ontario Population Report

[iii] Ministry of Environment (MOE) detected 40 ppb of NDMA, human carcinogenic substance in the samples of drinking water, when the US Environmental Protection Agency (EPA) guideline was 14 ppt (ppb – parts per billion; ppt – parts per trillion). The detected amount of NDMA was almost 400 times higher than the guideline. Environment Canada accounted NDMA carcinogenic to humans, potentially at relatively low levels of exposure (2002).

[iv] In the general population, 395,000 of every one million people will develop some form of cancer and this figure (39%) constitutes the normal rate. Accordingly to the MOE regulations, anything more than one case in a million higher than the normal rate is unacceptable
[v] April 30, 2004, Responses to MOE Comments on the Site Specific Risk Assessment for Sediments Crompton Co.; CPAC

[vi] Old Order Mennonites believe that false doctrine might be learned from 'worldly influences'. Hence they do not permit their children to attend school beyond grade 8. Also, Old Order Mennonite teachers have only a Grade 8 education. Most classes are taught in English but Bible reading, hymn singing and prayers are taught in German. The curriculum emphasis is on reading, writing, arithmetic and Mennonites history.

[vii] Women from both communities were interviewed regardless if they were biological mothers, adopted children or if they were never pregnant. The invitation to women to participate in the interviews did not exclude anyone. In total, 35 women from the general society (and 9 professional women, not included in this count) participated in the research.

[viii] Documentation of environmental contamination, developed by Mrs. Esther Thur, was moved to the Wilfrid Laurier University Library's special collection in 2004.

[ix] An interviewer did not probe for religion or religiosity of other interviewees.

[x] Old Order Mennonite community is different from modern society: " in Gemeinschaft community individuals remain united…whereas in Gesellschaft (society) people are separated in spite of all uniting factors (sic). The actions of individuals from Gemeinschaft community take place on behalf of those united with them (Eyles, 1985 p. 76).

[xi] In their German dialect known as Pennsylvania Deutsch

Chapter 6

INCLUSIVITY MATTERS... PERCEPTIONS OF CHILDREN'S HEALTH AND ENVIRONMENTAL RISK, INCLUDING OLD ORDER MENNONITES FROM ONTARIO

Abstract

In this study, the perceptions of a closed, ethno-religious Old Order Mennonite community, farming along the most contaminated tributary of the Grand River, Ontario, have been central to the analysis of children's health risk and the environment. This study represents the first time that Old Order women living in the area have participated in any research. To understand the health and environment concerns of mothers living in the contaminated area, 34 semi-structured interviews were conducted with mothers from the mainstream society and mothers from the Old Order Mennonite community. Emerged themes revealed concerns about exposures to toxicants, children's exposures reflected in their behaviour, and exposure differences determined by lifestyle. Despite the existing environmental hazards, results demonstrate that the participants perceived their children's health to be 'good'. The inclusion of the Old Order Mennonites in this study is important because it reveals information about differential patterns in people's perceptions of health. When links between children's health and their polluted physical environment by mainstream society are contrasted with the perceptions of the Old Order Mennonites, it becomes clear that children's health is defined differently by each group in the local context.

6.1 Introduction

> "To stay healthy, the old saying says, you need to eat seven pounds of dirt in your life." *Rhoda, Old Order Mennonite Woman from Ontario*

Determinants of children's health including maternal factors, environmental contamination, nutrition deficiency, injury and personal illness control, not only impact children's health directly but also affect perceptions of children's well-being. Culture and sociopolitical status influence the relationship between health and medical care, health understandings and the utilization of medical services (Clarke 2004). The social determinants of health, including housing, nutrition, low family income, unemployment and environmental exposure play a major role in actual and perceived health status (Gesler 1991; Kawachi and Berkman 2000; Gatrell 2002; Gesler and Kearns 2002; Curtis 2004). These factors are relevant to this study's aim of developing a thorough understanding of perceptions of children's health in the local community.

Geographers have explored health and environmental concerns from various perspectives, acknowledging epidemiological health trends and considerations of place, social aspects and people's experiences (Donovan 1984; Eyles 1985; Baker, Greenland et al. 1988; Brown 1992; Elliott 1995; Eyles 1997; Whittaker 1998; Dyck, Davis Lewis et al. 2001; Inhorn and Whittle 2001; Wilson 2003). Existing literature suggests that parental perceptions of children's health have been influenced by environmental degradation (Moffatt, Pless-Mulloli et al. 2003), access to medical services (Donnelly, Donnelly et al. 1987; Panelli,

Gallagher et al. 2006), lifestyle choices, patterns of behaviour (Denton, Prus et al. 2003), and overall perceptions of social status depicting inequalities in health (Wind, Van Sickle et al. 2004; Wilcox, Washburn et al. 2007). In reference to ethnic diversity, researchers acknowledge culturally derived biases in the self-rating of health by different communities (Waterloo Region Community Health Department [WRCHD] 2000; Crighton, Elliott et al. 2002). Despite the influence of these factors, assessments by mothers of the health of their children and their development are considered important measures, having a higher validity than assessments by general physicians (Arcia 1998).

This research examined the opinions of two groups about children's health in the local communities: mainstream society and the Old Order Mennonite community. The women of the mainstream society had previously been able to express their health concerns related to the contamination of the environment by participating in environmental surveys, actions or public meetings (Waterloo Region Community Health Department [WRCHD] 2000). The opinions of the Old Order Mennonite women regarding their children's health and environmental contamination have never been previously researched or discussed.

Our study had three objectives:

1) to document the perceptions of children's health by mothers from the mainstream society and mothers from the Old Order Mennonite community,

2) to compare how a particular culture may influence perceptions of health and children's health risk, and
3) to examine the perceived links between children's health and the physical environment.

This research on children's health and environmental pollution moves global issues from large urban locations to a small town and rural environment in the Township of Woolwich. It draws on data from geographic fieldwork to analyze mother's perceptions of children's health in an area of Southern Ontario that has experienced a long history of chemical contamination.

6.2 Study Site

Elmira, a town located in Woolwich Township, is approximately 14 km north of Kitchener-Waterloo, Ontario, Canada (Figs. 6.1 and 6.2). Woolwich Township is known for its large Mennonite community, the annual Spring Maple Syrup Festival, and for the historic covered bridge in West Montrose. Elmira has been the subject of environmental concerns due to its industrial history that resulted in toxic groundwater, toxic sediments and air contamination. Recent tests of soil of the Crompton (Chemtura) chemical plant in Elmira, which continues to produce pesticides, revealed dioxin at a ratio of 56,000/trillion, well above the limits for agricultural soil which is 10/trillion (Reimer 2003). For three decades, people living in the local urban and rural communities have been exposed to the contaminated water, air, sediments and soil (Jaagumagi, Lomas et

al. 1987; Awad and Hayton 2004). In 1989, the town of Elmira was forced to close down its wells when unacceptably high levels of a carcinogenic substance, N-nitroso-dimethylamine (NDMA), were detected in the water. The aquifer under the town is poisoned with numerous chemicals including dioxin, furans, NDMA, DDT which continue to leak into the Canagagigue Creek. Stark differences in levels of dioxins/furans in the Canagagigue Creek floodplain soil samples are observable at locations upstream and downstream from the source. While the sediments upstream from the plant property contain minimal levels of 0.07 Toxic Equivalents (TEQ) of dioxin/furans, up to 89.6 TEQ of dioxin/furans were detected downstream of the chemical site in the banks on the Creek (Fig. 6.3).

The water crisis in Elmira, along with air and soil pollution, has impacted the Old Order Mennonites who have farmed for generations along the Creek. In 2003, a Human Health Risk Assessment evaluated cancer risk probabilities for local residents and occasional users of the Canagagigue Creek floodplain and found that populations living downstream have an excess cancer risk[i] of 1.9 to 3.7 cases per million (Conestoga-Rovers & Associates 2003). This result has labeled them as a population of concern. A more accurate risk assessment, adjusting for behavioural differences among ethnic minority groups such as extensive hours of outdoor work and play, was never conducted for this population. Despite living in close proximity to Canagagigue Creek, Old Order Mennonite water wells have not been checked for chemical contamination for the last 15 years. It is known,

however, that the population farming along the Canagagigue Creek has a higher risk probability of getting cancer than an average resident in Canada because of the high levels of toxicity in the area (Conestoga-Rovers & Associates 2003).

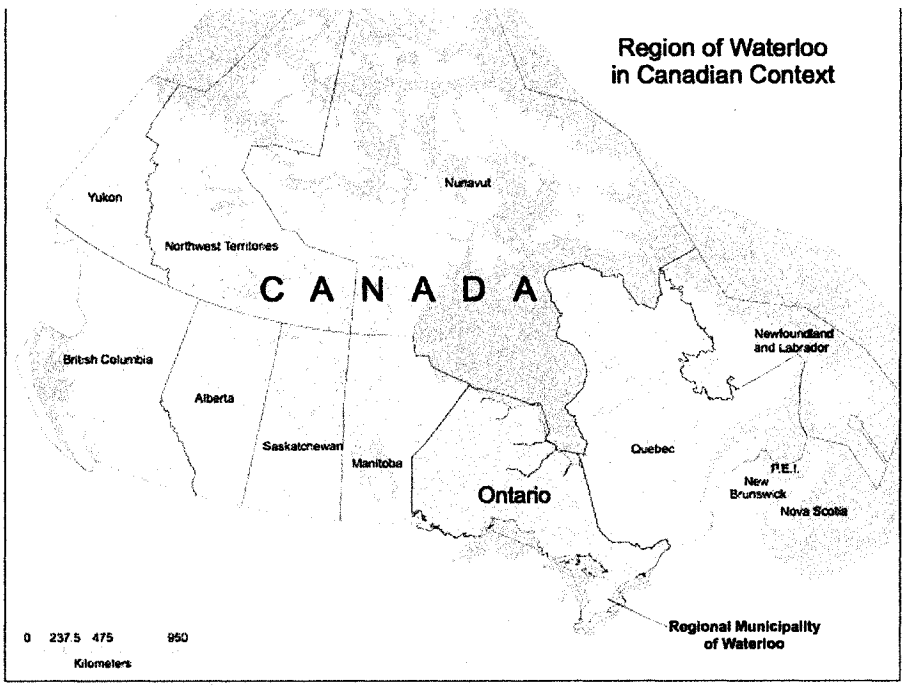

Fig 6.1 Region of Waterloo in Canadian Context. Small Insert Map.
DMTI CanAtlas [NAIS]. Markham, Ontario: DMTI Spatial Inc., [2005]

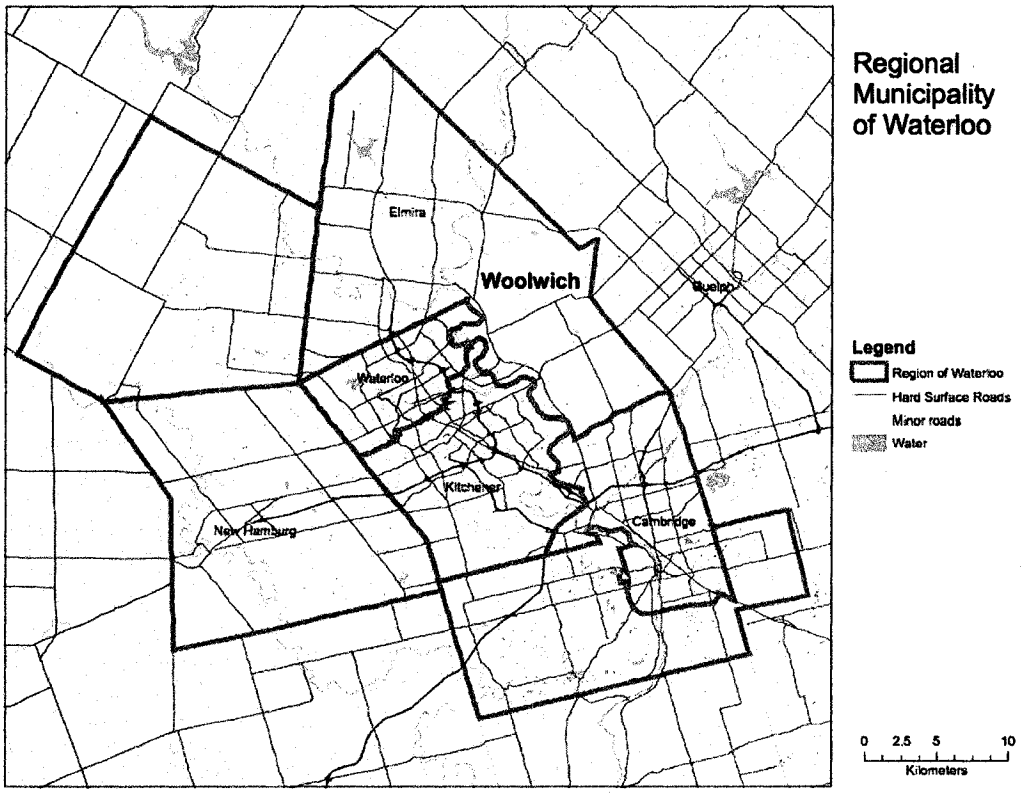

Fig. 6.2 Township of Woolwich within the Regional Municipality of Waterloo. DMTI CanMap Streetfiles [ONTARIO]. Markham, Ontario: DMTI Spatial Inc., [2005]

There is ongoing controversy about the possible health effects associated witindustrial contamination in the local communities. The first concerns date back to the 1940s, and continued throughout the 1980s[ii] to today. A local study of Industrial Air Emissions in Elmira, conducted by the Region of Waterloo Public Health, found that about 34% of respondents (269 people out of 800) reported negative health effects due to the industrial air emissions (Waterloo Region Community Health Department [WRCHD] 2000). Old Order Mennonite

responses were not included. Local grass-roots organizations recommended that the long-term exposure to dioxins by Mennonite families could be reduced in farms along the Creek by fencing off the floodplain (CPAC 2005). Old Order Mennonites living in the area have ignored the recommendation for the most part and have let it be known that they would rather take care of matters themselves.

The safety of children is an ongoing concern for Elmira area residents. Despite remediation of their environment, many local residents are afraid of the possibility of a major environmental crisis such as a fire or explosion at the plant[iii], which continues to produce chemicals.

6.3 Old Order Mennonites

The Old Order Mennonites prefer to retain social, cultural, political and geographical separation between themselves and the mainstream society. The lack of the participation of the Old Order Mennonites in any programs offered by the secular government means that information regarding their perceptions of health risk is lacking.

Old Order Mennonites are members of an ethno-religious community in rural Ontario that distinguishes themselves from other Anabaptists groups[iv] (Hostetler 1975; Good Gingrich and Lightman 2004). The Old Order Mennonites, who still maintain a horse-and-buggy culture, number about 2,700 people in the Township of Woolwich (Peters 2003). This community maintains the traditional *gemeinschaft*[v] structure and regards the authority of God, the Bible

and the church leaders as higher than the authority of the state. The clear distinction between church and state shapes cultural boundaries differentiating the traditional, agriculture-oriented, religious-bound community, from the technologically-based, mainstream society. For this community, church leaders have a greater authority than a secular government of a state.

To retain cultural and social separation from mainstream society, Members of the Old Order Mennonites community speak Pennsylvania Dutch[vi] as their primary language. Old Order Mennonite mothers determine their expectations of their children's well-being based on core cultural and religious values (Fretz J. 1989). Their children are expected to maintain their Christian orthodox traditions, lifestyle of family farming and their cultural heritage (Snyder and Bowman 2002; Bennett 2003; Good Gingrich and Lightman 2004). Parents measure their children's health as a function of their contribution to the family and community (Wengler 2003). These children play and work and help their parents, and their neighbours. Their experiences of childhood differ substantially from the childhood experiences of the mainstream society (Horst 2000; Platte, Zelten et al. 2000). Rules of behaviours are clearly defined for each member of the Old Order Mennonite community in the *ordnung,* which consists of the rules for member to live on a daily basis. Sameness of dress, language and lifestyle choices explicitly identify members' conformity to the faith. The community is committed to the preservation of traditions (Fretz 1989).

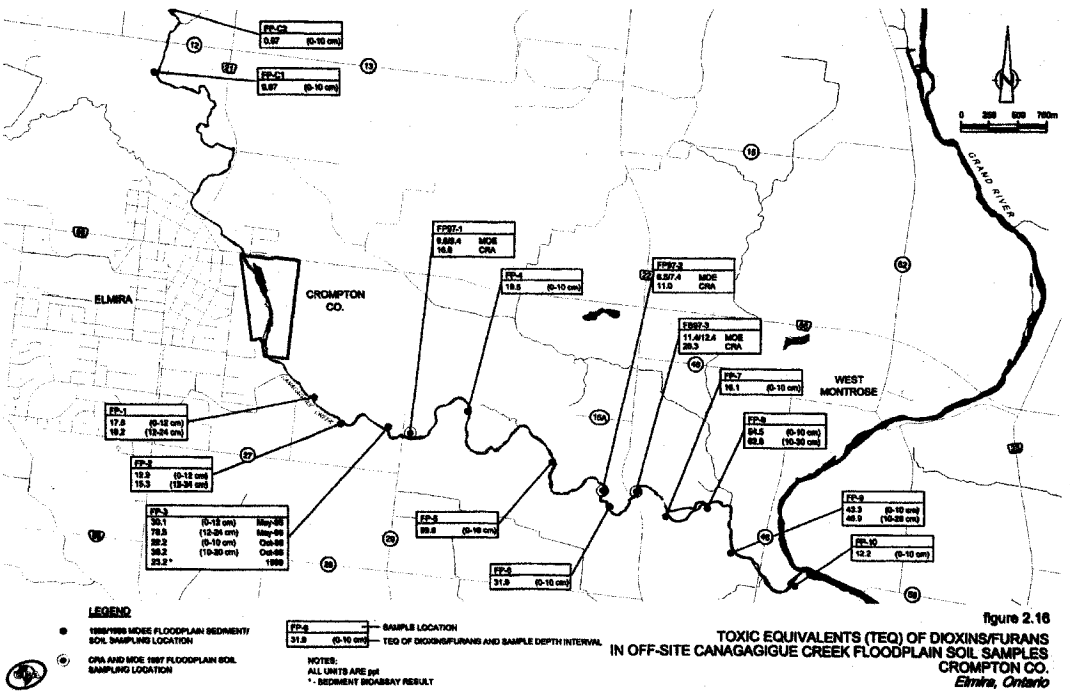

Fig. 6.3. Toxic Equivalents (TEQ) of Dioxins/Furans in Off-Site Canagagigue Creek Floodplain Soil Samples. Human Health Risk Assessment (Conestogo-Rovers & Associates 2003).

6.4 Background

After the closure of local wells in 1989, there were public demands for health studies in the communities. Impacts of environmental pollution on the local communities were unknown. People were very concerned that they had been drinking water contaminated with a carcinogenic substance. Concerns were also expressed about the negative health impacts on children's long-term health. A Summary Health Status Report prepared by the Region, however, indicated no urgent health concerns for Woolwich Township (Waterloo Region Community Health Department 2001).

The failure of the study to identify suspected associations between contaminant exposures and health outcomes might be attributed to poor statistical power resulting from a small number of cases and the uniqueness of diseases (Waterloo Region Community Health Department [WRCHD] 2000). The level of aggregation of the data combined with small area statistics may have masked any differences in health outcomes between the broader Waterloo Region and the exposed communities around Elmira. The small size of the Elmira population and existing health patterns of ethnic minority groups limits the usefulness of conventional quantitative research methodologies (Hewner 1997). For this reason qualitative methods were used in this study to assess perceptions of children's health in Woolwich Township.

6.5 Methodology

6.5.1 Research Design

Two qualitative methodologies were employed in the research design: grounded theory and ethnographic methodology (Quinn-Patton 2002). This project anticipated conducting 10 to 15 interviews with members of the Old Order Mennonite community, which was a significant and unique feat as in the past nobody had conducted any study with this group. Following detailed preparations, access to the closed community was granted with the help of two mainstream society women who introduced the researcher to an Old Order Mennonite family. The mother from this family, who was a respected member of their community, facilitated contacts with other Old Order Mennonite families.

Semi-structured in-depth interviews were conducted in the Township of Woolwich from August 2005 until January 2006. In total, 34 interviews were undertaken, with 19 women from the mainstream society and 15 women from the Old Order Mennonite community.

Interviews focused on four major topics: perceptions of children's health risk, understanding the health of children and concerns about the local environment. Socio-demographic information was collected from participants to contextualize their responses. During the interviews, a short questionnaire was distributed to mothers asking them to evaluate their children's health on a five-point scale *(ranging from very good to very poor).* The researcher was aware that outsider effects could bias obtained results. She asked for personal notes to be written on

the questionnaire to lessen these effects, when interviewees appeared to be uncomfortable speaking openly about sensitive issues (Appendix F, G).

6.5.2 Sample

The topographic line used for sampling purposes was the Canagagigue Creek. Diverse and multi-method sampling was used to ensure that information from various sources and geographical locations would be collected. Individuals living along the river approximately 10 km upstream and downstream from the chemical plant and along the river, and 10 km east and west of the plant in the rural areas were included in the sample. Participants, the majority of whom were women, were recruited through a combination of purposive and snowball sampling methodologies (Hay 2000; Quinn-Patton 2002). In response to advertisements (Appendix B) five women from the mainstream society volunteered to participate. Since it was necessary to select participants who had been living in the area for a minimum of 10 years, they helped to identify an additional fourteen women from different geographical locations within the Elmira area. Access to the Old Order Mennonite community was successfully gained with the help of an Old Order Mennonite woman, who acted as a gatekeeper.

Table 6.1. Study Participants

Characteristic	Mainstream Society	Old Order Mennonites
Sample Size	19	15
Females	19	15
Mean Age (range)	56.5 (26-83)	49.7 (23-64)
Marital Status		
Married/Partner	15	12
Widowed/Separated/Never Married	4	3
Highest Level of Education		
Elementary	1	14
High School	4	-
College/Undergrad/Post Grad	14	1[vii]

The average age of the women participants from the mainstream society was 56.5, compared to 49.7 years among the women from the Old Order Mennonite community (Table 6.1). All Old Order Mennonite women, except one, had an elementary grade 8 level of education[viii], while 73% of women from the mainstream society had graduated from a postsecondary institution.

6.5.3 Data Collection Instrument and Process

Interviews with members of the mainstream society were conducted from August 2005 until January 2006. Interviews with the Old Order Mennonites were conducted from November until the end of December 2005, a season when there are lower demands from farming activities. The interviews lasted from 45 to 90

minutes in length and were conducted mainly in the homes of the participants. All women from the mainstream society granted the researcher permission to audiotape the interviews. Interviews with Old Order Mennonite families were not taped in deference to their avoidance of electronic technologies. The researcher took handwritten notes during these interviews. The use of a brief questionnaires had two purposes; serving as a demographic document, and allowing for the recording of mother's opinions who, because of cultural differences, were not allowed to speak before their husbands. Due to patriarchal relations existing within this community, eight male spouses were included in the study; however, the researcher did speak directly with all women in the study.

6.5.4 Data Analysis

Transcripts of the interviews with all the participants were formatted into text documents and imported into a qualitative software package (NVivo). Detailed coding was implemented using the computer software to search the text for themes that emerged during the interviews. Numerical summaries of the themes were constructed and analyzed (Baxter and Eyles 1997). Each research participant created a new opportunity to develop and add concepts to the theory of the links between health, place and the understandings of health experienced in place.

6.5.5 Ethics

Academic research guarantees the anonymity of all participants and pseudonyms were used while reporting the study findings. All ethical procedures for informed consent, as required by Wilfrid Laurier University, were followed.

6.6 Results

The results are presented in two parts.

First, the summary data from the questionnaire presented during the interviews is analyzed. The information about children's health status was collected at the scale of household in the community.

Second, the data from in-depth interviews is grouped into emerged themes, organized into two categories and compared among the study groups. Mothers provided perceptions of children's health in geographically bounded locations impacted by empirically measurable contaminants.

6.6.1 Perceptions of children's health by mothers and women from mainstream society and the Old Order Mennonites.

There are noticeable differences between the two groups of children. The health experiences of the Old Order Mennonite children are as unique as their biological, sociological, economic and cultural environments. Mennonite children are born into and grow up in large families and develop in an environment that supports and protects family life. The average Old Order family in this study

sample had 7 children (a range of 4 to 10 children). The average size of families in the mainstream society was 2 children (a range from 1 to 4) per family. The presented data provides information for 111 children: 76 Old Order children, which is more than double the number of children from the mainstream society which is 35.

The majority of mothers reported their children's health to be either 'very good' or 'good' (Table 6.2). No one reported 'very poor' health for their children. The findings indicate that mainstream society mothers perceived their children as being healthy in a range from 80% to 85% (boys and girls) and a weaker health ('so-so') in a range from 15% to 20%. Old Order Mennonite mothers' perceived their children's health to be even better: 90% of boys and a 100% of girls were perceived to have 'very good' or 'good' health.

Table 6.2. Assessments of the children's health status by their mothers. Sample size n=111 children.

	Boys (n=57)		Girls (n=54)	
Perception of Health Overall	Mainstream n (%)	Old Order n (%)	Mainstream n (%)	Old Order n (%)
Very Good	6 (40%)	26 (62%)	8 (40%)	30 (88%)
Good	6 (40%)	12 (28%)	9 (45%)	4 (12%)
So-so	3 (20%)	1 (2%)	3 (15%)	-
Not Good	-	3 (7%)	-	-
Very Poor	-	-	-	-
Sub Totals	15 100%	42 100%	20 100%	34 100%

For the Old Older Mennonites there was a notable exception of 7% boys not having good health, and 1% having a weaker health ('so-so'). This summary points to a very small number (9%) of Mennonite children having perceived health-related problems in the study sample. The overall findings indicate that the Mennonite children were perceived by their mothers to have better health than children from the mainstream society.

In addition to evaluating health status, mothers were asked to comment on each of their children's health problems, diseases and illnesses and to record the information on the questionnaire. These results are presented in Table 5.3, which permits a comparison of the health experiences between urban and Old Order Mennonites children. It needs to be pointed out here that the summary of

"children's data" is information pertaining to a second generation of individuals living in the polluted environment along the Canagagigue Creek. Thus, the age of mothers range was from 26 to 83 years and for children the ages ranged from 2 to 58 years.

As illustrated in Table 6.3, the most distinctive differences between the two groups of children can be seen in reported cases of asthma and allergies. A larger percentage of mainstream society children suffer from environmental allergies (37%), as compared to only eight percent (8%) of the Mennonite children. In this sample, 11% of Mennonite children are identified as being affected with asthma compared to 6% of the children from the mainstream society. Old Order Mennonite mothers of children living in the most polluted areas downstream from the plant reported a much higher incidence of asthma than the mothers of children living upstream from the plant (1 compared to 7 children) in the study sample.

Table 5.3 Perceptions of children health by their mothers. Disease/Illness Cases reported in the study sample (N=111).

	Mainstream Society (n=35)		Old Order Mennonites (n=76)	
	n	(%)	n	(%)
Asthma	2	6 %	8	11%
Allergies	13	37%	6	8%
Cancer	2	6%	-	-
Diabetes	1	3%	1	1%
Developmental/congenital	7	17%	5	7%
Chronic fatigue syndrome	-	-	2	2%
Car accidents	1	3%	-	-
Farm accidents	-	-	4	5%
Total number reported	26	74%	26	34%

The noticeable differences between the two groups of children are shown by the number of reported disease/illness cases. As such, 26 of 35 or 74% of mainstream society children were reported to have had health problems. In the case of the Old Order Mennonites, only 26 of 76 or 34% were perceived to have health issues. The results indicate that the mainstream society mothers were twice as likely to see their children as ill or at having health problems related to environmental impacts.

6.6.2 Qualitative Results

The main study findings are the results of the semi-structured interviews. Findings are organized around two key themes relevant to the research objectives. In the first organizational theme, *environment*, the mothers' concerns about pathways of exposures of their children to the hazardous chemical are explored. In the second theme, focusing on *cultural differences* between children, further aspects of environmental links to health are discussed. The numerical summaries of key themes are presented in Table 6.4 and Table 6.5.

6.6.2.1 Environment - Mother's Concerns with Pathways of Exposures

Table 6.4 summarizes interviewer reports on behavioral health links to environmental hazards. It presents reported behaviors linked to pathways of exposure between the contaminated physical environment and children's health. Interviewees were asked to report on children's potential exposure to chemicals (Barrow 2001) by intake (eating, drinking), by inhalation (breathing contaminated air while playing or working) and exposure by contact or touch (swimming in the polluted Creek). Differences in culture are indicated by behavioral differences in eating locally grown food by Old Order Mennonite children (26% of interviews). They are also presented in community awareness of the children's exposure to pesticides (53%), contacts with contaminated banks of the Creek (6%) or playing or swimming in the Canagagigue Creek (38%).

Table 6.4 Local Reports on Pathways of Exposure to Environmental Contaminants.

Pathway	Mainstream Society Women n=19	Old Order Mennonites Women n=15	Total Number Interviews n=34
Eating local food A: small percentage B: always	 6 (32%) -	 - 3 (20%)	 6 (18%) 3 (9%)
Reported exposure to pesticides	11 (58%)	7 (47%)	18 (53%)
Length of time spent outdoors by children playing and working A: school year B: holiday	 1 to 2 hrs 2 to 6 hrs	 2 to 4 hrs 4 to 8 hrs/ no limits	100%
Swimming in the Canagagigue Creek	5 (26%)	8 (53%)	13 (38%)
Contact with contaminated banks	2 (11%)	-	2 (6%)

In the mainstream society, there is a general understanding of the negative effects of air pollution and of breathing contaminated air. A majority of mothers in Elmira (about 70% in our sample) expressed opinions similar to the one below and discussed the health of their children in relation to environmental pollutants:

> *My health concern is related to the environment. I think my fear of cancer is related to the environment. Yeah, and I think the kids' allergies and stuff are some of the things related to the environment too. (Miriam, Mainstream, age 48)*

Although the extensive time the Old Order Mennonite children spend outdoors in the rural environment, while playing or working, significantly increases potential exposure to air pollutants and has the possibility of increasing harm to health, Old Order mothers did not in general express a concern that environmental conditions could negatively affect their children health. The

cultural differences between the Old Order Mennonite children and the mainstream society are visible in their behaviour:

> *During the summertime, our children spent outside from 6 to 8 hours...during the winter from 3 to 4 hours. When they were little, they played in the barn. They also were skating on the pond or at the Canagagigue Creek. (Mary Ann, rural Old Order Mennonite (OOM), age 58)*

> *They have no TV to watch and there is nothing to do in the house. They will go to the barn to play, to ride bicycles there in the winter (Esther, rural OOM, age 53)*

Old Order Mennonites demonstrate some awareness of air contamination but they did not report taking any actions to change their children's behavior nor to limit time of outdoor activities. Also, since they do not listen to radio, they are never aware of smog day warnings in the Region of Waterloo, which is important to their children's health (Woolwich Community Health Centre 2005).

Several participants from the mainstream society reported concerns about possible food contamination. Some Old Order Mennonite families have been warned by local activists that the fish from the Creek are not safe so they should not eat them. It is clear that some of the Old Mennonites understood the connections between environmental damage and health of animals and people.

> *In 1964, my neighbour's cattle died (drinking the water). My father's cattle did not die but their cream was not good. Now it is better. We let our children swim in the water, but we did not eat the fish. We do not eat the fish. (Viola with Tony; rural OOM, age 52)*

We eat fish but we do not have too many meals. (Lucinda: rural OOM, age 57)

The possibility of food contamination has been a concern of local parents since the 1940s, when Elmira's citizens reported the abnormal taste of tomatoes[ix]. The issue of poor-tasting tomatoes was raised by all groups, although the chemical plant has denied any connections and responsibility for the taste of the vegetables [x]. Due to high level of dioxin in the banks of the Creek, identified since 1990s, some women in this study were concerned with the safety of milk from the farms located downstream from the Creek:

The Mennonites do not have their own food checked. They have their own dietary practices and they eat the same food from one source, their own farm. It is not good if the food is contaminated (Nora, mainstream, age 58)

Concerns about environmental exposure to pesticides are high in rural areas of Ontario (Arbuckle, Savitz et al. 1999; Arbuckle, Schrader et al. 1999). Like farmers in the mainstream society, many Old Order Mennonites use pesticides in large amounts. However, they do not use pesticides on their own fruit and vegetable gardens, where for most part children work and play:

They will be outside for at least 8 hours. My boys help in the garden. We have large gardens and we sell organically grown vegetables (Minerva, rural Old Order Mennonite, age 45).

Historically, exposure to pesticides for Elmira children may have been much higher than in other parts of Ontario because the town took pride in its pesticide-producing industry, and promoted itself as a weedless town:

> *Interestingly enough, I think what happened was in the 50's we were known as the weedless town and I think that was the kind of control too because Naugatuck (now Chemtura) went around and sprayed every lawn. There wasn't a dandelion in town and our fame was that we were the weedless town. Little did we know the impact that would have. (Roselyn, Mainstream, age 68)*

> *I always remember when I was young we had the full block and we ran up everyone's backyard because there was no fence. And everyone sprays and everyone plays. The kids aren't on the sidewalks there, but everywhere and their hands are in their mouth and all over (Irene, Mainstream, age 26).*

Perceptions of environmental links to health are further explored by discussing the changes in children's health as being observed by mothers in the last decade. In general, it seems that many women are aware of local contamination, but their behavioural responses are differentiated by group membership.

6.6.2.2 Cultural Differences

Cultural, social and economic differences were observable between the members of the mainstream society and the Old Order Mennonites in their homes, farms, workshops and schools. Table 6.5 illustrates that ethnic beliefs and religious faith were the most frequently identified themes describing

environmental health links (14 interviews or 41%). Both groups referred to several aspects of their children's lives and indicated that both limited use of medical services and health care costs may be negatively impacting health of the Old Order Mennonites (15% of interviews).

Table 6.5 Main health concerns of mothers in the Township of Woolwich. Study Sample (N=34).

Organizational Theme	Mainstream Society Mothers n=19 (%)	Old Order Mennonites Mothers n=15 (%)	Total Interviews n=34 (%)
Ethnic beliefs and core values	4 (21%)	10 (67%)	14 (41%)
Health care cost	1 (5%)	4 (27%)	5 (15%)
Transportation	-	6 (40%)	6 (17%)
Use of medical services	-	4 (27%)	4 (12%)
Farm accidents	0	5 (33%)	5 (15%)

Old Order Mennonite children work and contribute to the family from their very early years:

> *Even a three-year-old can take a small cart, load it with corn and help in feeding the cattle in a barn. (Esther, Old Order Mennonite, age 53)*

Children's roles are determined by gender relations, which are undergoing changes, for example, now girls are allowed to use bicycles:

> *...so they do not have to be walking back home. Now the girls are allowed to use bicycles to ride to schools and they can come at the same time as boys. (Martha, Old Order Mennonite, age 59)*

The major ethnic difference between the mainstream society and the Old Order Mennonites is the spirituality of the latter and their belief that their health is

in the hands of God. They tend to see any links between environmental contamination and the health of their children as being in the hands of God and as a matter of faith. From that perspective the most relevant behavioral responses are acceptance and a prayer.

> *People do not understand that health is a great gift from God. Some of our children have health problems and some are healthy. (Father of eight, including two chronically sick children, Old Order Mennonite).*

> *Yes, I have five children and I had five miscarriages. Only my oldest daughter is healthy. All my boys had health problems. Maybe it was better that the others did not live. (Ellen, Old Order Mennonite, age 51)*

Old Order Mennonite parents follow their cultural traditions raising their children. The Old Order Mennonite mothers in the study are concerned about the health of the environment and its potential impact on maintaining the traditions by future generations:

> *I hope that the next generations will live in the country too. We know that health is a gift from God. We hope that the environment stays (healthy) so the next generations can stay healthy on the farms. (Rhoda, rural OOM, age 54)*

Due to cultural differences, Old Order Mennonites do not make use of state funded programs including the Ontario Health Insurance Program (OHIP). Hence they pay full cost of their health care. They believe that since they do not participate in war to protect the country, they do not have a right to accept free healthcare from the government. This principle can negatively impact children's health care because of the high costs involved. Mennonite families often delay

accessing medical care and only seek medical attention when health concerns are serious. Recently, Old Order Mennonites increased their participation in immunization programs for children, but *"they do not participate in health prevention programs"* such as mammography (Miriam, mainstream society, age 48).

Accessibility to medical services is not perceived to be a problem among Old Order women. Their conservative way of life requires the use of horse and buggies for everyday transportation and they do not question their mobility patterns. This mode of transportation constrains access to healthcare services since a trip to the local town may take a few hours. It is also up to individuals to decide how much help they will seek in case of a child emergency. Locally, the high level of farm accidents indicates a distinctive hazard for Mennonite children. Due to the recent Church leaders' permission to have personal telephones, Old Order Mennonites are now able "to make a phone call immediately when we need help" (Mary Ann, Old Order Mennonite, OOS7).

Woolwich Community Health Services has taken leadership in establishing culturally responsive health care mechanisms. It is difficult to bridge cultural gaps in environmental links to children's health. Our qualitative results for the study suggest that Old Order Mennonites tend to judge these environmental risks as smaller and less problematic:

> *I did not worry much about the plants and the chemicals. I think you were asking if we know, about the problems. Because in our language, to worry means to lose sleep over it. I have never worried about that*

but I knew about the problems. (Lucinda, Old Order Mennonite, 57; OOS1)

6.7 Discussion

This research has uncovered several important findings regarding perceptions of health of children's health in the cultural context of the Township of Woolwich. Members of the mainstream society recognized possibility of links between their children's health and local environmental contamination. These responses correspond with the findings of the geographical studies in which people perceived environmental health risk in the cultural context by the 'reflexive monitoring' processes (Beck 1992; Wakefield and Elliott 2000; Luginaah, Taylor et al. 2002). Our study and others suggest that distrust of scientific authority, awareness of threats to their core values and negative emotional effects (such as worry or anger) are among the typical responses of the mainstream society. Mothers from mainstream society tend to perceive their children's health mainly through a biomedical, Western model of health (Clarke N. 2004). Mothers felt safe in their homes but were still concerned about long-term effects of pollution on their children's health. Also, mothers in our study tended to believe feel that the location of their homes was safer than that of other mainstream families, which was clearly indicated during the interviews. Thus, perceptions of their children's safety and well-being were viewed within a scientific

medical model paradigm and had geographical dimensions of place, time and locality.

The cross-cultural differences among people's perceptions of children's health are particularly visible in this case study. Old Order Mennonites do not tend to identify causative links between contamination and their children's health. The results presented in this case study and reported in Table 6.3 indicate that mainstream society mothers were twice as likely to see their children as ill or as having health problems related to environmental impacts. Strong place attachment to homes and farms, spirituality and their community self-identity strongly influence Old Order mothers' perceptions of empirically measurable contamination. Their children's health is perceived to be "*better in the country than the 'town' children*" (Lucinda, Old Order Mennonite, OOS1).

Figure 6.4 models local processes that emerge from conflicting beliefs and ideologies. The pointing arrows represent different health hazards affecting both community groups. When biospheric, physical contamination of the environment is impacting mainstream society, then members frequently perceive multiple dangers to their children's health. For the Old Order Mennonites, any perceived links between environment and human health are largely contradicted by being embedded in people's beliefs, in a higher power, literally. Thus, it is God's will, rather than human impacts on environmental quality, which has the most powerful influence on children's health.

The opposite arrows visually represent hazard-declining and hazard-denying perceptions. In this situation, belief systems override experienced conditions (Couch and Kroll-Smith 1994), in fact, the beliefs and moral values of the group contradict the possibly negative impacts on children's well-being.

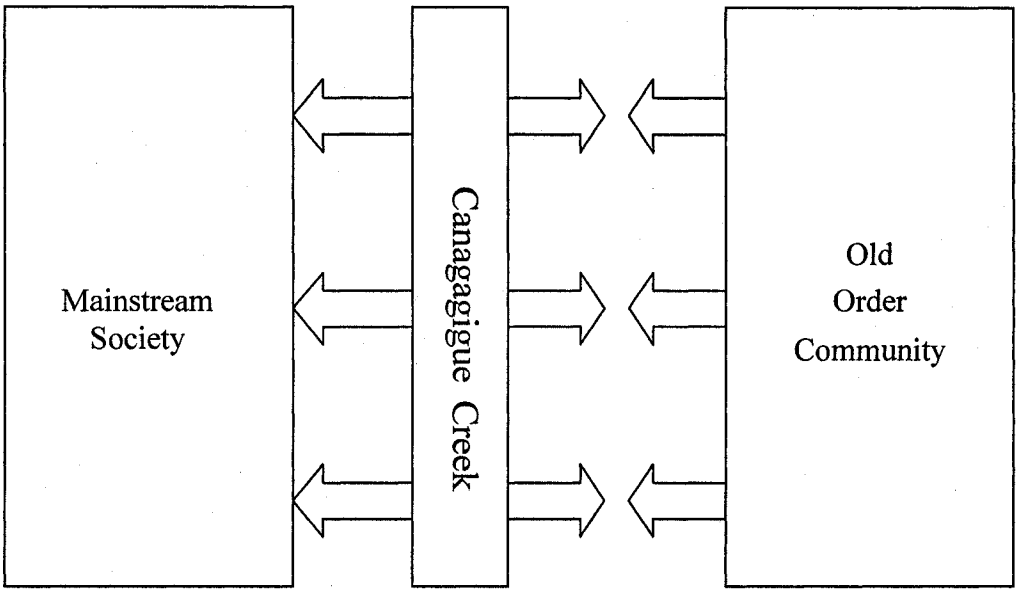

Fig. 6.4 A model representing perceptions of links between environment and children's health by mainstream society and the Old Order Mennonites community.

As presented in this simple drawing, the Canagagigue Creek divides the area into two disconnected worlds: technologically-bounded, postmodern society perceiving polluted environment posing possible health

issues for their children, and a traditional, religious ethnic minority-group, grateful to God for their healthy children.

Many mothers from the mainstream society voiced environmental concerns to ensure the protection of their children and related their worries to the Creek. The contaminated banks of the Creek are now undergoing remediation, and improvements in air quality have been noted. Many participants have confirmed that '*it is much better now*'. Also, the quality of life in a small town and the contact with the natural environment have continued positively influencing parents' perceptions of their children's health.

The perceptions of the increased incidence of asthma, allergies or cancer in the local communities suggests a wide range of behavioural, psychosocial and geographical health determinants and confirm the importance of looking more closely at environmental links to children's health (Johnson 2002; Denton, Prus et al. 2003). It is clear that the understanding of environment health links is still limited for different communities (Brown 1992; Couch and Kroll-Smith 1994; Eyles 1997; Luginaah, Taylor et al. 2002; Macintyre, Ellaway et al. 2002; Wilson 2003). In our study, Old Order Mennonites perceived their children's health status as having little or no dependence on environmental condition and as being generally positive. Ongoing research into reproductive health and genetics of Amish and Old Order communities in other locations confirm the complexity of the links between culture, religion, health and environmental conditions, but do

not themselves provide sufficient explanation for perceived health differences in this community (Campanella, Korbin et al. 1993; Falk, Feiler et al. 2004). Numerous researchers have noted "that lifestyle based religions, such as Old Order faiths, may contribute to improved health status" (Wengler, 2003, p. 14).

This study was exploratory and can only suggest explanations for the results we obtained. Investigations of possible links across the moral, cultural, social and biological contexts of Old Order Mennonite lives suggests that aspects of their culture such as mutual assistance, co-operation, and altruistic behaviour may provide some of the explanation for their unique health experience. Also, improved trust, sense of control, equitable power sharing in the small community as well as great network and cohesion of this community, point to the differences in the context of community life (Wismer 1999). The context within Old Order community, ethnic differences in health experienced both at an individual level and at community scales are central in explaining the results of this study. Old Order Mennonite parents' opinions about their children's health in the environmentally impacted areas uncovered health related perceptions specific to this population. Mennonite mothers in this study reported that children did not experience elevated levels of allergies or cancers, although an increased incidence of asthma was observed. When examining any perceived environmental links, a question might be asked, are there mechanisms that have caused this group's sensitivity to asthma and protected them from a growing number of allergies? Another question is, which health inequalities should be analyzed for this

particular ethnic group? Investigating questions may challenge universal understandings of gender and power relations in this community where patriarchic relations and lack of political will are the norms. Another question has emerged, whether the lower cancer rates which have been observed in Old Order Amish[xi] communities also apply to polluted environment such as the one in this study (Troyer 1988; Hewner 2001). Further research is needed to address the safety of the Old Order Mennonites children in place.

This qualitative research project's unique contribution has been to identify new information about children's health issues. The Old Order Mennonites agreement to participate in the research has been highly valued, as this case-study was intrusive for a religious group that strives to be separate from mainstream society (see also (Hall and Kulig 2004). Despite the small sample size of about 50 participants, I was able to obtain saturated results for both communities. The Old Order Mennonite community tends to be a homogenous group and their understandings of health were quite uniform among the members. Because the perceptions of children's health by the members of mainstream society were more diverse, the sample size is larger for this group (15 compared to 19 women).

The study is important because it provides a comparison between the mainstream population living in Elmira and a highly distinct cultural group of Old Order Mennonites. Old Order Mennonite parents acknowledge that their physical environment is contaminated, but that did not increase their

concerns about their children's health. In their separation from the world, their perceptions revealed that they were able to escape the dilemmas of postmodern society regarding perceived health risks, quite often referred to in geographical studies as the "risk society" (Haalboom, Elliott et al. 2006). Old Order Mennonite women believe their children's health is inseparable from their religious and cultural values, indicating that their past is an important part of their children's future.

Perceptions of children's health viewed through the positivistic lens of science have changed as mothers from mainstream society in our study perceived changes in the local environment, so that it has become 'safer, better or quite safe'. These mothers were concerned with a better, healthier future for their children, however, they articulated a number of continuing environmental concerns. The health of children from the mainstream society is linked by their mothers to a desire for a contaminants-free physical environment, outdoor playtime and healthy food sources.

For the Mennonite children, higher levels of physical activity and a lower rate of obesity are embedded in their lifestyle and cultural differences. A recently-conducted, positivistic study of physical activity and body mass index of children from the Old Order Mennonite colony living near Mount Forest, Ontario shows that Mennonite children are stronger and healthier than their Canadian peers from urban and rural neighborhoods (Bassett, Tremblay et al. 2007). Results of our study in the Elmira area are consistent

with the findings for the Old Order Mennonite community in Mount Forest, Ontario.

6.8 Conclusions

This research examined perceptions of links between health and environmental contamination in the small area of Southern Ontario impacted by high levels of air and soil pollutants. It contributes unique knowledge and fills in the missing gap of information about Old Order Mennonite community by presenting information about their children's health. The cross-cultural aspect of this research provides examples of diverse ways of viewing the links between health and place in both the mainstream society and Old Order Mennonites in their local environments.

Ethnic differences in health beliefs on environmental hazards cannot be ignored for both scientific and ethical reasons. The results of this case study must be interpreted with cautions characteristic to the research undertaken within the social constructivist framework. The perceptions of both groups of participants hint at tensions present among different, contradictory philosophies in the multicultural Canadian society. In opposition to the cultural relations generating concerns about environment-human health vulnerabilities in a scientific, technologically-oriented world, Old Order Mennonite children are perceived by their families to be healthier than their peers living in the neighbouring communities in Ontario.

6.9 References

Arbuckle, T., D. Savitz, et al. (1999). "Exposure to phenoxy herbicides and the risk of spontaneous abortion." Epidemiology **10**(6): 752-760.

Arbuckle, T., S. M. Schrader, et al. (1999). "2,4-Dichlorophenoxyacetic acid residues in semen of Ontario farmers." Reproductive toxicology **13**: 421-429.

Arcia, E. (1998). "Latino parents' perception of their children's health status." Social Science & Medicine **46**(10): 1271-1274.

Awad, E. and A. Hayton (2004). Contaminant monitoring in forage fish and sport fish in Canagagigue Creek near Elmira, Ontario: 1982-2003. Toronto, Ministry of Environment**:** 24.

Baker, D. B., S. Greenland, et al. (1988). "A health study of two communities near the Stringfellow waste disposal site." Archives of Environmental Health **43**: 325-334.

Barrow, C. J. (2001). Environmental and social impact assessment. New York, NY, Oxford University Press Inc.

Bassett, D., Jr., M. S. Tremblay, et al. (2007). "Physical Activity and Body Mass Index of Children in an Old Order Amish Community." Medicine & Science in Sports & Exercise: 410-415.

Baxter, J. and J. Eyles (1997). "Evaluating qualitative research in social geography: establishing "rigour' in interview analysis." Transactions of the Institute of British Geographers **22**: 505-525.

Beck, U. (1992). Risk Society: Towards a New Modernity. London, Sage.

Bennett, E. (2003). "Emancipatory responses to oppression: The template of land-use planning and the Old Order Amish of Ontario." American Journal of Community Psychology **31**(1/2): 157-171.

Brown, P. (1992). "Popular epidemiology and toxic waste contamination: Lay and professional way of knowing." Journal of Health and Social Behavior **33**(267-281).

Campanella, K., J. E. Korbin, et al. (1993). "Pregnancy and childbrith among the Amish." Social Science & Medicine **36**(3): 333-342.

Clarke N. J. (2004). Health, Illness, and Medicine in Canada, Oxford University Press.

Clarke, N. J. (2004). Health, illness, and medicine in Canada, Oxford University Press.

Conestoga-Rovers & Associates (2003). Ecological Risk Assessment. Waterloo, Ontario, Conestoga-Rovers & Associates: 80.

Conestoga-Rovers & Associates (2003). Human Health Risk Assessment for Canagagigue Creek. Waterloo, Ontario, Conestoga-Rovers & Associates: 80.

Couch, S. R. and S. Kroll-Smith (1994). "Environmental controversies, interactional resources, and rural communities: siting versus exposure disputes." Rural Sociology **59**(1): 25-44.

Crighton, E., S. J. Elliott, et al. (2002). "The Aral Sea disaster and self-rated health." Health and Place.

Curtis, S. (2004). Health and Inequality. Geographical Perspectives. London, Thousand Oaks, New Delhi, Sage.

Denton, M., S. Prus, et al. (2003). "Gender differences in health: a Candian study of the psychosocial, structural and behavioural determninants of health." Social Science & Medicine **58**: 2585-2600.

Donnelly, J. E., W. J. Donnelly, et al. (1987). "Parental perceptions and attitudes toward asthma and its treatment: A controlled study." Social Science & Medicine **24**(5): 431-437.

Donovan, J. L. (1984). "Ethnicity and Health: A Research Review." Social Science & Medicine **19**(7): 663-670.

Dyck, I., N. Davis Lewis, et al., Eds. (2001). Geographies of Women's Health. London, Routlege.

Elliott, S. J. (1995). "Psychosocial stress, women and heart health: a critical review." Social Science & Medicine **40**: 105-15.

Eyles, J. (1985). Senses of Place. London, Silverbrook Press.

Eyles, J. (1997). "Environmental health research: setting an agenda by spinning our wheels or climbing the mountain?" Health and Place **3**(1): 1-13.

Falk, M. J., H. S. Feiler, et al. (2004). "Cohen Syndrome in the Ohio Amish." American Journal of Medical Genetics **128A**: 23-28.

Fretz J., W. (1989). The Waterloo Mennonites. A community in paradox. Waterloo, Ontario, Conrad Grebel College.

Fretz , W. (1989). The Waterloo Mennonites. A community in paradox. Waterloo, Ontario, Conrad Grebel College.

Gatrell, A. (2002). Geographies of Health. Oxford UK, Blackwell Publishers Ltd.

Gesler, W. M. (1991). The Cultural Geography of Health Care. Pittsburgh, University of Pittsburgh Press.

Gesler, W. M. and R. A. Kearns (2002). Culture/Place/Health. New York, Routledge.

Good Gingrich, L. and E. Lightman (2004). "Mediating communities and cultures: A case study of informal helpers in an Old Order Mennonite community." Families in Society: The Journal of Contemporary Social Services **85**(4).

Haalboom, B., S. J. Elliott, et al. (2006). "The risk society at work in the Sydney 'Tar Ponds'." The Canadian Geographer **50**(2): 227-241.

Hall, B. and J. Kulig (2004). "Kanadier Mennonites: A case study examining research challenges among religious groups." Qualitative Health Research **14**(3): 359-368.

Hay, I., Ed. (2000). Qualitative Research Methods in Human Geography. Victoria Australia, Oxford.

Hewner, S., J. (1997). "Biocultural approaches to health and mortality in an Old Order Amish community." Collegium Antropologicum **21**(1): 67-82.

Hewner, S., J. (2001). "Postmenopausal function in context: biocultural observations on Amish, neighboring non-Amish, and Ifugao household health." American Journal of Human Biology **13**: 521-530.

Horst, I. R. (2000). A separate people: An insider's view of Old Order Mennonite customs and traditions. Waterloo, Ontario, Herald Press.

Hostetler, J. (1975). Mennonite Life. Kitchener, Ontario, Herald Press.

Inhorn, M. and K. L. Whittle (2001). "Feminism meets the "new" epidemiologies: toward an appraisal of antifeminist biases in epidemiological research on women's health." Social Science & Medicine **53**(553-567).

Jaagumagi, R., T. Lomas, et al. (1987). A study of the effects of in-place pollutants on the bottom water, sediments and sediment-dwelling organisms of Canagagigue Creek at the Uniroyal Chemical Ltd. Plant Elmira, Ontario. Toronto, Ministry of the Environment.

Johnson, B. B. (2002). "Gender and race in beliefs about outdoor air pollution." Risk Analysis **22**(4): 725-738.

Kawachi, I. and L. F. Berkman (2000). Social Cohesion, Social Capital, and Health. Social Epidemiology. L. F. Berkman and I. Kawanichi. Oxford, Oxford University Press.

Luginaah, I., M. Taylor, et al. (2002). "Community responses and coping strategies in the vicinity of a petroleum refinery in Oakville, Ontario." Health and Place **8**(177-190).

Macintyre, S., A. Ellaway, et al. (2002). "Place effects on health: how we conceptualise, operationalise and measure them. ." Social Science & Medicine **55**: 125-139.

Moffatt, S., T. Pless-Mulloli, et al. (2003). ""It wasn't the plaque we expected." Parent's perceptons of the health and environmental impact of opencast coal mining." Social Science & Medicine **57**: 437-451.

Panelli, R., L. Gallagher, et al. (2006). "Access to rural health services: Research as community action and policy critique." Social Science & Medicine **62**: 1103-1114.

Peters, J. F. (2003). The Plain People: A Glimpse at Life Among the Old Order Mennonites of Ontario. Kitchener, Herald Press.

Platte, P., J. Zelten, et al. (2000). "Body image in the Old Order Amish: A people separate from "the world"." International Journal of Eating Disorders **28**: 408-414.

Quinn-Patton, M. (2002). Qualitative research and evaluation methods. Thousands Oaks, Sage.

Reimer, M. L. (2003). Old Order farmers threatened by poisoned creek. Canadian Mennonite. **7**.

Snyder, L. and S. Bowman (2002). Communities in cooperation: human services work with Old Order Mennonites. Waterloo, Renison College**:** 38.

Troyer, H. (1988). "Review of cancer among 4 religious sects: evidence that lifestyles are distinctive sets of risk factors." Social Science & Medicine **26**: 1007-1017.

Wakefield, S. and S. J. Elliott (2000). "Environmental risk perception and well-being: effects of the landfill siting process in two sourthern Ontario communities." Social Science & Medicine **50**: 1139-1154.

Waterloo Region Community Health Department (2001). Summary Health Status of Woolwich Township Residents. Waterloo, Ontario.

Waterloo Region Community Health Department [WRCHD] (2000). Industrial Air Emissions in Elmira. Final Report. Waterloo, Waterloo Region Community Health Department
and University of Waterloo.

Wengler, L. (2003). *Unser Satt Leit: Our sort of people*. Health understandings in the Old Order Mennonite and Amish community. Recreation and Leisure Studies. . Waterloo, University of Waterloo. **MA:** 206.

Whittaker, A. (1998). "Talk about cancer: environment and health in Oceanpoint." Health and Place **4**(4): 313-325.

Wilcox, C., E., R. Washburn, et al. (2007). "Seeking help for attention deficit hyperactivity disorder in developing countries: A study of parental explanatory models in Goa, India." Social Science & Medicine **64**: 1600-1610.

Wilson, K. J. (2003). "Therapeutic landscapes and First Nations peoples: and exploration of culture, health and place." Health and Place **2003**(9): 83-93.

Wind, S., D. Van Sickle, et al. (2004). "Health, place and childhood asthma in southwest Alaska." Social Science & Medicine **58**: 75-88.

Wismer, S. (1999). "From the ground up: Quality of life indicators and sustainable community development." Feminist Economics **5**(2): 109-114.

Woolwich Community Health Centre (2005). Community Needs and Capacity Assessment. Final Report. St. Jacobs, Ontario.

ENDNOTES

[i] In the general population, 395,000 of every one million people will develop some form of cancer and this figure (39%) constitutes the normal rate. Accordingly to the MOE regulations, anything more than one case in a million higher than the normal rate is unacceptable.

[ii] Mar. 23 1983 "Preliminary testing indicates minor concerns about dioxin" *The Elmira Independent*

[iii] Jun. 12 2004 "Elmira fire. Alert: More concern than panic" *The Elmira Independent;* Jul. 20 2006 "Explosion at Chemtura" *The Elmira Independent*

[iv] The Mennonite faith is a Christian religion that traces its origin to the Swiss Anabaptist of the 16th century. Knowing the history of the Anabaptist movement helps to understand culture of the conservative Mennonites and the Amish. Their desire to be obedient of God's will and to avoid sins of the flesh can be recognized in their simple agrarian lifestyle, plain dress, and "horse-and-buggy" transportation. As religion and customs are inseparable, the Old Order Mennonites are guided in their behavior not by their own desires but by the rules and obligation to God and to the needs of the community.

[v] *Gemeinschaft community* refers to a traditional, agricultural-oriented, pre-industrial community, which is perceived as an organic totality, where people are connected with each other and the common goal is a primary value. Within this structure a group of church leaders governs in the name of values common to the entire group.

[vi] The Old Order Mennonites speak a dialect called Pennsylvania Dietch (not Dutch) but the English speaking mainstream society does not distinguish the difference (Peters, 2003).

[vii] No member in good standing can have more than elementary education. The offending woman was excommunicated and had to leave the community a few years ago

[viii] Old Order Mennonites believe that false doctrine might be learned from 'worldly influences'. Hence they do not permit their children to attend school beyond grade 8. Also, Old Order Mennonite teachers have only a Grade 8 education. Most classes are taught in English but Bible reading, hymn singing and prayers are taught in German. The curriculum emphasis is on reading, writing, arithmetic and Mennonites history.

[ix] An article printed in *The Elmira Signet* on Sept. 12, 1946 informed the residents that they should not be concerned with the abnormal taste of tomatoes "Ill Flavored Tomatoes Not Traceable to Chemicals". People believed in the 1940s that scientific test 'proofing' these statements were conducted in the plant.

[x] *Air Pollution Injury on Tomato and Pepper*. Tomatoes are susceptible to a number of pollutants, including sulfur dioxide, ozone and peroxyacetyl. Ministry of Agriculture. <httpp:www.omafra.gov.on.ca> Accessed on 18, 04, 2006.

[xi] There are many similarities between the Amish and the Old Order Mennonites. The differences between the groups are dated back to 1693 in their European history. The followers of Jacob Amman, the Amish, are very strict in their practice of shunning to those who are excommunicated. The offending persons are forbidden to converse with or even attend funerals of their parents, children or family members (Peters, 2003). The Amish are considered to be *old order* Mennonites. Both ethnic minority groups, the members of the Old Order Mennonite Church and the Amish read the same bi-monthly magazines, such as *Family Life* and *Young Companion.*

Chapter 7

DISCUSSION AND CONCLUSIONS

7.1 Summary of Key Findings

This research has explained how risk and health understandings are constructed among two culturally different communities in response to technological hazards. Culturally sensitive and inclusive geographical fieldwork allowed for the examination of women's perceptions of the impacts of risk among a spatially separated ethno-religious minority group. The cross-cultural aspect of this research provides examples of diverse ways of viewing the links between health and place in both the Old Order Mennonites and mainstream society and in their local environments. In the process environmental risks and health links were conceptualized by developing models of health understandings and by proposing a model of cultural processes leading to risk amplification and risk attenuation.

Cultural differences are central to viewing the links between health and place. The healing benefits of place do not have universal meanings and culturally specific landscapes exist in communities. This geographical research recognizes the complexity of the interrelationship between the health, identity and spirituality of the studied participants.

Relationships between health and place among Old Order Mennonites are complex. Old Order Mennonites have developed physical bonds with the land as

part of the agricultural work of the family and their spiritual links with their place through a religious way of living in the Gemeinschaften community.

This research has confirmed that for the Old Order Mennonite community religion and culture are inseparable. Dark horses and buggies, black dresses and head coverings for women are meaningful signs of their identity. Their community does not allow a secularization of knowledge. Their God determines their landscape and their connections with place. The relationships with the land are enclosed in their religious values as their religion is incorporated in their culture and their way of living.

The findings illustrate that this particular community is focused on spiritual aspects of health. The cultural identity of the Old Order Mennonites has constructed their life experiences into a group affirmation of difference, and has contributed to their unique perceptions of environmental technological hazards. Old Order Mennonites are proud of their ethnic identity despite their low level of education, limited use of medical services, lack of political power, and culturally distinct mode of transportation. Culturally specific dimensions of the Old Order Mennonites' landscape, determined by God's will, allow them to perceive their world as a safe and healthy place. As the result, the Old Order Mennonites are empowered in their unique identity in place. Their children are perceived by their parents to be healthier than their peers living in the neighbouring communities in Ontario.

7.2 Academic Contributions

In terms of academic contributions, this research contributes to our knowledge of cross-cultural and 'unique' risk and health experiences in place. Through the incorporation of epistemologies that include qualitative inquiry in geographical health research, risks and culture are explored at a community scale.

Chapter 4 contrasts the mainstream society's biomedical conceptualization of health with the holistic understanding of health by Old Order Mennonites. The social structure of Old Order Mennonites is very different in comparison to modern society's. In a traditional *Gemeinschaft* community, well-being is understood as a moral obligation on an individual to place their community first before their own needs. Old Order Mennonites perceive their health in relation to their ability to perform their roles in the home and in serving the needs of the community. Only when they are no longer able to perform these roles do they perceive that their health has been compromised. Their health understandings are not biomedical but are connected with place. Healthy individuals make choices defined by culture where their identities are to be mothers, daughters, wives, sisters, aunts, and contributing community members. Their belief in the ultimate power of their God creates a dissonance between their perceptions and reality. What influences the definition of health in this community is their religious belief that they must live *separately* from the world and *not to be of the world.*

However, they exist and live *in the world*, in an orthodox consistency that determines their landscape.

Their different culturally-constructed experiences manifest their understandings of the local landscape within their engagement in a socially formed place. The Old Order Mennonite women's *affirmation of difference* in place has been produced through religious and historical consciousness. The therapeutic result of these interactions has created particular meanings and allows them to experience the 'healing effects' of their rural place. The culture of Old Order Mennonites profoundly shapes their understanding of reality and their experience of health and risk.

Chapter 5 reveals an important divergence in risk perceptions between the members of the mainstream society and Old Order Mennonites, and provides an example of how cultural understandings are constructed in place. Culture influences the meaning of risk, resulting in risk attenuation or risk amplification. The research illustrates how culture can be conceptualized and empirically measured within the proposed framework. Threats to lives, core values, worldviews and community context comprise the categories linked not only to personal experiences but also to the cultural identity of the participants. The study proposes a way of unpacking the black box of culture by using a qualitative based explanation of the dimensions of culture that influence risk perceptions.

The thesis highlights the importance of qualitative research in examining the relations between culture and risk perceptions (Baxter and Greenlaw 2005). Risk attenuation and amplification processes are not yet well understood in culturally diverse communities and thus this research makes a significant contribution to the field. The results indicate that members of the mainstream society are considerable likely than Old Order Mennonites to perceive their environment as dangerously impacted by technological hazards.

Chapter 6 examines perceptions of links between health, disease and illness and a contaminated local environment and provides a comparison between the mainstream population living in Elmira and the Old Order Mennonites living along the severely contaminated Canagagigue Creek. While parents from the Old Order Mennonite community acknowledged that their physical environment is contaminated that knowledge has not increased their concerns about their children's health. In their separation from the world, their perceptions reveal that they are able to escape the dilemmas of a postmodern society. Old Order Mennonite women believe their children's health is inseparable from their religious and cultural values, indicating the perception that their past is an important part of their children's future. In contrast, mothers from the mainstream society are concerned with a better, healthier future for their children and expressed a number of on-going environmental concerns. The health of their

children is linked to a contaminant-free physical environment, outdoor playtime and healthy food sources.

This research was feminist in its theoretical focus by exploring the well-being of women and their children from both the mainstream society and an ethnic minority group. This was a purposeful decision, as women and children often are most affected by technological environmental hazards and yet severely underrepresented in the literature (Schettler, Solomon et al. 2000; Dyck, Davis Lewis et al. 2001).

This research confirmed that health, risk and illness are culturally constructed experiences. The multiple perceptions of health shared by people of similar sociocultural backgrounds is significantly different from the mainstream health belief system. The concept of ethnicity in this research is essential and applies directly to an understanding of place by the communities. Adopting this cross-cultural approach to place was important to the project's design, data collection methods, analysis, and presentation of findings. Although the researcher's knowledge of the community was limited due to cultural differences, her competence and cultural sensitivity extended beyond these limitations and allowed for a successful completion of the project.

The results fill an important gap in our knowledge of how cultural differences influence concepts of risk, health, and risk in place in reference to this specific ethnic minority group in south-central Ontario. The analysis of the

findings point to a recognition that community empowerment is an important aspect of Old Order Mennonite community health. Within this community, health and illness are explained through their complex relations with God, and members are empowered by the spiritual connections in their social networks. The findings reveal that place is perceived as having the power to heal. The place of the Old Order Mennonites "empowers" them in their therapeutic landscape, which differs so markedly from the landscape of the mainstream society.

The gap between the Old Order Mennonites and the mainstream society is wide and identifying the discrepancies between the communities is important. In this study, it was as important to the researcher to shift away from 'exclusion' to 'inclusion' and to reveal the health inequalities among different communities in the Elmira area. With this research, the silent voices of Old Order Mennonite women have been heard and the inclusion of their perceptions brings greater insights to understanding their lives and health in their community.

7. 3 Practical Contributions

The practical contributions of this study relate to its applicability to environmental risk management. This research calls for public policies that enable the effective protection of ethnic minority groups in place, despite the cultural challenges that such action involves. People's experiences of therapeutic landscapes are essential to their well-being, but they do not create a barrier to

protect them against environmental hazards. There is a need for government policies and practices to work with ethnic minority groups in the contaminated areas to minimize their exposure to environmental contamination in a way that is sensitive to their cultural ways of communication.

Researchers should take action to inform separate minority groups about the environmental hazards despite their separation from the mainstream society, regardless of the difficulties in reaching out to these minorities. Policy makers and risk managers need to develop a greater sensitivity to cultural differences in risk understandings. Better prevention measures, including more open communication with the communities at risk of exposure, need to be incorporated into future plans.

This research has increased the awareness of the risk attenuation process that exists among members of this ethnic/cultural minority groups. People's perceptions of their cultural identity are essential for the management of local and global technological hazards in protecting children, vulnerable communities, and all members of society.

7.4 Study limitations

The study presented a number of challenges. This qualitative research involved an intrusive method to reach a religious group of women who strive to remain isolated from the mainstream society (Hall and Kulig 2004). This

particular community of Old Order Mennonites live in a relatively small geographic area in the Elmira area, but the number of participants in the research was constrained by the difficulty of contacting individual members of the community. Moreover, the researcher had no guarantee that the Old Order Mennonite community would agree to participate in the study. Nevertheless, she was determined to conduct the study, if at all possible. A long period of contact with the Elmira community allowed her to identify a mainstream society community leader and a public health professional who initiated her contact with one Old Order Mennonite family. An older member of this family who became the "gatekeeper" introduced the researcher to the members of her community and provided the addresses of willing participants. The researcher was successful in interviewing 15 Old Order Mennonite women, a relatively small sample, but one that reveals the homogeneity of this religious group. The researcher was successful in speaking with women of different ages and who marital status differed in the Old Order Mennonite community.

Old Order Mennonite women are silenced both in the family and the community where patriarchy structures all relationships. My study provided them with the opportunity to be heard, though inevitably their spoken message has been interpreted through the culture, prior knowledge and biases of this researcher. The very genre in which the researcher works requires that she presents her own interpretation of the links between health, risk and culture, and as a result, the

researcher unavoidably "speaks for others" – in this case for women in the Old Order Mennonite community.

Ethical considerations are central to this inquiry. This study was a cross-cultural research in a community that lacks political power and where patriarchal relations are the norm. As a researcher I was able to develop a questionnaire guide, a consent letter and an information letter in consultation with the Old Order Mennonite 'gatekeeper' who evaluated the appropriateness of all aspects of the study for members of her community. It was evident that as an outsider my understanding of the culture of the Old Order Mennonite community was somewhat limited, despite extensive reading, and consequently a long period of preparation was required before the fieldwork could begin. Despite this extensive learning period, it is possible that cross-cultural misunderstandings may have influenced the responses to the research questions given by Old Order Mennonites. However, given the homogeneity among the responses, it would appear that these misunderstandings were few. The interviews permitted the researcher to develop a positive relationship with this closed religious community and gained the trust of its members. The identity of the researcher, whose mother tongue is not English, was perceived positively and assisted the researcher in forming relationships with the Old Order Mennonite community who were interested in the researcher's own cultural background. A mutual respect of differences developed among the researcher and the Old Order Mennonites. As a

result, confidential church books and hand-drawn maps were provided to the researcher, and as gifts from members of the community she listened to personal stories and to hymns sung for her. The Mennonites were assured that their confidentiality would not be jeopardized.

This research has highlighted the need for a policy to regularly check well water for the presence of chemical contamination on farms belonging to Old Order Mennonites. If such a policy is established, what might it mean to the local communities? Old Order Mennonites in the study sample claimed to be healthy and most of them did not identify any concerns between their health status and technological environmental hazard. The main ethical consideration is whether such checks and any follow up studies are justified given their desire for a "peaceful and separate reality". However, the dangers exist and Old Order Mennonites should decide if they want their well-water checked for chemical contamination and whether they should follow the advice given to members of the mainstream farming community to fence the banks of the Canagagigue Creek to prevent dispersion of dioxins/furans into the local environment. At the present time, children may still play in the Creek and some farmers give their livestock access to it, though some have fenced it off. The cultural separation of the Old Order Mennonite community from the mainstream society could effectively limit any further research.

7. 5 Future research directions

Future research might examine how connections to place among ethno-religious minority groups condition their perceptions of health. Religiosity and spirituality impact their perceptions of risk in place. There are few geographical explorations of identity and difference that position religion in a class of significant factors, which are mainly concerned with pilgrimages, or unusual places. It appears that geographical aspects of faith experiences are under-researched areas.

An interesting research possibility is to find whether the findings of this study are transferable to other ethno-religious minority groups in Canada, especially to Old Order Amish or to the Hutterites. In reference to the cultural theory of risk and advances in risk research, the differences among perceptions of technological hazards might be further explored in another region of the country. Indeed, understandings of ethnic minority groups might reveal coherence despite the differences among sectarians, egalitarian or hierarchical characteristics of these groups (Douglas and Wildavsky 1982; Tansey 2004).

While this study has made only a modest start in exploring the concept of culture and affirmation of difference in place by the Old Order Mennonite ethnic minority group in Ontario, there is a need to examine the concept further. Investigations of possible links across the cultural, social and biological aspects of ethnic groups such as mutual assistance, co-operation, and altruistic behaviour

may provide some explanation for people's unique health experiences. In addition, improved trust and cohesion among members of separated ethnic communities point to differences in the context of their community life which would be interesting to research.

Future research could examine the concept of scale in the local environment in relation to environmental controversies. Scale determines the border of the neighborhoods and/or size of the study area. It is essential to study everyday technological hazards within local communities in relation to changes in the global environment at the small scale. Choosing scale is important as cultural differences may not be observable in larger scale quantitative studies. When conducting large-scale quantitative studies, the cultural differences cannot be easily indicated in small geographical locations. These research findings might provide some insights for the positivist geographers in developing culturally sensitive indicators of well-being in place to fully capture the reality of women's health experiences in orthodox communities.

The location of this study in south-central Ontario has a physical environment that is contaminated with some chemicals "persuasively linked" to cancer, neurological impairments and reproductive problems (Appendix D). A long-term study of health outcomes comparing Old Order Mennonites living in the more rural areas in Bruce County with their counterparts living in the Elmira area of Waterloo County would illustrate the impact of the chemical

contamination on similar ethno-religious groups. Undertaking such a study may present some particular challenges, however, as there would likely be some reluctance among these groups for cultural reasons to participate in research of this nature.

The perceptions of place have been important to reveal a place-based identity (Jackson 1989; Oakes 1997; Wilson 2003). This research addresses a new direction that might be taken to examine the concept of identity in place and the paradox of contrasting the limited modernity of the orthodox Mennonites in the modern world with global citizenship. The community of the Old Order Mennonites has a "pre-modern" structure of place-bound "traditional societies" and maintains a unique community structure. It would be interesting to examine how the relations of community-based identities have been modified and changed in place in confrontation with modern world based economy.

The Old Order Mennonites' attachment to place, their social capital, social cohesion, strong community networks, and strong self-sufficiency construct their meaningful identity in place. A new direction of research could explore how people's identity progresses into a group affirmation of difference and the creation of ethnic islands, from which their experience of unique landscapes evolves. This area of study incorporates cross-cultural fieldwork as identities of research participants are examined in contrast to the complexities existing in mainstream groups.

Continued research in the area of technological environmental hazards is central to advancing our understanding the reactions of people from various cultures as they relate to the growing contamination of global environments. Increasing our understanding of cross-cultural issues is vitally important to guide decision-making and manage public policies in the context of health, risk and environment in Canada and more broadly, on a global scale.

7. 6 References

Baxter, J. and K. Greenlaw (2005). "Explaining perceptions of a technological environmental hazard." The Canadian Geographer **49**(1): 61-80.

Douglas, M. and A. Wildavsky (1982). Risk and Culture: An essay on the selection of technological and environmental dangers. Berkeley, University of California Press.

Dyck, I., N. Davis Lewis, et al., Eds. (2001). Geographies of Women's Health. London, Routlege.

Hall, B. and J. Kulig (2004). "Kanadier Mennonites: A case study examining research challenges among religious groups." Qualitative Health Research **14**(3): 359-368.

Jackson, P. (1989). Maps of Meaning: An Introduction to Cultural Geography. London, Unwin Hyman.

Oakes, T. (1997). "Place and the paradox of modernity." Annals of the Association of American Geographers **87**(3): 509-531.

Schettler, T., G. Solomon, et al. (2000). Generations at risk. Reproductive health and the environment. Cambridge, Massachussetts, The MIT Press.

Tansey, J. (2004). "Risk as politics, culture as power." Journal of Risk Research **7**(1): 17-32.

Wilson, K. J. (2003). "Therapeutic landscapes and First Nations peoples: and exploration of culture, health and place." Health and Place **2003**(9): 83-93.

Appendix A

A Brief Chronology of the Selected Events in Elmira.

Date	Event	A Sample of Newspaper Article
1941	Naugatuck Chemicals Ltd. begins its operation	Jul. 10 1941 "Nagatuck to Employ All Local Help" *The Elmira Signet*
1946	Elmira advertised as a "weed-free town" and a home of pesticides, DDT, 2-4 D	Aug. 15, 1946 "Plan to Make Elmira First Weed Free Town in Canada" *The Elmira Signet*
1946	First reports of food contamination and an abnormal testing of tomatoes	Sept. 12 1946 "Ill Flavoured Tomatoes Not Traceable to Chemicals" *The Elmira Signet*
1964	Air and water pollution bring strong comments from population, dying fish in Canagagigue creek	June 24, 1964 "Creek Pollution Kills Fish Causes Odours" *The Elmira Signet*
1965	A new sewage treatment plant constructed - 12 years after the recommendation from the Ontario Health	Jun. 9, 1965 "Water Pollution Control Plant Opens June 9" *The Elmira Signet*
1965	23 cattle died from drinking water contaminated with carbon tetrachloride from Canagagigue Creek; loss and damage of 60 acres of land that had to be fenced along the river	Nov. 10,1965 "Cattle Death Question Also Compensation Matter" *The Elmira Signet.*
1969	Various reports documenting the damage to the Canagagigue Creek and proposals to build dams to stop pollution	Aug. 26, 1970 "Canagagigue pollution among the worst in country" *The Elmira Signet*
1978	Newspaper reports about bad tasting water; problems with smell; extensive testing of water for bacterial contamination is conducted.	April 12, 1978 "Officials Admit Elmira Water Has Abnormal Taste *"The Elmira Independent"*
1980	First concerns about health issues and speculations about cause-effects health issues: "a large number of skin rashes reported by a local doctor"	April 9, 1980 "Elmira still has water problem" *The Elmira Signet*
1981	Increased problems and speculation about possible contamination from the town's dump to Elmira's water supply	Nov. 19, 1980 " Ordinary garbage at Woolwich dump causing ground pollution" *The Elmira Independent"*
1982	MOE sets up a 12 member technical Citizen's Environmental Advisory Committee (CEAC) to review the air and groundwater contamination problems	Nov. 17, 1982 "Technical committee hold meeting at Uniroyal Chemical" *The Elmira Independent*
1983	After a year of work CEAC opposes Uniroyal plan to release the treated waste water into the Canagagigue Creek. Meeting with MOE officials and the local television reporters. Uniroyal refused to attend the meeting.	Oct. 26, 1983 "Uniroyal officials refuse to speak at public meeting tonight" *The Elmira Independent*
1983	Dioxin detected in shallow test wells on Uniroyal property	Mar. 23 1983 "Preliminary testing indicates minor concerns about dioxin" *The Elmira Independent";*

1984	Accidents in the chemical plants, hospitalization of workers and rising public concerns[i]	June 27, 1984 "Leak of hydrogen chloride gas put 4 Uniroyal staff in hospital *"The Elmira Independent"*
1987	Major concerns about removal of hazardous waste from the Uniroyal site; 800 hazardous drums instead of 500 were buried at the property[ii];	Aug. 1987 "Final count of buried drums at Uniroyal could be 300 over the original estimate
1987	Chemical spill, unknown amount of toluene released into the atmosphere causes damage to approximately 130 vehicles	August 1, 1989 "Malfunction at Uniroyal results in localized chemical fallout" *The Elmira Independent*
1987	Residents annoyed by Uniroyal's lack of responsibility and denials that spill had ever taken place	October 3, 1989 " Toluene fall-out did not damage the cars in Elmira says Uniroyal Chemical official" *The Elmira Independent*
1987	Citizens concerns about health effects	August 15, 1989 letter to editor : "Are bad smells from Uniroyal dangerous to health?" *The Elmira Independent*
1989	Offensive smells from Uniroyal and problems with noxious odours spurs opposition to proposal to build a waste incinerator	[I] September 12, 1989 "Problems with 'wetox' at Uniroyal show why incinerator not welcome'. *The Elmira Independent"*
1989	Water crisis in Elmira; detection of N-nitroso-dimethlamine (NDMA) critically exceeding guidelines; Permanent Shut down of two main municipal wells by MOE	Dec. 12, 1989 "ROMW establishes 'health committee' to deal with water" *The Elmira Independent*
1989	Incinerator proposal postponed until water contamination solved.	November 25, 1989 "Uniroyal Chemical asked to abandon hazardous-waste incinerator proposal" *The Elmira Independent*
1989	NDMA found at 2000 ppb in Uniroyal's wastewater entering the Elmira sewage-treatment plants and in effluent discharging into the Canagagigue creek at 50 ppb	Dec. 21"MOE suspects DMN was in the ground water under Uniroyal Chemical before the south wells were found contaminated" *The Elmira Independent*
1990	The plant complies with MOE restrictions as "this is the only thing to do as a corporate member of this community"	Jan. 9, 1990 :Uniroyal complies with MOE restrictions; most processes continue" *The Elmira Independent*
1990	Uniroyal initiates legal action to challenge the Ministry authority to prohibit use of the Elmira sewage plant"	Jan. 23 1990 "Uniroyal Chemical forced to stop using the Elmira sewage plant" *The Elmira Independent*
1990	Environmental Appeal Board accepts terms, and production at Uniroyal resumes	Jan. 30 1990 "Uniroyal can resume using sewage plant" *The Elmira Independent*
1991	A number of charges brought by MOE against Uniroyal. For example: Uniroyal spilled 900 gallons of NDMA contaminated water at 300,000 ppt into the Canagagigue Creek and caused Waterloo to close 9 municipal wells	Mar. 26, 1991 "Uniroyal dumps 900 gallons of DMNA wastewater into Canagagigue creek *"The Elmira Independent"*

2000	20 charges have been laid against Uniroyal Chemical by MOE for air pollutions	18 Feb. 2000 "Uniroyal charged" *Elmira Independent*
2003	Human Health Risk Assessment. Prepared by Conestoga Rovers and Associates for Crompton, CPAC and the local communities. Ref. No. 11725 (9)	Feb. 2003 "Elmira study shows excess cancer risk" *The Record*
2004	A large fire in a tank at Crompton. About 75 firefighters from Elmira worked to put out the blaze.	Jun. 12 2004 "Elmira fire. Alert: More concern than panic" *Elmira Independent*
2006	Explosion at Crompton/Chemtura Chemical plant after 11:00 p.m. Another fire at the plant	Jul. 20 2006 "Explosion at Chemtura" *Elmira Independent*
2006	Community Alert Network (CAN) issues. Establishing protocol to activate the siren.	Aug. 31 2006 "Hot topic. Chemtura fire subject of meeting" *Elmira Independent*

Appendix B

A Sample of Newspaper Advertisement.

Invitation to Participate in a Research Project

A doctoral student from the Department of Geography at Wilfrid Laurier University in Waterloo, Ontario is conducting a research project on environmental and health issues of women and children living in the Township of Woolwich. The focus of this geographical study is to examine possible trends in women's and children's health and to document local perceptions of the environment. A small number of confidential interviews will be conducted in the community during the Summer of 2005. The goal of this research is not generalization but rich and detailed description of people's experiences in the community. You are invited to participate in the study and to make an important contribution to the research on children's and women's health issues. **If you have any questions about this research please contact: Eva Dabrowska at 519-884-0710 ext 6842.**

Appendix C

Summary of Interview Participants: Old Order Mennonites (OOM), Women Mainstream society (W) and Key Informants (K).

Code			Pseudonym	Sex	Age	Education	Years of Residence	
OOS1			Lucinda	F	57	Elementary	Rural	34
OOS2			Viola	F	52	E	Rural	30
OOS3			Ellen	F	51	E	Rural	26
OOS4			Anna	F	56	E	Rural	36
OOS5			Hannah	F	34	E	Rural	11
OOS6			Martha	F	59	E	Rural	29
OOS7			MaryAnn	F	48	E	Rural	36
OOS8			Naomi	F	23	E	Rural	23
OOS9			Minerva	F	45	E	Rural	25
OOS10			Malinda	F	53	E	Rural	31
OOS11			Amanda	F	56	E	Rural	10
OOP12			Rhoda	F	54	E	Rural	32
OMP13			Barbara	F	64	E	Urban	18
OMP14			Laurene	F	46	University	Urban	20
OOP15			Marlene	F	48	E	Urban	17
	W0R1		Miriam	F	48	U	Urban	11
	W0R2		Erma	F	54	U	Urban	18
	W0P3		Saloma	F	72	E	Urban	32
	W0S4		Erla	F	49	College	Urban	13
	W0S6		Lorna	F	83	C	Urban	32
	W0S7		Bertha	F	53	U	Urban	20.5
	W0S8		Katie	F	55	U	Urban	20
	W0S9		Vera	F	54	U	Urban	19
	W0S10		Irene	F	26	U	Urban	20
	W0S11		Lovina	F	73	H	Urban	17
	W0R12		Ada	F	49	U	Urban	10
	W0S13		Elaine	F	26	C	Urban	20
	W0P14		Ella	F	43	C	Urban	37
	W0P15		Verna	F	80	H	Urban	41
	W0P16		Erma	F	62	H	Rural	25
	W0S17		Elvina	F	64	H	Urban	40
	W0P18		Nora	F	58	U	Rural	32
	W0S19		Florence	F	57	C	Urban	30
	W0S20		Roselyn	F	68	U	Urban	29
		K01	Monica	F	N/A	U	Urban	30
		K02	Lisa	F	N/A	U	Urban	15
		K03	Jane	F	N/A	C	Rural	20
		K04	Debora	F	N/A	C	Rural	24
		K05	Morma	F	N/A	U	Urban	15
		K06	Marita	F	N/A	U	Rural	15
		K07	Tom	M	Ret.	U	Urban	11
		K08	David	M	Ret.	U	Urban	37
		K09	Denis	M	N/A	U	N/A	10
		K10	Nick	M	N/A	U	Urban	20
		K11	Margaret	F	N/A	U	N/A	10
		K12	Arthur	M	Ret.	U	Rural	60
		K13	Rachel	F	N/A	C	N/A	10
		K14	Stephanie	F	Ret.	C	Urban	30

Appendix D

2002-04-13- Canada Gazette Part I, Vol.136 No. 15

Publication of Final Decision on the Assessment of a Substance - N-Nitrosodimethylamine - Specified on the Priority Substances List (Subsection 77(6) of the Canadian Environmental Protection Act, 1999)

Whereas a summary of a report of the assessment of N-Nitrosodimethylamine, a substance specified on the Priority Substances List, is annexed hereby;

Notice therefore is hereby given that the Ministers of the Environment and of Health intend to recommend to Her Excellency the Governor in Council that N-Nitrosodimethylamine be added to the List of Toxic Substances in Schedule 1 to the Canadian Environmental Protection Act, 1999; and

Notice furthermore is hereby given that consultations will be held on the development of a regulation or instrument respecting preventive or control action in relation to N-Nitrosodimethylamine.

DAVID ANDERSON

Minister of the Environment

ANNE MCLELLAN

Minister of Health

ANNEX

Summary of the Report of the Assessment of the substance N-Nitrosodimethylamine specified on the Priority Substances List.

N-Nitrosodimethylamine (NDMA) is the simplest dialkylnitrosamine, with a molecular formula of $C_2H_6N_2O$. There are no industrial or commercial uses

of NDMA in Canada. NDMA is released to the Canadian environment as a by-product and contaminant from various industries and from municipal wastewater treatment plants. Major releases of NDMA have been from the manufacture of pesticides, rubber tires, alkylamines and dyes. NDMA has also been detected in drinking water and in automobile exhaust. Sources of release of NDMA may occur across Canada, but releases have been quantified only in Ontario. NDMA may also form under natural conditions in air, water and soil as a result of chemical, photochemical and biological processes.

Photolysis is the major removal pathway from surface water, air and land. However, in surface waters with high concentrations of organic substances and suspended matter, photodegradation is much slower. In subsurface water and in soil, biodegradation is the removal pathway of importance. NDMA is unlikely to be transported over long distances in air or to partition to soil and sediments. Because of its solubility and low partition coefficient, NDMA has the potential to leach into and persist in groundwater. It is metabolized and does not bioaccumulate. NDMA is generally not detectable in surface waters, except for localized contamination from industrial sites, where end-of-pipe effluent concentrations as high as 0.266 µg/L have been measured.

Acute and chronic toxicity data are available for aquatic organisms. The most sensitive toxic effect was a reduction in the growth of algae at 4 000 µg/L. Concentrations of NDMA in Canadian surface waters are less than the threshold for adverse effects estimated for aquatic organisms. No data on concentrations of NDMA in sediments or in soil have been identified in Canada. NDMA is not involved in stratospheric ozone depletion and is not an important contributor to climate change or photochemical smog formation.

NDMA has not been detected in ambient air, except in the vicinity of industrial sites, in small surveys of several cities in southern Ontario. Low concentrations of NDMA have been measured in drinking water in Ontario, where sources have included the contamination of groundwater with industrial effluents and the formation of NDMA in water treatment plants. The presence of NDMA has been demonstrated in some foods in Canada, most frequently in beer, cured meat and fish products, and some cheeses, although levels of NDMA have decreased in these products in recent years owing to changes in food processing. Some of these changes have been mandated under the Canadian Food and Drugs Act and Regulations.

Based upon laboratory studies in which tumours have been induced in all species examined at relatively low doses, NDMA is clearly carcinogenic, with a very strong likelihood that the mode of action for the induction of tumours involves direct interaction with genetic material. **Qualitatively, the metabolism of NDMA appears to be similar in humans and animals; as a result, it is considered highly likely that NDMA is carcinogenic to humans, potentially at relatively low levels of exposure.**

Based on the information available, it is concluded that NDMA is not entering the environment in a quantity or concentration or under conditions that have or may have an immediate or long-term harmful effect on the environment or its biological diversity, or that constitute or may constitute a danger to the environment on which life depends. NDMA is considered to be entering the environment in a quantity or concentration or under conditions that constitute or may constitute a danger in Canada to human life or health. **Therefore, NDMA is considered to be "toxic" as defined in section 64 of the Canadian Environmental Protection Act, 1999 (CEPA 1999).**

While there have been a number of measures taken to limit exposure of the general population in Canada to NDMA in foodstuffs, cosmetics and consumer products, recent data on the NDMA content of foodstuffs and rubber-containing products in Canada other than infant feeding bottle nipples and pacifiers have not been identified. Moreover, with the exception of monitoring conducted in Ontario in the early 1990s, potential for exposure to NDMA in the vicinity of point sources in Canada is also largely unknown, although stakeholders under the voluntary Accelerated Reduction/Elimination of Toxics (ARET) program have committed to reducing total emissions of NDMA from 6 000 g in 1993 to 87 g by the year 2000.

Continued monitoring of levels of nitrosamines (including NDMA) in Canadian foodstuffs to verify reduction of content seems warranted. Determination of the potential presence of nitrosamines (including NDMA) in rubber products other than infant feeding bottle nipples and pacifiers may also be warranted, particularly for those products with which infants (who exhibit mouthing behaviour) may come into contact.

On the basis of limited information from short-term monitoring surveys of ambient air and water near industrial facilities, the priority for investigation of options to reduce exposure to NDMA in the vicinity of such point sources is considered high. It is recommended, therefore, that there be additional

investigation of the magnitude of exposure of populations in the vicinity of point sources to assist risk management actions.

Optimization of drinking water treatment to minimize formation of NDMA is also recommended, though such measures must not compromise human health protection.

Since NDMA may be released directly to the environment through the application of certain pesticides, the levels of this nitrosamine in products regulated under the Pest Control Products Act should also continue to be monitored. Monitoring by the Pest Management Regulatory Agency has shown that the review standard of 1 μg/g is rarely exceeded.

Owing to the common practice in Canada of applying sewage sludge to agricultural lands and the potential for uptake by plants, it is recommended that concentrations of NDMA in such sludge be monitored to determine the potential of this practice to contribute to the exposure of humans and non-human organisms.

Since NDMA is likely to be carcinogenic to humans at relatively low levels of exposure and is not currently used in commerce in Canada, it is recommended that the manufacture, import and use of the substance be banned in order to prevent its introduction into the Canadian market.

The full Assessment Report may be obtained from the Priority Substances List Assessment Report Page (http://www.ec.gc.ca/substances/ese/eng/psap/final/main.cfm) or from the Inquiry Centre, Environment Canada, Hull, Quebec K1A 0H3 (1-800-668-6767).

REFERENCE

Environment Canada. CEPA Environmental Registry [http://www.ec.gc.ca/ceparegistry/notices/noticetext.cfm?intnotice=168&intdocument=1006] Accessed on August 22, 2007

Appendix E
Informant's Interview Guide

Topic/Rationale	Questions	
1. Community Context/Inequalities	How would you describe your experience with people* from Elmira's community? What are the major differences between the groups from this community, which you have noticed in your practice?	* **The informant's profession will determine appropriate** wording of this question e.g. *patients, clients, students,* etc.
2. Environmental Awareness/ Perception of Environment	How aware are you of the documented pollution of this area?	
	What are some of the problems in this community?	
3. Children's Health Issues	What is your perception of children's health in the towns' community?	
	What is your perception of children's health in the rural community?	
	Can you think of any changes in children's health in the last ten (twenty) years?	
4. Perceived Exposure Pathways/ Risks	Can you describe diet, living conditions, practices and behaviour have some of the families in this community? Do you have any concerns about environmental risks?	*nutritionist, child programs practitioners

Appendix F

Women's Interview Guide

Topic/Rationale	Questions
	1. How long have you lived in Elmira? 2. How long have you live in Woolwich Township?
Women's Health	1. When were you born? 2. How would you describe your general health? 3. How many siblings do you have? 4. How would you describe your mother general health to have been? 5. Would you say that your childbirth experiences were positive?
Children's Health	1. Do you have children? 2. If so, what are the ages and genders? 3. How would you describe the overall health of your children? 4. Have you ever had cause for concern regarding health of your children? 5. What would your children be doing in a typical day after school?
Environment	1. Have you ever had reasons to be concerned about the quality of the environment in your neighbourhood? 2. What is the source of your drinking water? 3. Have you ever had cause for concern about this source? 4. From where do you obtain your vegetables and fruit? 5. From where do you obtain your meats and fish? 6. Do you use pesticides on your loan/ or farm? 7. Does anybody from your family ever worked in the local chemical industry? 6. What do you think about environment now?
Closing remarks	1. Is there anything you'd like to add, or something that I haven't brought up that you think is important?

Appendix G

Short Questionnaire

Topic/Rationale	Questions
Women's Information	1. How long have you lived in Elmira (Woolwich) or this house? Please write a number or years _____ 2. What year were you born? _____
Women's Health	2. Would you say that your mother's general health was Very good □ Good □ So-so □ Not good □ Very poor □ Why? _____ _____ 3. Do you remember your mother telling whether or not any children were lost to either miscarriage or illness? Yes □ No □ If yes, can you tell me about this? 4. **How would you describe your general health?** Very good □ Good □ So-so □ Not good □ Very poor □ Why? _____ —

Children's Health	1. Do you have children? Yes □ No □ 2. If so, what are the ages and genders? 3. For each child, would you say that, **First child's health is** Very good □ Good □ So-so □ Not good □ Very poor □ Why? _____ ___ **Second child's health is** Very good □ Good □ So-so □ Not good □ Very poor □ Why? _____ ___ 4. What was pregnancy (pregnancies) like for you? Would you say that your experiences was positive □ or negative □ and Why? _____ _____ _____ _____ _____ 5. Have any of your children ever been examined with illness or health problems which you think might be related to environment? Yes □ No □ **Can you tell me about it?**

Environment/ Exposure/Risk	□1. On a typical day for each child how much time is playing or working outside? a. school-days? b. weekends: Saturday? Sundays? c. Holidays? **Introduction: define environment** **In geography, when we talk about environment we include the outside factors (like seasonal changes, weather, soil, air, water pollution) and the interior environment (like leaving conditions, good quality air in your home) and many social factors.** 2. What would you say about the environment in your neighbourhood? Positive aspects? (Probe questions: What do you think about the quality of water? Air? Ground/Sediments?) Negative aspects? Concerns? 3. Do you have any concerns about environmental issues now? If so, why? What? (Possible questions: Have you ever had any concerns about environmental issues in the past? Are you concerned about any environmental pollution in the air? Water? Earth?)

	4.0 Do you use pesticides/herbicides/fertilizers on your farm? or your lawn (if appropriate) Which ones? How often? Has their use changed overtime? Why? Why not? Do you get your drinking water from a well? **Closing remarks:** Is there anything you'd like to add, or something that I haven't brought up that you think is important:

Appendix H

Sample Information Letter to the Old Order Mennonites

Dear Mr. and Mrs. X,

I am a student from Wilfrid Laurier University in Waterloo. I would like to talk with people from Woolwich Township about how environment affects their health. This is for my doctoral degree in geography, and it may be published in a book or article. I am especially interested in the health of women and children, and how the health of this generation compares with the health of earlier generations living in the same township. I am also interested in how you feel about the environment—if it is healthy or unhealthy.

I would like to ask about mothers' and children's health experiences and find out what your opinions are about the environment. I am hoping to find people who are willing to share their experiences with me and to talk with me about this. I would come to your home on a day and time that is convenient for you. It will take about one hour.

The information obtained from you will be confidential and I will bring a document form called the Informed Consent Statement. This means that your name will not be used anywhere in any publication or printed material based on this interview and no one will ever know your name.

The things I find out from talking to people like you will help doctors, scientists, and the government know what is happening so far as the health of women and children is concerned in Township of Woolwich. This will help provide a guideline for what laws and medicines are needed to keep people healthy.

I will call you in the near future to see if you are willing to have me come and talk with you, and to plan which day and what time suits you best.

Thank you very much for your time and consideration.

Sincerely,

Ewa Dabrowska
