

**Exploring Risk Perception of an Emerging Environmental Health Risk: A
case study of allergic disease in youth team sport in Ontario, Canada**

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This thesis consists of material all of which I authored or co-authored: see Statement of Contributions included in the thesis. This is a true copy of the thesis, including any required final revisions as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

STATEMENT OF CONTRIBUTIONS

Exceptions to sole authorship:

Chapter 4:

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Geographer.*

I hereby declare that as lead author on all three manuscripts, I was responsible for the research conceptualization, data collection and analysis. I was also responsible for drafting and submitting the articles for publication in the respective peer-reviewed journals, and addressing all comments from peer-reviewers. The other co-author adopted a supervisory role, and provided feedback during data collection and analysis, and on the draft manuscripts. Dr. Susan Elliott, as my supervisor, provided significant direction and assistance.

ABSTRACT

Asthma is the most common chronic disease among children worldwide, and approximately 3.8 million Canadians are diagnosed. Although the relationship is complex, participation in physical activity is recommended as part of a comprehensive asthma management plan, as it can reduce symptoms and improve wellbeing for those affected. Team sport participation is a common way for children and youth to engage in physical activity. The spaces in which team sport is experienced can present unique challenges for vulnerable children, and evidence suggests that those with asthma may be less physically active than their non-asthmatic peers. While asthmatic youth may experience barriers to sport participation, effective allergic disease management that includes coach consideration of the environmental contexts of sport can help asthmatic athletes maintain long-term engagement in activity.

The research presented in this thesis therefore aims to increase understanding of how children, parents and organized youth team sport coaches in Ontario understand and manage the links between allergic disease, the environment and physical activity. The research focuses on three broad objectives: first, to explore the knowledge, attitudes, and practices of users and providers of child and youth team sport with respect to the links between the environment, allergic disease and physical activity; second, to investigate the impact of a coach education module related to coach attitudes and behaviours regarding the links between the environment, allergic disease and physical activity; and finally, to document the factors shaping the perception of asthma as an emerging environmental health risk in Ontario youth team sport. A mixed-methods case study approach was used in this research.

There is an inherent geographic component to understanding how environmental factors impact allergic disease risk in organized team sport. Understanding how elements of the

environment are managed and risk is perceived amongst sport stakeholders is important for effective asthma management. In-depth interviews with coaches (n=18) and athletes with asthma (n=11) suggest that ensuring both the physical (e.g., recognizing potential triggers) and social (e.g., reducing stigmatization) needs of vulnerable athletes are recognized is important to maximize enjoyment and performance, and improve asthma management for those affected. Focus groups with coaches (n=12) indicate that while coaches perceived an education module related to the environment, physical activity and allergic disease as valuable, some content was considered less relevant, and barriers to its implementation (e.g., coach autonomy) were identified. Finally, multivariate analysis of two surveys (coaches, n=94; parents of athletes with allergic disease, n=90) suggests that various factors (e.g., exposure, education, propensity for risk, gender) contribute to how asthma risk is perceived amongst and between sport stakeholders, emphasizing the value of population-specific risk management communication.

This research makes multiple important contributions. Theoretically, a place-based conceptual framework for understanding public experience of risk was applied; this framework informed research design, and recommendations (e.g., consideration of scale) with respect to future application are offered. The use of multiple and mixed methods, and including a potentially vulnerable group in the interviews, allowed for enhanced understanding of the factors that contribute to asthma management in sport. Substantively, this research contributed to the Geographies of Asthma literature, increasing understanding of asthma risk perception outcomes, and the environmental factors (e.g., sociocultural, political) that contribute to how asthma is perceived amongst sport stakeholders in Ontario. Considering the environmental contexts of risk is therefore critical to improve environment and health management in Ontario organized team sport, and reduce the future chronic disease burden associated with physical inactivity in Canada.

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TABLE OF CONTENTS

Examining Committee Membership	ii
Author's Declaration	iii
Statement of Contributions	iv
Abstract	v
Acknowledgments	vii
List of Figures	xi
List of Tables	xii
Chapter One: Introduction	1
1.1 Research Problem	1
1.2 Research Context	2
1.3 Research Objectives	3
1.4 Thesis Outline	4
Chapter Two: Literature Review	6
2.1 Introduction	6
2.2 Geographies of Health and Health Care	6
2.3 Global Environmental Change and Health	10
2.3.1 Climate Change and Health	11
2.3.2 Climate Change and Health in Canada	14
2.3.3 Air Quality and Health in Canada	16
2.4 Allergic Disease and Asthma	19
2.4.1 Risk Perception of Allergic Disease	27
2.5 Child and Youth Obesity and Physical Activity	31
2.5.1 Physical Activity, Sport Participation and Asthma	33
2.5.2 Determinants of Youth Physical Activity and Sport Participation	35
2.6 Theoretical Context	40
2.6.1 Social Constructionism	40
2.6.2 Conceptual Framework for Understanding Emerging Environmental Health Risks	41
2.7 Chapter Summary	43
Chapter Three: Study Design and Methods	44
3.1 Introduction	44
3.2 Research Setting	44
3.3 Research Design and Methodology	49
3.3.1 Introduction	49
3.3.2 Objective One	50
3.3.3 Objective Two	58
3.3.4 Objective Three	64
3.4 Assessing Rigour	69
3.5 Chapter Summary	73

Chapter Four: Manuscript #1 - They Say “Kids with asthma don’t play sports”: Geographies of asthma	74
4.1 Introduction	74
4.1.1 Geographies of Asthma in Sport.....	76
4.2 Research Design and Methods.....	79
4.3 Results	81
4.3.1 Participant Characteristics	81
4.3.1.1 Players and Parents.....	81
4.3.1.2 Coaches.....	81
4.3.2 Primary Themes.....	81
4.3.2.1 Sport, Environment and Health.....	81
4.3.2.1.1 Players and Parents	82
4.3.2.1.2 Coaches	83
4.3.2.2 Knowledge.....	85
4.3.2.2.1 Players and Parents	85
4.3.2.2.2 Coaches	86
4.3.2.3 Attitudes	88
4.3.2.3.1 Players and Parents	88
4.3.2.3.2 Coaches	91
4.3.2.4 Management and Prevention Behaviours	92
4.3.2.4.1 Players and Parents	92
4.3.2.4.2 Coaches	94
4.4. Discussion	95
4.5 Conclusion	99
Chapter Five: Manuscript #2 - Investigating Youth Sport Coach Perspectives of an Asthma Education Module	100
5.1 Introduction	100
5.2 Materials and Methods	103
5.3 Results	105
5.3.1 Participant Characteristics	105
5.3.2 Short-Term Outcomes	105
5.3.3 Medium-Term Outcomes	108
5.3.4 User Experience	115
5.4 Discussion	118
5.5 Conclusion	122
Chapter Six: Manuscript #3 - Understanding an Emerging Environmental Health Risk: Investigating Asthma Risk Perception in Ontario Youth Sport	123
6.1 Introduction	123
6.1.1 Place-based Conceptual Framework	124
6.1.2 Applying the Framework to an Emerging Environmental Health Risk	126
6.2 Methods	129
6.2.1 Research Design	130
6.2.2 Analysis	131

6.3 Results	134
6.3.1 Sample Characteristics	134
6.3.2 Risk Perception Outcomes	137
6.3.3 Political Environment	140
6.3.4 Physical Environment	141
6.3.5 Sociocultural Environment	142
6.3.6 Economic Environment	142
6.3.7 Environmental Health Risk	143
6.3.7.1 Socioeconomic Position and Demographics	143
6.3.7.2 Risk Characteristics	144
6.3.7.3 Exposure	145
6.3.7.4 Mediators of Expectation	146
6.3.8 Regression Results	155
6.3.8.1 Physical Environment	155
6.3.8.2 Environmental Health Risk	155
6.3.8.2.1 Risk Characteristics; Uncertainty.....	155
6.3.8.2.2 Risk Characteristics; Exposure	156
6.3.8.2.3 Mediators of Expectation	156
6.3.8.2.4 Socioeconomic Position and Demographics	156
6.4 Discussion	166
6.5 Conclusion	175
Chapter Seven: Discussion and Conclusion	177
7.1 Introduction	177
7.2 Summary of Key Findings	178
7.3 Contributions	181
7.4 Future Research Directions	189
References	193
Appendix A Coach and Parent Demographic Information Questionnaires	233
Appendix B Semi-Structured Interview Schedules	237
Appendix C Online Advertisements	243
Appendix D Sports Organization Sample Frame	245
Appendix E Semi-Structured Interview Letter of Information	248
Appendix F Semi-Structured Interview Consent Forms	253
Appendix G Semi-Structured Interview Codebooks	257
Appendix H Air Aware Focus Group Letter of Information	273
Appendix I Air Aware Coach Education Module Completion Procedure	275
Appendix J Air Aware Focus Group Consent Form	276
Appendix K Air Aware Focus Group Interview Schedule	277
Appendix L Air Aware Focus Group Codebook	281
Appendix M Coach and Parent Online Surveys	288
Appendix N Political Environment Data Extraction Tool	303

LIST OF FIGURES

Figure 2.1 Conceptual framework for understanding emerging environmental risks	42
Figure 3.1 Study Location – Golden Horseshoe Region of Southern Ontario	45
Figure 3.2 Participant, Data and Recruitment Breakdown	58
Figure 5.1 Focus Group Discussion Scenarios – Scenario 1, Parts A and B	109
Figure 5.2 Focus Group Discussion Scenarios – Scenario 2, Parts A and B	111
Figure 6.1 Coach and Parent Perceived Level of Risk to the Canadian Public for 17 Health Hazards	138
Figure 6.2 Coach Perceived Level of Risk to the Canadian Public for 17 Health Hazards	139
Figure 6.3 Parent Perceived Level of Risk to the Canadian Public for 17 Health Hazards	139

LIST OF TABLES

Table 3.1 Case Study Region Breakdown	49
Table 3.2 Athlete and Parent Participant Demographic Breakdown.....	53
Table 3.3 Coach Participant Demographic Breakdown	54
Table 4.1 Participant-Identified Symptoms	86
Table 4.2 Participant-Identified Triggers	87
Table 4.3 Participant-Identified Attitudes	89
Table 4.4 Participant-Identified Management Behaviours	93
Table 5.1 Focus Group Participant Demographic and Coaching Breakdown	106
Table 5.2 Focus Group Summary of Results	117
Table 6.1 Survey Sample Characteristics	136
Table 6.2 Survey Sample Region of Residence	137
Table 6.3 Sport Organization Website Sport and Health Themes Identified	142
Table 6.4 Perceived Asthma Risk – Bivariate Results	148
Table 6.5 a) Perceived Asthma Risk – Binary Regression Results, Combined Participants	158
Table 6.5 b) Perceived Asthma Risk – Binary Regression Results, Coach Participants	160
Table 6.5 c) Perceived Asthma Risk – Binary Regression Results, Parent Participants	163

CHAPTER ONE

Introduction

1.1 Research Problem

During the latter half of the 20th century, the worldwide prevalence of asthma and allergic diseases increased significantly (Akinbami, et al., 2016; Brozek, et al., 2015; ISAAC Steering Committee, 1998; Subbarao, et al., 2009; Williams, et al., 2008). Asthma is the most common non-communicable disease among children worldwide (World Health Organization, 2017), and although rates vary geographically, it is estimated that 3.8 million Canadians (over the age of one), or roughly 10% of the population, are living with asthma (Public Health Agency of Canada, 2018). In Ontario, despite improvements in disease management and education (Crighton, et al., 2012), prevalence of asthma increased by 70.5% from 1996 to 2005, likely due in part to increasing rates in children (Gershon, et al., 2010). While the complete etiology of asthma is unknown, environmental factors (e.g., air quality), and the presence of other chronic health conditions (e.g., obesity) have been shown to contribute to asthma development (Subbarao et al., 2009). Evidence suggests that those with asthma may be less physically active (Ford, et al., 2003; Teramoto & Moonie, 2011) and face a range of barriers to participation (Williams et al., 2008), despite recommendations for physical activity for effective asthma management (as well as the additional health benefits) (Lucas & Platts-Mills, 2005; Williams et al., 2008). In order to ensure effective allergic disease management and to reduce the burden of chronic disease in Canada through increased youth physical activity, this thesis presents the findings of research that uses a mixed-methods case study approach to increase understanding of how children, parents and providers of youth sport in Ontario perceive and manage the links between allergic disease, the environment and physical activity.

1.2 Research Context

Allergic diseases are chronic conditions that can have physical, economic, psychological and social impacts to those affected (Blaiss, 2000). Asthma affects approximately 300 million people worldwide (Pawankar, 2014), and this number is anticipated to increase to 400 million by 2025 (GINA, 2016; Pawankar, 2014). Triggers for asthma symptoms vary, and include a range of environmental factors, such as cold temperatures, exercise, tobacco smoke, dust mites, pets, mould, and air pollution (e.g., volatile organic compounds, nitrogen dioxide, ground level ozone, and particulate matter) (Clark et al., 2009; Subbarao et al., 2009). In Canada, air quality continues to be a major public health concern (Health Canada, 2017); while air quality has improved in Southern Ontario (Government of Ontario, 2018), smog conditions and elevated levels of ground-level ozone and fine particulate matter are common, especially during summer months (Government of Canada, 2018; Government of Ontario, 2018). Climate change is expected to exacerbate outdoor air quality (e.g., formation of ground-level ozone, production of pollens can increase at higher temperatures), and populations including children and those who exercise outdoors are particularly vulnerable (Berry, et al., 2014).

In addition to the direct physical symptoms, respiratory disease is associated with obesity in both adults and children (Zammit, et al., 2010). Increasing obesity rates among children and young people is a growing public health problem (Agha & Agha, 2017; Sahoo et al., 2015); this is particularly problematic, as obesity is a significant risk factor for increased morbidity and mortality associated with other illnesses, including type 2 diabetes, heart disease, certain cancers, and osteoarthritis (Agha & Agha, 2017; Lobstein, et al., 2004; Pi-Sunyer, 2009). In Canada, almost 1 in 7 of Canadian children and youth are obese, and the prevalence of overweight and obesity of those between 12 and 17 is 28.9% (Rao et al., 2016).

Although the relationship is complex, participation in physical activity can affect weight and encourage healthy lifestyles for Canadian children (Tremblay & Willms, 2003). Sport participation is a common way for children to engage in physical activity (Somerset & Hoare, 2018; Tofler & Butterbaugh, 2005), however, children with asthma are generally less active than their non-asthmatic peers for a number of reasons (e.g., inaccurate symptom perception, family beliefs related to physical activity and chronic disease) (Mtshali & Mokwena, 2009; Williams et al., 2008). Although physical inactivity is only one factor associated with the growing prevalence of obesity, increasing understanding of how asthma is perceived by both providers and users of sport (e.g., children and youth affected, parents) is important to ensure asthma management goals are achieved, and that child and youth physical activity (e.g., through sport participation) is encouraged and maintained into adulthood. This thesis therefore aims to increase understanding of how children, parents, and organized youth team sport coaches in Ontario understand and manage the links between allergic disease, the environment and physical activity.

1.3 Research Objectives

This research will therefore address the following objectives:

- 1) To explore the knowledge, attitudes, and practices of users and providers of child and youth team sport in Ontario with respect to the links between the environment, allergic disease and physical activity;
- 2) To investigate the impact of a coach education module related to coach attitudes and behaviours regarding the links between the environment, allergic disease and physical activity; and,
- 3) To document the factors shaping the perception of asthma as an emerging environmental health risk in Ontario youth team sport.

1.4 Thesis Outline

This thesis is organized into seven chapters, including this Introduction. Chapter Two reviews the relevant theoretical, methodological and substantive literature that guides the research. Chapter Three provides an overview of the methodology used to address each of the three research objectives outlined above, while chapters Four to Six are comprised of manuscripts that meet one of each of the specific objectives outlined in the Introduction.

Chapter Four corresponds to objective one, and focuses on the experiences and perceptions of youth team sport users and providers related to physical activity and sport participation, the environment and allergic disease. In-depth semi-structured interviews with both youth team sport coaches and athletes diagnosed with asthma (and their parents) in the Greater Golden Horseshoe area of Southern Ontario explore the knowledge, attitudes and practices related to asthma and allergic disease in local youth team sport environments, broadly defined. This paper is particularly novel in its investigation of child and youth athlete asthma experiences and coping strategies in the youth team sport environment from *their* perspective. This paper has been submitted to *Children's Geographies*.

Chapter Five, which corresponds to objective two, aims to investigate the impact of the Air Aware Coach Module, which was designed by Clean Air Champions to increase coach awareness of the links between allergic disease, the environment and physical activity. Results from focus groups and an interview illustrate the value of the online module for youth team sport coaches related to allergic disease (and specifically asthma) management in youth team sport in Ontario. This chapter has been published in the *Journal of Environmental and Public Health* (<https://doi.org/10.1155/2018/2512010>). Chapter Six specifically addresses objective three, and uses a mixed-methods approach and Harrington & Elliott's (2015) place-based risk perception

framework to investigate asthma risk perception determinants and outcomes amongst two distinct groups (coaches, parents of athletes with allergic disease) in Ontario youth team sport.

This paper has been submitted to *The Canadian Geographer*.

Finally, Chapter Seven concludes the thesis by presenting a summary of the major research findings, substantive, methodological and theoretical contributions, limitations, and future research directions. Additional information (e.g., data collection tools), are included in the various appendices.

CHAPTER TWO

Literature Review

2.1 Introduction

The following chapter begins by situating the current research within contemporary health geography. Next, a review of the relevant literature with respect to global environmental change (e.g., climate change, air quality) and health in Canada, allergic disease and asthma, and physical activity and sport participation will be outlined. This is followed by a description of the theoretical approach that will be applied in this research.

2.2 Geographies of Health and Health Care

Geography and health are inherently linked. It is not possible to understand health-related experiences, outcomes, and exposures without consideration of where we are born, live, study and work, the spaces, places, and populations we interact with, the air we breathe, and the food and water we consume (Dummer, 2008). Health geography is a subdiscipline of human geography, which explores the interactions between people and the environment. The geography of health uses a spatial lens to study the distribution, determinants, diffusion, and delivery associated with health and health systems in human populations at a range of scales (Elliott, 2014).

Our spatial location and interactions with the physical (natural, built), social, political, and economic environments shape our health and wellbeing in diverse ways (Harrington & Elliott, 2015; Swinburn et al., 2000). The notion that the environment influences disease dates back to ancient Greece and Hippocrates' *Airs, Waters and Places* (Andrews & Moon, 2005), and later studies of epidemics and their causes, such as John Snow's observations of London's Broad Street cholera outbreak in 1854 (von Mutius, 2000). Traditionally, research in medical

geography has followed two separate, although at times overlapping, streams: the planning, provision, and utilization of health services, and the mapping and modeling of the spatial determinants, patterns, and spread of disease (Andrews & Moon, 2005; Dummer, 2008; Kearns & Moon, 2002). The past few decades have seen a shift in the subdiscipline, as the twin streams of health geography began to increasingly overlap. Health geographers have focused increasingly on the importance of *place* (Andrews & Moon, 2005; Cummins et al., 2007; Kearns & Moon, 2002), following criticisms including a lack of recognition of the influence of place on health, not keeping up theoretically with other areas of geography, and the application of primarily positivist and reductionist approaches (Litva & Eyles, 1995; Luginaah, 2009). In the 1990s, debates around relocating place in health geography research (Dorn & Laws, 1994; Kearns, 1993; Mayer & Meade, 1994), and the shifting of medical geography away from a focus on disease and the biomedical model to a broader and more holistic view of health and wellbeing led to a name change in 1993 from medical geography to the geography of health and health care (Kearns & Moon, 2002; Luginaah, 2009; Rosenberg, 1998). Other changes in the field include recognition of health geography research becoming increasingly critical, an increased focus on social justice, inequalities and inequities, and oppressive power relations, and the increasing recognition of the importance of theory (in particular sociocultural theory) in academic discourse and research (Kearns & Moon, 2002).

In Canada, health geography has grown significantly since the 1970s, and a diverse group of scholars from across the country employ the theory and methods of health geography to address a range of substantive topics (Giesbrecht et al., 2014; Luginaah, 2009). Research in the geographies of health is broad and the subject matter, theoretical approaches and methodology are diverse (Andrews & Moon, 2005; Giesbrecht et al., 2014). For example, theoretical

perspectives including positivist, social constructionist, structuralist and structurationist paradigms are used, and quantitative (e.g., geographical information systems [Luginaah, 2009]), qualitative (e.g., focus groups, in-depth interviews [Andrews & Moon, 2002]) and mixed-methods are all applied (Gatrell & Elliott, 2014). New theoretical frameworks and methodological approaches are also emerging. For example, digital methodologies that employ video, audio and photography have been used (e.g., Photovoice) (Giesbrecht et al., 2014). Recent scholarship in health geography in Canada focuses on a range of topics, including population health, health inequalities and vulnerability at a range of scales and amongst various populations, psychosocial health, women's health, environmental risk, aging, disability and chronic disease, environmental determinants of health, social and health inequities, and accessibility of health and health-promoting services (Giesbrecht et al., 2014; Luginaah, 2009; Rosenberg, 2016).

More specifically, children's geographies, as a subfield of human geography, has evolved and changed significantly since the 1970s (Aitken, 2017; Evans & Holt, 2011; Ergler et al., 2016; Holloway, 2014; Horton & Kraftl, 2006), and focuses on geographical issues and spatial concepts related to children, young people and families (Evans & Holt, 2011). Children's geographies have shifted away from children's spatial cognition and mapping (rooted in developmental psychology [Aitken, 2017]) toward a more social approach (rooted in sociology and anthropology) focusing on children's voices, power, and experiences (Holloway, 2014). The subfield of children's geographies has grown to increasingly recognize children's and young people's different needs, characteristics, and identities, as they experience the world differently over time, in different places, and based on different characteristics (e.g., based on gender, class, age). In the context of this research, this is especially relevant as children and youth athletes with asthma may experience organized sport differently to adults with asthma, and their management

techniques may differ based on geographical context (e.g., social, political or physical environments) and vulnerability.

Like health geography and across the social sciences more broadly, a range of theoretical and methodological approaches are applied in children's geographies. For example, the focus on difference in children's geographies parallels theoretical approaches in health and other subdisciplines of human geography, including feminism and critical studies (e.g., of race or ethnicity) (Evans & Holt, 2011). Methodologically, researchers give voice to children and investigate their lived experiences in multiple ways; for example, participatory methods and the use of digital technologies (e.g., smartphones, tablets, online and offline identities, gaming technologies [Ergler et al., 2016]) are being increasingly used to understand children's everyday worlds (Ergler et al., 2016; Holloway, 2014).

The geographies of sport literature is also situated within human geography. Despite Bale's introduction to the subfield with his book *Sports Geography* in 1989, the underdevelopment of the geographies of sport has been recognized (Koch, 2016; Montez De Oca, 2017; Tonts & Atherley, 2007). The subfield of the critical geographies of sport has, however, recently emerged as significant (Montez De Oca, 2017), as sport is inherently geographical; while sport affects (and is affected by) the physical and social environments (Bale, 1989), it is also central to individual and national identities, generates emotional and financial investments, and at a national level plays a significant geopolitical role. Politics and power are expressed in sport at both micro and macro scales, and sport plays a significant role in political, economic and social geographies (Montez De Oca, 2017). In addition to the health benefits associated with sport participation, sport provides opportunities for social interaction and contributes to individual and community identity (Tonts & Atherley, 2007). Despite the

relatively recent emergence of the geographies of sport, previous geographical work focusing on aspects of sport participation exists. For example, Evans (2006) investigated the links between space, gender and adolescents' bodies using qualitative and quantitative methods with 13-16 year-olds in Liverpool, UK; the role of school space (and the focus on competition and evaluative gaze of teachers) emerged as particularly important in explaining differential participation rates in physical education class (Evans, 2006). Similarly in the school environment, Hemming (2007) qualitatively investigated children's values and experiences of sport in school in the UK.

The work presented in this thesis is research is situated within health geography, children's geographies, and the geographies of sport, and uses theoretical (i.e., social constructionism) and methodological approaches (i.e., mixed-methods) to explore how broad environmental factors (i.e., the physical, social, political and economic environments) impact how allergic disease is experienced and managed by different stakeholders (coaches, parents, youth athletes) in organized youth team sport in Ontario.

2.3 Global Environmental Change and Health

Human activities are causing large-scale changes to the natural environment (McMichael, 2013; Steffen et al., 2018). Anthropogenic and natural environmental changes, including land-use change (e.g., deforestation, urbanization), altered ecosystem function (e.g., loss of biodiversity, protection from natural hazards), and climate change (e.g., warming temperatures), are increasingly recognized as major public health challenges (Costello et al., 2009; Watts et al., 2015); for example, population displacement, natural disasters, and altered access to food, clean air and clean water all have repercussions for human health (Huang et al., 2011; Watts et al., 2015).

The relationship between the environment and health is complex. While the World Health Organization estimated in 2012 that 23% of global deaths were attributable to modifiable factors in our natural environment (e.g., air, water, soil and food) (Watts et al., 2015; World Health Organization, 2016), the health impacts of global environmental change vary geographically and over time, may have multiple causative factors, and impact health unequally and inequitably; the burden is much greater in low- and middle-income countries (McMichael et al., 2006), and amongst minority or marginalized populations in countries at every income level (Landrigan et al., 2017). Socially and economically vulnerable populations often bare a heavy burden of environment and health risks, and those with existing health problems, the elderly, children, women, low socioeconomic status groups and marginalized communities, and immigrant populations are particularly vulnerable (Watts et al., 2015). For example, the Lancet Commission on Pollution and Health estimates that pollution (e.g., from industrial emissions, vehicular exhaust, toxic chemicals) is the largest environmental cause of disease and premature death globally, was responsible for nine million premature deaths in 2015, and disproportionately affects poor and vulnerable populations (Landrigan et al., 2017). In addition to the direct and indirect impacts on human health, adverse health outcomes related to environmental change bare other social costs including productivity and economic losses and health-care costs (Landrigan et al., 2017).

2.3.1 Climate change and health.

There is scientific consensus that anthropogenic greenhouse gas emissions will continue to impact the Earth's climate (IPCC, 2014a; 2018) through changes to the mean and/or variability of temperature and precipitation, frequency and magnitude of extreme weather events,

and sea-level rise (IPCC, 2014a). The Intergovernmental Panel on Climate Change (IPCC) also identifies the climate's natural variability, and defines climate change as:

“a change in the state of the climate that can be identified by changes in the mean and/or variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use” (IPCC 2014a).

In their Fifth Assessment Report, the IPCC (2014a) concluded that the warming of the climate is unequivocal. Atmospheric concentrations of greenhouse gases, such as carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O), have increased to levels unprecedented in the last 800,000 years, and the concentrations of these greenhouse gases exceed pre-industrial levels by approximately 40%, 150% and 20%, respectively. The IPCC concludes that it is extremely likely (95-100% probability) that human forces are the dominant cause of global warming observed between 1951 and 2010 (IPCC, 2013). While climate change involves complex interactions and a diverse range of impacts that are often difficult to predict, the overall risks can be reduced through mitigation (e.g., reducing anthropogenic greenhouse gas emissions) (IPCC, 2014b). Without mitigation efforts, projections suggest an increase in global mean temperatures of 3.7-4.8 degrees Celsius, relative to pre-industrial levels, by 2100 (IPCC, 2014c).

While the Earth's climate has changed through history due to natural causes (e.g., changes in Earth's orbit that impact the amount of solar energy received by Earth), current observed warming is particularly important as it is extremely likely to be the result of anthropogenic causes (IPCC, 2014a). Earth's natural greenhouse effect is critical to sustain human life, but has been intensified through human activities (Watts et al., 2015). Naturally, short-wave solar radiation is reflected by the Earth's atmosphere and surface, or passes through

the atmosphere and is absorbed and warms the Earth's land and ocean surface (Watts et al., 2015). Longwave (infrared) radiation is emitted back to the atmosphere, and greenhouse gases absorb a portion of this radiation and re-emit it, driving a net positive energy balance, and warming at the surface. Without the natural greenhouse effect, temperatures would be around 30 degrees Celsius lower. The natural greenhouse effect has been intensified through anthropogenic activities (e.g., burning fossil fuels [e.g., oil, coal, natural gas], human agricultural practices and deforestation), and atmospheric greenhouse gas concentrations (such as CO₂, CH₄, and N₂O) have increased since the industrial revolution (IPCC 2014a; Watts et al., 2015). This has resulted in observed changes including increased land surface temperatures, melting of arctic sea ice and the Antarctic ice sheet, sea levels rising, and increased ocean surface temperatures due to ocean absorption of (approximately 90% of) the excess heat energy (IPCC 2013; McMichael, 2013; Watts et al., 2015).

Adverse health outcomes related to climate change will impact humans and ecosystems, are direct and indirect, and include the effects of extreme weather events (e.g., heat stress, floods, storms, droughts), changes in infectious disease patterns (e.g., vector-, food- and water-borne disease), air quality impacts, effects on food and freshwater supplies, loss of livelihoods, population displacement, economic and social outcomes, and impacts on mental health and wellbeing (McMichael et al., 2006; Watts et al., 2015). The Lancet's Commission on Health and Climate Change identifies limiting global average temperature rise to less than 2 degrees Celsius in order to minimize the risk of major health impacts of climate change. While high emission projections show global average warming of up to 4.8 degrees Celsius by the end of the century, current trajectories of greenhouse gas emissions are tracking in excess of these high-end projections (Watts et al., 2015) and are not consistent with limiting warming to below 2 degrees

Celsius (IPCC, 2014c). At a global scale, reducing greenhouse gas emissions and minimizing temperature increases will be critical to reduce the burden of adverse health outcomes, and economic, social and health inequities (Watts et al., 2015).

2.3.2 Climate change and health in Canada.

Climate change is a major environmental challenge facing Canadians (Government of Canada, 2015). Between 1948 and 2014, the average national temperature increased by approximately 1.6 degrees Celsius (relative to the baseline average; the mean over the 1961-1990 reference period), and this increase is projected to continue (Government of Canada, 2015). Temperature increases vary geographically, and certain regions (e.g., Canada's North) are already experiencing more rapid warming (Government of Canada, 2015; Health Canada, 2008; Warren & Lemmen, 2014). Other observed impacts of climate change (between 1950-2010) in the Canadian context include increased frequency of temperature extremes, increased annual average precipitation trends in certain regions (e.g., increased rainfall and decreased snowfall in southern Canada), rapid declines in sea ice extent in the Arctic, and shrinking glaciers in the Arctic and western Canada (Warren & Lemmen, 2014). Future impacts of climate change in Canada are anticipated, as average temperatures are expected to continue to increase, and increased frequency and/or intensity of extreme weather, heat and heavy rainfall events are expected (Warren & Lemmen, 2014). Other projected Canadian changes include sea level rise (and increased risk of storm-surge flooding), and decreases in sea ice that could affect coastal erosion (Lemmen, et al., 2008).

Climate change has the potential to severely impact public health (Berry et al., 2014; Maantay & Becker, 2012), and has been dubbed the “biggest global health threat of the 21st century” (Costello, et al., 2009: 1693). It is projected to both exacerbate existing health problems

and generate new ones (World Health Organization, 2018). Health Canada has identified a range of possible climate-related impacts on health and wellbeing, including temperature-related mortality and morbidity (e.g., fatigue, dehydration, exhaustion and heat stroke, heart and lung strain [Berry et al., 2014; Kovats & Hajat, 2008; Maantay & Becker, 2012]), physical and mental health impacts of weather-related hazards (e.g., physical destruction of place, population displacement and loss of livelihoods, destruction of medical care or other social services, anxiety, depression and post-traumatic stress disorder [Berry et al., 2014; Health Canada, 2008; McMichael et al., 2006]), increased exposure to poor air quality (e.g., impacts related to respiratory disease, cardiovascular disease, cancer [Berry et al., 2014; Maantay & Becker, 2012]), water-, food-, and vector-borne and zoonotic disease (e.g., Lyme Disease [Berry et al., 2014; Charron et al., 2004; Greer et al., 2008]), extreme weather impacts (e.g., storm-related flooding and aggravation of chronic disease through lack of food or potable water [Berry et al., 2014]), and socioeconomic impacts on community health and wellbeing (e.g., disruption of social networks, damage to critical infrastructure). Health impacts of climate change will vary geographically, based on individual behaviours, and regional and individual vulnerability (e.g., exposure to hazards, sensitivity of populations, and ability to take protective measures [Berry et al., 2014]) (IPCC, 2014b). Impacts will exacerbate inequities between the rich and poor, with most significant effects likely to be experienced unevenly by vulnerable populations (e.g., those with the fewest resources to adapt), and where health inequalities already exist (e.g. low income and minority groups) (Costello et al., 2009). Populations including children, immigrant groups, economically disadvantaged and homeless populations, northern residents, Aboriginal Canadians, and the elderly are more vulnerable to the possible health risks of climate change (Government of Canada, 2018; Health Canada, 2008).

With respect to allergic disease and asthma, air quality continues to be a major public health concern in Canada (Health Canada, 2017), and the direct and indirect impacts related to air quality on health in Canada are well established (Berry et al., 2014) (see section 2.3.3). Climate change will exacerbate existing health risks related to poor air quality, including respiratory conditions and allergies, chronic obstructive pulmonary disease, and cardiovascular disease (Berry et al., 2014).

In Ontario more specifically, climate change presents many risks to human health and wellbeing. Although it is difficult to attribute any one event directly to climate change (Ebi et al., 2016), changes in precipitation and the frequency, intensity and duration of extreme weather events (e.g., heavy rainstorms), heat waves, and smog episodes are anticipated more frequently (Ebi et al., 2016). Heat-related mortality will be particularly relevant in Ontario, especially in urban regions (e.g. the Toronto-Windsor corridor [Smoyer et al., 2000]), and among vulnerable populations such as the elderly, children, those with preexisting respiratory or cardiovascular problems, and the homeless (Kovats & Hajat, 2008; Maantay, et al., 2012). Thunder Bay, Toronto, and Windsor have already seen increases in annual, winter and summer mean temperatures (e.g., annual mean temperatures in Toronto increased by 2.2 degrees Celsius between 1990 and 2013), and this increase is expected to continue. By the mid-21st century, winter average temperatures are anticipated to increase by 3.2 degrees Celsius (under a mid-range atmospheric greenhouse gas concentration scenario that includes mitigation efforts) (Ebi et al., 2016). Further, the number of days with temperatures above 30 degrees Celsius in cities including Toronto is expected to double between 2011-2040, and 2071-2100 (Berry et al., 2014).

2.3.3 Air quality and health in Canada.

Air pollution includes the biological and chemical agents that impact the natural characteristics of the atmosphere, causing harm to the environment or human health (Government of Canada, 2016a). Air pollutants come from a range of sources including industrial processes, transportation sources, burning of fossil fuels, and smoke from forest fires, wood stoves and backyard burning (Government of Canada, 2016a). Changes in weather and climate are closely linked to changes in and patterns of air pollution concentrations (Berry et al., 2014; Kinney, 2008). Meteorological variables including wind speed, direction, temperature, and humidity are linked to pollutant emissions, transport, chemical transformation and deposition, therefore influencing air quality patterns over time and space (Kinney, 2008). Increased temperatures can also result in ozone and particulate matter formation, and high temperatures and elevated CO₂ concentrations can lead to increased pollen production. Finally, extreme heat events can increase use of air conditioning and related power plant emissions (Kinney, 2008). Poor air quality has a major impact on respiratory health (D'Amato et al., 2015), and increases in the prevalence and severity of asthma and related allergic diseases are anticipated with future environmental change (Shea et al., 2008).

Allergic disease is affected by air quality through a number of pathways. Outdoor airborne allergens (aeroallergens) that are present in the air can stimulate allergic response in people with sensitivities (Kinney, 2008). Aeroallergens can be broadly classified into 3 groups; moulds (indoor and outdoor [Barnes et al., 2013]), other indoor proteins related to dust mites, animal dander, and cockroaches, and pollens (e.g., trees, grasses, weeds) (Kinney, 2008). Pollen release is seasonal and dependent on variables including temperature, moisture and sunlight (Kinney, 2008). There is evidence that climate warming and higher ambient CO₂ concentrations may alter growing seasons and the geographic range of certain plant species. For example, pollen

production is anticipated to be impacted, particularly in areas with elevated temperature or ‘urban heat islands’ (whereby urban regions are subject to increased temperatures due to rapidly heating surfaces from buildings and asphalt [Kim, 1992]) (Barnes et al., 2013). For example, ragweed is a major cause of allergic rhinitis and seasonal allergy symptoms (Ziska et al., 2011), and is common in populated Canadian regions. Already, the North American ragweed season is becoming longer; between 1995 and 2009 the length of the ragweed season increased in Saskatoon and Winnipeg by 27 days, and 25 days, respectively (Berry et al., 2014; Ziska et al., 2011).

Higher levels of outdoor allergens can increase personal exposure both indoors and outdoors (Barnes et al., 2013). Indoor air quality may be impacted through efforts to reduce greenhouse gas emissions (e.g., efforts to weatherize buildings can lower ventilation or trap pollutants that are emitted outdoors, such as tobacco smoke or particulate matter) (Berry et al., 2014; Potera, 2011), or through intense precipitation events that lead to flooding, poor building maintenance, and growth of infectious bacteria that can impact respiratory disease (Berry et al., 2014; Deger et al., 2010; Potera, 2011). Finally, increased frequency and intensity of forest fires related to drought conditions in dry years may also result in smoke that can affect respiratory symptoms; inhaling particles from wood burning can lead to cardiovascular problems, bronchitis, asthma and emphysema (Barnes et al., 2013).

In addition to weather and climatic changes, evidence suggests that high levels of vehicle emissions, urbanization, and western lifestyles are all related to increased frequency of respiratory allergy (Barnes et al., 2013; D’Amato et al., 2015). While both the US and Canada have seen improvements in air quality in recent decades (Barnes et al., 2013; Kinney, 2008), ground-level ozone is a continuing respiratory health concern related to increased greenhouse gas

emissions (e.g., nitrogen oxides) from transportation and other sources (e.g., industrial, solvent use) (Ministry of the Environment, Conservation and Parks 2012). Ozone is formed in the troposphere through reactions between sunlight, nitrogen oxides and volatile organic compounds (VOCs) (Brunekreef & Holgate, 2002; Kinney, 2008). Ozone formation increases with higher temperatures and increased sunlight, and therefore tends to reach levels that can impact human health during warmer times of the year, at midday in urban areas, or in the afternoon in areas downwind (Kinney, 2008). More hot and sunny summer days and consequent ozone exposure can cause increased symptoms for those with asthma and respiratory disease (Barnes et al., 2013), lung inflammation and short-term decreases in lung function, increased hospital visits related to asthma, and premature mortality (Kinney, 2008). Vulnerability to the health impacts of ozone exposure is increased for those with pre-existing asthma, when engaging in physical activity, and for children and outdoor labourers (Kinney, 2008).

Finally, particulate matter exposure also poses a risk to respiratory health. Air pollutants smaller than 10 micrograms (PM_{10}) can penetrate into the lower respiratory system, and ultrafine particles smaller than 2.5 micrograms ($PM_{2.5}$) can penetrate into the gas-exchange region of the lung, increasing human health risks (Brunekreef & Holgate., 2002). Particulate matter is a complex mixture of solid and liquid particles, and originates from combustion of fuels from motor vehicles, wildfires, power plants and through windblown dust (Kinney, 2008). Adverse health outcomes related to particulate matter exposure include premature mortality related to heart and lung disease (Kinney, 2008), decreased lung function, and exacerbation of current asthma and respiratory symptoms (EPA, 2018). Air pollution is a major environmental risk to health, and improving air quality can reduce the burden of disease related to cardiovascular and respiratory health (Pruss-Usten, et al., 2016).

In Canada, air quality has been a major public health concern for multiple decades (Wakefield et al., 2001). While air quality has improved since the 1970s (Government of Canada, 2013; Health Canada, 2017), air pollutants that impact human health are continually present and climate change is anticipated to exacerbate air pollution in some regions (Berry et al., 2014). Ground-level ozone and particulate matter already impact the health of Canadians, and it is anticipated that parts of Southern Ontario will see increases in particulate matter and ground-level ozone if anthropogenic air pollutant emissions remain constant (Berry et al., 2014).

2.4 Allergic Disease and Asthma

Allergic diseases are chronic conditions that affect the physical, psychological and social lives of those affected (Blaiss, 2000). They include food allergies and anaphylaxis, allergic rhinitis (hay fever), conjunctivitis, atopic dermatitis, eczema, drug and insect allergies, and asthma (Pawankar, 2014; Von Mutius, 2000). Allergic diseases are increasing worldwide (Burbank et al., 2017; Pawankar, 2014); while genetic predisposition alone is unlikely to explain the observed increase, complex gene-environment interactions likely play a key role in the development of allergic disease (Aruda et al., 2005; Marks, 2005; Subbarao, et al., 2009a; Subbarao et al., 2009b; Von Mutius 2000; Yang et al., 2007). In addition to the individual impacts on quality of life, societal burdens with respect to reduced productivity and increased health care demands also exist (Crighton et al., 2012).

More specifically, asthma is the most common chronic disease among children worldwide (WHO, 2017), characterized by recurring symptoms and periodic acute episodes related to reduced airflow (Subbarao et al., 2009a). Asthma affects approximately 300 million people worldwide (Pawankar, 2014), and prevalence rates in Western countries such as Canada, the United Kingdom, and Australia vary between 15-20% (Subbarao, et al., 2009a). In their 2012

comparison of asthma prevalence in 70 of the World Health Organization (WHO) member states, To et al. found variation in asthma prevalence based on different measures. The prevalence of doctor-diagnosed asthma was estimated to be 4.3% worldwide, although varied widely by country and ranged from 0.2% in China to 21% in Australia. Using a less stringent definition, the global prevalence of wheezing was estimated to be approximately 8.6%, with the highest rates again observed in Australia (27.4%), the Netherlands (22.7%), the United Kingdom (22.6%) and Brazil (22.6%). China (1.73%) and Vietnam (2.05) had the lowest prevalence rates of wheezing. No standardized data from the Canadian context was available in this work (To et al., 2012).

Asthma and its symptoms (e.g., wheeze) disproportionately affect low-income and minority groups (as defined by class, race, or geographical location [e.g., inner city]) (Bloom et al., 2010; Carr et al., 2011; Duran-Tauleria & Rona, 1999; Malhotra et al., 2014). For example, variation between racial-ethnic groups has been documented; in the United States, Puerto Rican children (16.1%) and non-Hispanic Black children (16%) have higher prevalence of asthma compared with non-Hispanic White children (8%) (Akinbami et al., 2012), while asthma-related hospitalization rates have been documented as three times higher among Black children compared with White children (Heron et al., 2009). In addition to the observed geographic variations in asthma, migration status is also associated with asthma and allergies. The healthy immigrant effect (McDonald & Kennedy, 2004), whereby immigrants demonstrate a higher health status than a host population upon arrival but converge over time due to environmental influences, has been documented (Cabieses et al., 2014; Newbold, 2006). For example, Moerman et al. (2013) found that while South Asian children living in Canada have similar prevalence rates to non-South Asian Canadian children, both groups had higher prevalence compared with

children living in South Asia, highlighting the role of environmental and social factors in asthma prevalence.

In Canada, nearly one in three people is diagnosed with some form of allergic disease (Networks of Centres of Excellence of Canada, 2017), and approximately 14% of Canadians 5-9, 19% of Canadians 10-14, and 19.6% of Canadians 15-19 are diagnosed with asthma (Canadian Chronic Disease Surveillance System, 2018). Allergic disease in Canada also carries significant economic burden and productivity loss. Ungar & Coyte (2000) estimate that although productivity loss days vary amongst different populations (depending on patient and disease characteristics, travel and waiting time, and level of functioning on restricted days), approximately 22 productivity days are lost per asthmatic student per year. While asthma often develops in childhood and persists through life, some experience remission and relapse periods, and cases of asthma onset in later life exist (Marks, 2005). Allergic diseases can be complex to manage, and commonly occur together in the same individual (e.g., food allergy and asthma), requiring an integrated management approach (Pawaknar, 2014). People with allergic disease often have other comorbidities, such as diabetes, obesity, and cardiovascular disease (Pawaknar, 2014).

Asthma can vary by type and in severity, and can be allergic or non-allergic. Allergic asthma is the most common form, and symptoms are triggered by an allergic reaction. Allergic asthma triggers include dust mites, pets and animals, mould and cockroaches (Asthma Canada, 2015), pollens (such as ragweed), air pollutants such as volatile organic compounds (VOCs), carbon monoxide, nitrogen dioxide, sulphur dioxide, ground level ozone, and particulate matter (Cakmak et al., 2012, Clark et al., 2009, Deger et al., 2010, Subbarao et al., 2009a). Non-allergic asthma does not involve an immune response, and is triggered by factors such as exercise, stress,

intense emotions (e.g., anxiety), cold or dry air, environmental tobacco smoke, chemical fumes and strong-smelling perfumes, smog and certain air pollutants (such as traffic-related air pollution [Heinrich & Wichmann, 2004]) or certain viral infections (e.g., rhinovirus, certain flu viruses [Asthma Canada, 2015]) (Asthma and Allergy Foundation of American, nd; Asthma Canada, 2015; Jin, 2016). Although triggers vary, many of the symptoms of allergic and non-allergic asthma are the same (Asthma and Allergy Foundation of America, nd). Exercise-induced asthma can also lead to asthma symptoms and is triggered by physical exertion from faster breathing through the mouth during exercise, leading to colder and drier air entering the lungs (Pubmed Health, 2017). Due to increased ventilation over longer periods during exercise, and exposure to cold air and pollen allergens during winter and summer, respectively, athletes (especially at the elite level) are particularly vulnerable to acquiring asthma through sport participation (Carlsen et al., 2011; Helenius & Haahtela, 2000). While physical exercise can lead to symptoms of asthma in those whose asthma is poorly controlled or during particularly strenuous activity, participation in both physical activity and sport can have a positive effect on quality of life and asthma symptoms when properly managed (Chandratilleke et al., 2012; Pubmed Health, 2017).

During attacks, airway linings become inflamed, swollen or partially blocked due to mucous, causing the muscles that surround the airways to tighten. This can reduce airflow into and out of the lungs and lead to coughing, chest tightness, shortness of breath, wheezing and difficulty breathing (Marks, 2005; Subbarao et al., 2009a; WHO, 2017). Attacks of breathlessness and wheezing vary in severity and frequency, and some may experience worsening symptoms at night or during physical activity. Asthma therefore presents a significant burden for both individuals and families of those affected (WHO, 2017). Asthma symptom

triggers vary from person to person, and can include both allergic triggers that lead to inflammation of the airways or tightening of the airway muscles, and non-allergic triggers that do not cause inflammation, but lead to airway hypersensitivity (Asthma Canada, 2015).

Although the complete etiology of asthma is unknown (Subbarao et al., 2009a; Asthma Canada, 2017), genetic predisposition, environmental factors, and psychosocial health are believed to play important roles in the causation and severity of asthma and allergic disease (Subbarao et al., 2009a). The regional variability and temporal trends in the increasing prevalence of asthma suggest that lifestyle or environmental factors influence the expression of asthma among genetically similar populations (Marks, 2005; Yang et al., 2007), and while a family history of the disease is common, it is not necessary or sufficient in its expression (Subbarao et al., 2009a). The hygiene hypothesis suggests that while children exposed to western lifestyles may be protected from infectious disease burdens, exposure to protective microbes is important for immune system response development, and partially accounts for the recent increase in reported asthma, and other allergic disease, prevalence (AAAI, 2017; Harrington & Elliott, 2015).

While genetic influences on the causation of asthma remain important to our understanding of asthma etiology, this thesis is particularly interested in the influence of environmental risk factors. Environmental factors that can be ingested, inhaled, absorbed transdermally, or experienced (e.g., the psychosocial family environment) during the pre- and post-natal periods as well as throughout the lifecourse may potentially alter the risk of developing allergic disease or asthma (Subbarao et al., 2009a). While much remains unknown and the impact of exposure varies in different populations (e.g., in infancy compared with during

adulthood), some risk factors such as prenatal maternal smoking have been firmly established (Subbarao et al., 2009a).

Prenatal environmental risk factors for the development of asthma include environmental tobacco smoke, diet and nutrition (e.g., higher intake of fish oil during pregnancy is associated with lower risk of atopic disease), maternal stress, antibiotic use, and mode of delivery (e.g., allergy development is 2-3 times more likely among infants delivered by emergency caesarean section) (Subbarao et al., 2009a). In childhood, risk factors include breastfeeding (although its influence remains controversial in the literature), lung function, family structure (e.g., a large family size appears to provide a protective effect for developing the immune system), socioeconomic status, life stress, indoor and outdoor air pollution (e.g., exposure to particulate matter, nitrogen dioxide, sulphur dioxide, ozone and carbon monoxide), antibiotic use, environmental tobacco smoke, and exposure to animals (e.g., risk of asthma development decreases with exposure to farm animals in early life) (Marks, 2005; Subbarao et al., 2009a; 2009b; Von Mutius, 2000).

Gender also plays a role in asthma incidence. Until 13-14 years, the prevalence and severity of asthma is greater amongst males. Studies suggest, however, that throughout puberty a greater proportion of males experience asthma remission, while incidence and severity among adolescent and young adult females increases (Subbarao et al., 2009a). A continued understanding of asthma etiology is necessary in order to develop effective targeted preventative interventions and the long-term reduction of relevant environmental exposures (Hancox et al., 2012; Marks, 2005; Subbarao et al., 2009a; Yang et al., 2007). Finally, obesity is also recognized as a (modifiable) risk factor for asthma diagnosis, more severe asthma, and poor asthma control (Juel et al., 2012; Moerman et al., 2013; Shore, 2013).

While the prevalence of allergic disease and asthma are increasing worldwide (Pawankar, 2014), asthma remains the leading childhood cause of chronic disease globally (Ferrante & La Grutta, 2018; Potter, 2010). Asthma is often poorly controlled amongst those affected (Kim & Mazza, 2011), and diagnosis and management in children is difficult due to different wheeze-related illness etiologies and outcomes. Although resources and treatment options differ regionally, the general aim of successful asthma management is consistent with living a life free of symptoms (e.g., cough, breathlessness), regular school attendance, participation in school activities and sport, achieving restful sleep, and avoidance of hospitalization and medication-related side effects (Potter, 2010).

In Canada, management usually persists throughout a patient's lifetime (Asthma Canada, 2017). Two types of prescribed medication are common; "controller" medication reduces inflammation in the airways and should be taken every day, leading to fewer symptoms over time, whereas "reliever" medication treats tightening of the airways but not the underlying airway inflammation, and is used to relieve acute symptoms (Asthma Canada 2018). Using a reliever more than four times in a week (not including use with exercise), missing school or work due to asthma, exercising with symptoms, and waking up due to symptoms are all signs of poorly-controlled asthma (Asthma Canada, 2018). When severe, (e.g., completely out of breath, unable to speak using full sentences, feeling sleepy), using a "reliever" inhaler and calling an ambulance is recommended (Jin, 2016). Other management techniques for those with asthma include physical exercise to reduce symptoms (many people with asthma report that they experience fewer symptoms when physically fit [Chandratilleke et al., 2012]), the development of a personalized strategy with a doctor called an Asthma Action Plan, use of a Peak Flow Meter (which measures how well air is moving through airways and is used as a monitoring device to

determine asthma improvement or severity), keeping up to date with influenza vaccinations in order to prevent complications with other chronic conditions, and using available resources, (e.g., the Air Quality Health Index) to monitor local air pollution and health messages to make decisions related to outdoor activity that may exacerbate symptoms (Chen & Copes, 2013).

2.4.1 Risk perception of allergic disease.

Although lay perceptions of a number of environmental and health risks have been explored by health geographers (Luginaah, 2009), investigation of asthma risk perception determinants and outcomes by health geographers is limited. Outside of health geography, asthma patient perceptions and experiences have been explored in order to increase understanding of individual disease meaning, patient quality of life (e.g., physical and mental health outcomes beyond breathlessness, wheeze and chest tightness), and to identify ways to improve self-management and asthma control (Holley et al., 2017; Peterson & Sterling, 2009). In the context of children and youth, qualitative approaches have been used to investigate how children and teens perceive and manage their own asthma (Gabe et al., 2002; Holley et al., 2017; Mammen et al., 2017; Protudjer et al., 2008; Prout et al., 1999; Simon, 2003). For example, Mammen et al. (2017) found that teens often perceive their asthma symptoms as normal (also described by others; Protudjer et al., 2008; Prout et al., 1999), and often overlook reporting symptoms to parents or healthcare providers (who are only therefore able to offer support based on unusual or visible/audible symptoms). Other adolescent-identified barriers to self-management include quality communication with healthcare providers, and individual understanding of condition and treatments (Holley et al., 2017).

Adults' perspectives on their own asthma have also been explored; Cheung et al. (2018) used drawings to understand Australian patient feelings and the emotional burden of asthma

(e.g., life restrictions, feelings of difference), while Karvala et al. (2018) investigated asthma trigger perceptions amongst adults in Finland due to the potential for poor symptom control and related occupational consequences such as job change or disability in the workplace. Other work investigating perceptions of asthma triggers identifies that women may report more asthma triggers than men (Goksel et al., 2009), the potential for both under- and over-identification (e.g., related to other trigger characteristics such as smell [e.g., fragrances] or appearance [e.g., cats and dogs] [Dalton & Jaen, 2017; Janssens & Ritz, 2013]), and the association between increased education and fewer perceived triggers (Ritz et al., 2006). Amongst adults, identified barriers and facilitators to self-management include asthma management education, pre-existing health beliefs, complications with co-morbidities and medication, mental health and anxiety, social support, and access to healthcare (Miles et al., 2017; Smits et al., 2017). Failure to identify the severity of symptoms can result in delays seeking treatment (Banzett et al., 2000; Klein et al., 2004), and uncontrolled asthma amongst patients is common (Menzies-Gow & Chiu, 2017); for this reason, patients' perceived level of asthma severity and control have also been quantitatively investigated (Banzett et al., 2000). Ponte et al. (2007) found that incidence of poor perception of asthma control is high amongst Brazilian asthma patients, particularly amongst those with lower income, a lower degree of asthma severity, and the elderly.

Perceptions and experiences of other stakeholders (e.g., healthcare providers [Kim et al., 2018; Miles et al., 2017]) related to asthma symptoms, triggers, and management have also been explored. Perceptions of parents and caregivers, who are often responsible for, or contribute to, medical decisions for minors with asthma are particularly relevant to this research. For example, Shepperd et al. (2018) found that adult caregivers making decisions on behalf of their asthmatic child are more likely to act on perceived risk (e.g., reduce exposure for their child) when they

perceive exposure (e.g., to second hand smoke, dust) to be associated with breathing difficulties. Other parental and caregiver asthma experiences that have been explored include the impacts on caregiver quality of life in the context of poverty (Bellin et al., 2017), asthmatic parent-identified barriers to child physical activity (e.g., parental fear of asthma symptoms, lack of awareness, lack of trust in school management of asthma, unsafe neighbourhoods, nonadherence to medication) for urban children with asthma (Kornblit et al., 2018), barriers to asthma management for children from different ethnic groups (e.g., language of advice about management, delays in diagnosis, perceived uncoordinated care) (Lakhanpaul et al., 2017), and smoking caregivers' perceptions of their asthmatic child's exposure to secondhand smoke (Borrelli et al., 2014; Clawson et al., 2018; Wagener et al., 2010).

In the context of another form of allergic disease, Canadian health geographers have investigated perceived risk of food allergies in Canada. Results from a quantitative analysis of a national data set indicate that public understanding of the risks of food allergy is inflated, as the average respondent estimated the prevalence of food allergies in Canada to be 30% while the clinically-defined prevalence is 7.5% (Harrington et al., 2012). Further, 70% of the sample reported food allergies to be substantial risks to the Canadian population. Identified determinants of risk perception include gender (males were half as likely to rate the risks of food allergy as high [also reported by Majowicz et al., 2017]), age (older adults rated the risks as higher than those between 18-29), household composition (single adult homes with a minor were more likely to rate the risks of food allergy as high), education (those with highest levels were less likely to rate risks as high), pre-existing health risk attitudes (those disagreeing food allergies were easily treatable perceived risks of food allergy as high, those with fatalistic attitudes were more likely to rate risks as high, those who agreed there were health risks where they lived were more likely

to rate risks as high), and direct experience with food allergy (e.g., those who reported multiple allergies in the home were more likely to rate risks as high) (Harrington et al., 2012). In addition to this quantitative work, Lu et al. (2014) used qualitative methods to investigate the perceptions and experiences of food allergic new Canadians (from Asia); participants perceived food allergies to be more common in Canada, described the skepticism they experienced related to their food allergy in Asia, and believed that having a food allergy is more manageable in Canada (e.g., due to the policy environment).

More broadly, a significant body of literature related to risk perceptions of environment and health risks exists (both within and outside of health geography). This literature investigates perspectives of a diverse range of environment and health exposures and outcomes (e.g., reproductive health [Shepherd et al., 2011], nuclear power [Whitfield et al., 2009], wind turbines [Walker et al., 2015], climate change [Leiserowitz, 2006], air pollution [Elliott et al., 1999; Orru et al., 2018], water pollution [Macias, 2015]), is conducted in various geographic locations, and focuses on perceptions of different stakeholder groups (e.g., community members living in close proximity to a specific exposure [Lima, 2004; Wakefield & Elliott, 2000; Luginaah et al., 2002], public health experts [Luria & Lyons, 2009], college students [Young et al., 2013], different racial and ethnic groups [Macias, 2015], new mothers [Crighton, 2013; Keune et al., 2008]). Determinants of environment and health risk perceptions also vary, but commonly include individual characteristics such as race and ethnicity (Macias, 2015), gender (Flynn, et al., 1994; Finucane, et al., 2000), and worldviews (Dake, 1991; Krewski et al., 1995), as well as specific characteristics of a risk (Slovic, 1987), and communication pathways and sources of information (Kasperson et al., 1988).

2.5 Child and Youth Obesity and Physical Activity

In addition to the direct physical and social impacts of allergic disease, respiratory health is also associated with obesity in both adults and children (Delgado et al., 2008; Mafort et al., 2016; Ross & Hart, 2013; Shore & Johnston, 2006; Sutherland, 2008). For example, evidence suggests that asthma attacks, wheezing, and inhaler use among children are more common with increased Body Mass Index (BMI) (Bibi et al., 2004; Figueroa-Munoz et al., 2001), and Gilliland et al. (2003) found that the risk of new-onset asthma is higher among children who are overweight or obese.

Increasing obesity rates among children and young people is a growing public health problem (de Onis et al., 2010; Government of Canada, 2016b; Tremblay, 2012). Childhood obesity carries increased risk for developing illnesses into adulthood, including type 2 diabetes, heart disease, certain cancers, gall bladder disease, endocrine disorders, and osteoarthritis. Further, obesity is associated with hyperinsulinemia, hypertension, sleep apnea, social exclusion, and depression (Anis et al., 2010; Ebbeling et al., 2002; Government of Canada, 2016b; Lobstein et al., 2004; Reidpath et al., 2001). In Canada, approximately one in three (31.4%) children (6 to 17 years) are now overweight or obese. Prevalence rates in Canada vary geographically, and based on demographics and socioeconomic status (e.g., age, sex, place of residence) (Rao et al., 2016).

Obesity and overweight stems from an energy imbalance resulting from energy intake exceeding energy expenditure (Jebb, 2007). Traditionally, our understanding of the causes of weight gain relate to eating too much or exercising too little (Egger & Swinburn, 1997). This view has influenced public health messages, research, and interventions to focus primarily on the view of obesity as a personal disorder requiring treatment (e.g., calorie counting, or balancing

energy intake and output) (Egger & Swinburn, 1997). As our understanding of obesity has progressed toward an ecological perspective that considers obesity as “a normal response to an abnormal environment” (Egger & Swinburn, 1997), the biological (e.g., age, sex, genetics, hormones), behavioural (e.g., resulting from complex habits, emotions, attitudes, and beliefs) and environmental factors (e.g., physical [local recreation facilities], economic [cost of petrol and cars], or sociocultural [family recreation attitudes]) that impact energy intake and expenditure are considered critical to our understanding of the determinants of obesity and our ability to intervene and alter ‘obesogenic’ environments (Egger & Swinburn, 1997; Vine et al., 2014).

Although the factors associated with overweight and obesity are complex (Rennie et al., 2005), health behaviours such as participation in physical activity play a role in affecting weight and encouraging healthy lifestyles for Canadian children (Tremblay & Willms, 2003). In addition, physical activity in children and youth can provide other health benefits in the prevention of other chronic diseases, including cardiovascular disease, diabetes, cancer, depression, osteoporosis, and premature death (Warburton et al., 2006). Physical activity participation in children and youth is also associated with other outcomes, such as academic performance, risky and aggressive behaviours (e.g., bullying, substance abuse risk), and measures of mental health and wellbeing (Janssen & LeBlanc, 2010). Participation in organized sport as a form of physical activity is also linked with numerous additional social and physical outcomes, including improved muscular strength and endurance, flexibility (Fraser-Thomas et al., 2005), self-esteem and confidence, problem solving, goal attainment, academic performance, social skills (e.g., teamwork and social skills), and emotional regulation (Eime et al., 2013; Holt et al., 2011; Neely & Holt, 2014; Sahoo et al., 2015). Individual and societal economic and social benefits of increased physical activity through sport participation also exist; organized sport

participation enhances quality of life, as Canadians identify sport participation as a source of enjoyment and a way to increase social interactions with new acquaintances (Statistics Canada, 2011). Similarly, community-level benefits of sport include improved social cohesion and social capital (Bailey, 2005; Vail, 2007). A physically active population can also reduce the economic burden associated with chronic disease, which presents as increased medical costs and reduced workforce participation (Macera et al., 2003). Although the determinants are complex (Biro & Wien, 2010), physical activity is vital to reducing the future burden of overweight and obesity in Canada.

2.5.1 Physical activity, sport participation and asthma.

Obesity is a risk factor for asthma development (Shore, 2013), worsening of symptoms, and poor levels of control (CDC, 2013). Children with asthma are generally less active than their non-asthmatic peers (Avallone & McLeish, 2013; Glazebrook et al., 2006; Mtshali & Mokwena, 2009; Williams et al., 2008), despite the emphasized value of regular physical activity for children and adults diagnosed (e.g., it can reduce symptoms and strengthen lungs as physical fitness levels increase) (IQWiG, 2017; Williams et al., 2008). Children and adolescents with asthma should be encouraged to participate in physical activity to improve asthma management and minimize the health risks associated with sedentary lifestyles (Asthma Canada, 2017; Avallone & McLeish, 2013; Disabella et al., 1998; Mancuso et al., 2012; Williams et al., 2008).

Various factors associated with respiratory illness contribute to reduced physical activity amongst children and youth with asthma. First, individual asthma perceptions of those diagnosed can act as a barrier to participation. Evidence suggests that children impacted by asthma may believe that limiting their physical activity is inevitable given their diagnosis, and those with more severe symptoms are often more likely to believe that exercise will exacerbate the disease

(Velsor-Friedrich et al., 2004; Williams et al., 2008). Further, some children and youth with asthma may reduce physical activity based on inaccurate symptom perception (e.g., misinterpreting healthy shortness of breath related to physical activity with symptoms of an attack) (Williams et al., 2008), or even based on medical advice suggesting restricted activities (Chandratilleke et al., 2012). For sport participation more specifically, Chadwick (1996) found that children with asthma tend to accept that an inability to participate in sport is normal (although disappointing), and many boys and girls with asthma recognize the potential for stigmatization based on their diagnosis (Chadwick 1996; Velsor-Friedrich et al., 2004). While figures of authority, such as parents, teachers, and coaches, have an important role to play in encouraging children with chronic disease to participate in sport and physical activity, parents and teachers may themselves be concerned with the risks of physical activity for those with asthma (Vitulano, 2003; Williams et al., 2008).

Family behaviours, illness beliefs, and misperceptions (e.g., acceptance of low activity levels if symptoms are perceived as harmful or unmanageable) also influence levels of physical activity amongst asthmatic children. For example, Glazebrook et al. (2006) report that parents of those with asthma identified their child's health as a barrier to physical activity, compared with parents whose children did not have asthma (60.7% vs 11%). Lang et al. (2004) found that the strongest predictor of high levels of physical activity amongst 6-12 year olds was the belief by parents that exercise could improve their children's asthma.

Finally, teacher knowledge and attitudes, the influence of organizational policies (e.g. the reluctance to encourage children with asthma to engage in physical education [Williams et al., 2008]), and poor management of asthma in schools (e.g., stigma around publicly using asthma medication [Walker & Reznik, 2014]), could also impact asthmatic children's participation in

physical activity. Evidence suggests that some teachers may not have sufficient knowledge related to asthma and participation in physical activity (e.g., belief that children with asthma should avoid physical education in school [Tse & Yu, 2002]), and Getch & Neuharth-Pritchett (2009) found that many teachers do not feel prepared to deal with children with asthma. Teachers may therefore be unaware of the importance of physical activity for children and youth with asthma, and a perceived lack of knowledge about how to manage asthma attacks may lead to restriction of physical activity (Williams et al., 2008). Further study of the perceptual understanding of allergic disease and asthma amongst families, children and youth, and leaders of physical activity (e.g., coaches) is therefore necessary to ensure asthma is properly managed and that physical activity among child and youth populations can be maintained and enhanced.

2.5.2 Determinants of youth physical activity and sport participation.

There is an inherent geographic element to understanding how the environment impacts child and youth physical activity and team sport participation. Taking a place-based approach and considering not only the physical space in which sport is experienced, but also the characteristics and meanings of the spaces in which youth team sport occurs can increase our understanding of how environments, broadly defined, interact to shape the behaviours, perceptions, and health outcomes of participants. Environmental factors (physical, social, economic, political), in conjunction with individual characteristics (Atkin et al., 2016), therefore act as both determinants of child and youth participation in team sport, and determinants of athlete safety and health during participation (e.g., athlete management during extreme weather) (Townsend et al., 2003). While determinants of participation in organized sport vary geographically and by socioeconomic characteristics (Breuer et al., 2011; Hardy et al., 2010; Humpel et al., 2002; Townsend et al., 2003; Ullrich-French & Smith, 2008), environmental

determinants, such as the sociocultural, physical and political characteristics of the places in which sport occurs, play a pivotal role in athlete retention and long-term participation in sport (Sport for Life, 2017; Williams et al., 2008). This is critical due to the risks associated with physical inactivity. Although the determinants of obesity and overweight, physical activity and sport participation, and athlete retention are complex, well-organized team sport is vital to reducing the chronic disease outcomes associated with physical inactivity in Canada.

While intra-personal factors (e.g. attitudes, knowledge, skills, perceived skill level, behaviours, motivations [such as enjoyment of physical activity and skill development]) (Allender et al., 2006; Humbert et al., 2006; Townsend et al., 2003), and individual socio-demographic factors (e.g., gender, ethnic background, disability, education and income levels) (Allender et al., 2006; Ball et al., 2015; Fraser-Thomas et al., 2005) can influence sport and physical activity participation, the physical and sociocultural environments also act as determinants of participation in both sport and physical activity more broadly. Determinants also vary geographically and by sport (Breuer et al., 2011).

Elements of the sociocultural environment, such as peer social support, can act as factors that influence child and youth physical activity participation (Humbert et al., 2006; Townsend et al., 2003). For example, in a review of the literature related to UK children's and adults' participation in sport and physical activity, Allender et al. (2006) found that children and youth identify determinants of participation related to peer pressure, social networks (e.g., friend involvement), and the role of teacher, family and peer support networks. Other factors, such as a perceived lack of safety (e.g., community safety, facility safety), may also impact participation in physical activity (Humbert et al., 2006; Townsend et al., 2003).

More specific to youth team sport, another component of the sociocultural environment that influences participation relates to the role of adults (e.g., coaches, parents) in child and youth athlete development in both elite and recreational sport (Coakley, 2006; Jowett & Timson-Katchis, 2005; Kerr & Sterling, 2012). Research has demonstrated that coaches can act both positively (e.g., relationship that involves constructive feedback) and negatively (e.g., relationship based on a power difference between athletes and coaches in which athletes react based on fear [Tomlinson & Yorganci, 1997]) toward athletes (Kerr & Sterling, 2012). While approaches to athlete development that involve yelling or use of disparaging comments are justified by coaches in order to increase resilience or to ‘toughen up’ athletes (Kerr & Sterling, 2012), such approaches present risks toward athlete wellbeing in sport, and emotionally abusive coaching behaviours have been documented (Kerr & Sterling, 2012; Stirling & Kerr, 2009). For example, Gervis and Dunn (2004) found that amongst former elite child athletes, shouting, threats, and humiliation were common forms of emotional abuse (particularly when athletes transitioned to the elite level), while Stirling & Kerr (2008) found that elite female swimmers reported physical (e.g., throwing objects) and verbal behaviours (e.g., insults), and denial of support by coaches (e.g., providing inadequate feedback out of anger). It has been documented that not only is this behaviour normalized by athletes as part of the perceived process that leads to athletic success (Stirling & Kerr, 2008), but amongst parents as well (particularly at the elite level [Kerr & Stirling, 2012]), as they become socialized into the sport environment (Woolger & Power, 1993). The role of the parent in the sociocultural environment can be further complicated, as a child’s success in sports (which can be objectively measured or visible during games/training), can be (rightly or wrongly) directly attributed to parents by others (Coakley, 2006). This is particularly relevant as children advance into competitive sport, as some parents

can become singularly focused on the sport at the cost of their child's family and social life (Kerr & Stirling, 2012); indeed, reports of abusive parental behaviours exist (e.g., during a recent competitive soccer game in a tournament in Virginia, the father of a player ran onto the field and punched a 14 year-old on the opposition team [Tribune Media, 2018]). While adults (e.g., coaches, parents) can play a valuable role in the sport experience for youth athletes (e.g., as a source of information and advice, or socioemotional assistance [Fraser-Thomas et al., 2005; Jowett & Timson-Katchis, 2005]), their involvement in organized youth sport can also create pressure on athletes (e.g., to attain elite status) that can not only directly impact athletes' emotional and social wellbeing, but also increase an athlete's physical risk related to mismanagement of injury or through the stigmatization of injury or illness. For example, recent research (Kroshus et al., 2015) reports the pressures (from coaches, teammates, parents, fans) that athletes experience that can impact their decision to report post-head impact symptoms (Delaney et al., 2015). This can increase physical risk, as athletes who fail to report symptoms and continue to play are at risk of worsening symptoms or further neurologic consequences (including death [Prins et al., 2013]) if a secondary impact (e.g., a collision during participation) is experienced (Kroshus et al., 2015).

Elements of the physical environment (and others, including political and economic) can also act as facilitators or barriers to participation in organized sport. For example, availability, quality, and accessibility of appropriate infrastructure (e.g., indoor sporting facilities), and availability of different types of sport programming, may also influence participation in different sports (Hallman et al., 2012; Townsend et al., 2003; Wicker et al., 2012). Cost of participation, and the safety of, and proximity to, facilities are also important considerations for youth athletes and their families (Humbert et al., 2006).

Weather and climate may also act as determinants of physical activity more broadly, and sport participation more specifically, in a number of ways. Weather has been identified as a possible barrier to exercise participation (e.g., due to temperature, precipitation, wind) (Wagner et al., 2016), particularly in those with pre-existing conditions such as asthma (Chan & Ryan, 2009). For example, the perceived impacts of the natural environment could undermine the anticipated benefits, motivation to participate in, and enjoyment of physical activity either at the individual level, or related to familial support for child and youth participation. The perception of an unsafe physical environment (e.g., due to increased storm activity or lightning) may impact the decision to participate in physical activity or organized sport (Townsend et al., 2003). The fear of potential injury also exists if playing surfaces are not perceived as safe (e.g., there is increased risk of anterior cruciate ligament injuries with harder ground surfaces) (Orchard et al., 1999; Townsend et al., 2003). Finally, seasonal variation and weather can directly impact physical activity participation (Matthews et al., 2001), enjoyment of, and performance in sport (Leal, 2014), as direct exposure to conditions that are not comfortable for participation (e.g., high temperatures in summer) may impact individual decisions to spend time outdoors (Townsend et al., 2003). For example, heat stress may be of concern to athletes and their families due to the perceived risk of heat stroke during training and competition (Brotherhood, 2008). Improving physical environments (e.g., levels of air pollution) could therefore lead to environment and health co-benefits (e.g., increased levels of physical activity and social cohesion through participation in exercise or team sports) (Thomas et al., 2014).

Although physical inactivity is only one factor associated with the growing obesity epidemic, engaging youth affected by asthma and other allergic disease in physical activity through sport participation can encourage healthy lifestyles and reduce the future burden of

chronic disease in Canada. In order to do this, understanding how Canadian children, parents, and providers of sport in Canada perceive and manage the links between allergic disease, the environment and physical activity is essential.

2.6 Theoretical Context

The way health geographers understand health has evolved away from a biomedical paradigm. In this research, health is conceptualized with respect to multiple determinants and the relationships between people and their environments (Elliott, 2014). This research therefore embraces an understanding of health that considers both individual factors (e.g., behaviours, genetics) and the broad environmental determinants of health (e.g., the social, physical, economic, political environments) that shape the health of populations (Jones & Moon, 1993, Wilkinson & Marmot, 2003).

2.6.1 Social constructionism.

This research is largely guided by social constructionism, which focuses on individual meanings, feelings and subjective experiences of health and illness constructed out of daily interactions; that is, social constructionism is an epistemological approach that explores how different populations engage with the construction of knowledge through interactions and engagement with society and the everyday world (Bickerstaff & Walker, 2003). In health geography, social constructionist perspectives consider the knowledge, experiences, and behaviours of individuals just as important as those of policy makers and health professionals (Gatrell & Elliott, 2014), and qualitative methods (e.g., in-depth interviews, focus groups, photovoice) are often used to explore and understand meanings, opinions, behaviours, and subjective experiences of health.

Health geographers use social constructionism to explore perceptions and meanings of different populations, places, health behaviours and outcomes, and experiences of health care and utilization. For example, Pattinson et al. (2015) used semi-structured in-depth interviews (n=104) to explore perceptions of air quality amongst near-highway residents in South Auckland, New Zealand, while Abraham et al. (2017) explored veteran perspectives of health practices to manage mental health and well-being in Southeastern Louisiana and Northern California. Finally, Fairbrother et al. (2016) used a social constructionist perspective to investigate how 53 nine to ten year olds in the United Kingdom understand food in everyday life, and their ideas about the relationship between food and health. A social constructionist approach will be used to increase our understanding of how physical activity, allergic disease, and the environment are understood and managed amongst different participants in youth team sport in Ontario.

2.6.2 Conceptual framework for understanding emerging environmental health risks.

More specifically, this research will apply Harrington & Elliott's (2015) framework for understanding public response to emerging environmental health risks. Harrington & Elliott's place-based framework (Figure 2.1) builds on existing theories of risk perception (Slovic's [1987] *psychometric paradigm*, Kasperson, et al.'s [1988] *social amplification of risk framework*, and the *cultural theory paradigm of risk perception* [Douglas & Wildavsky, 1982]), and places these models of risk perception within social, economic and political contexts. The concept of place represents the backdrop of the framework, recognizing varying characteristics and meanings of space, and the role they play in shaping perceptions, behaviours, and health (Harrington & Elliott, 2015).

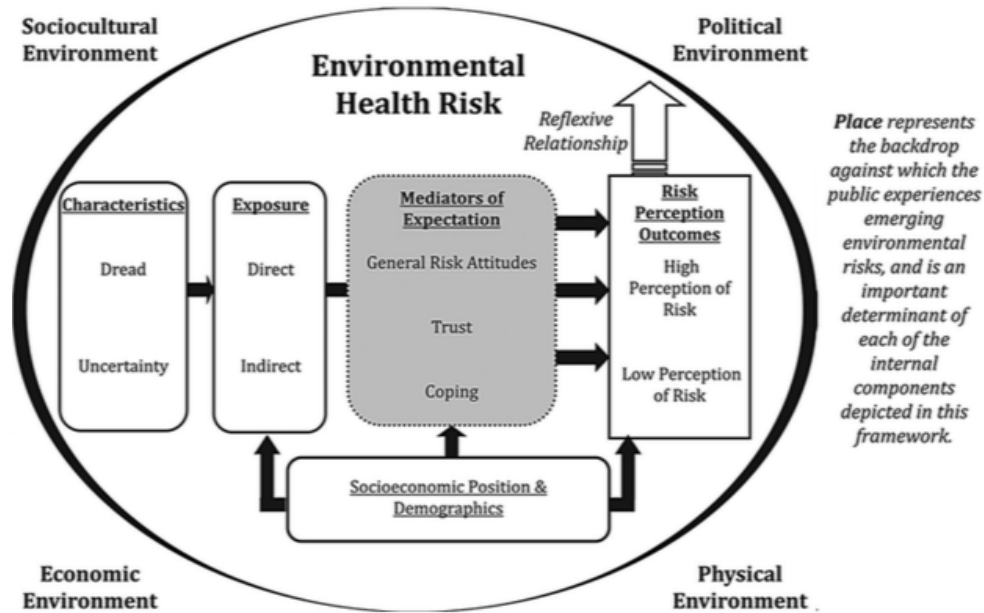


Figure 2.1 Conceptual framework for understanding emerging environmental risks (from Harrington & Elliott, 2015)

Within the framework, the environment is categorized into four types (sociocultural, economic, political, and physical) in order to conceptualize the potential role played by aspects of both the built and natural environment in shaping perceptions and experiences of risk. Risk perception of allergic disease in a specific population is therefore influenced by aspects of the sociocultural environment (e.g. attachment to or stigmatization of a place with poor air quality), the economic environment (e.g., the cost of respiratory health information provision), and the political environment (e.g., municipal and provincial policy related to air quality and respiratory health). Further, understanding how Canadians perceive and may be affected in the future by allergic disease is complicated by the changing physical environment.

Other components of the framework that influence how allergic disease is understood include the characteristics of the emerging risk (e.g. level of *dread* associated with an asthma attack and increasing prevalence rates in Ontario, complete etiology of asthma *unknown* [Slovic,

1987)), exposure to risk (e.g. direct [affected by asthma] or indirect [allergic disease information amplified or attenuated by media or peers]), mediators of expectation (e.g. attitudes toward risk, trust in information and those responsible for risk management, and adaptive capacity [presence of and access to financial or social resources]). Finally, socioeconomic position and demographics contribute to exposure, expectation and risk perception outcomes, and therefore play a significant role in how risk is perceived in a specific population. These components reflexively interact to both shape how risk is understood, and to (re)shape the places where risk is experienced (Harrington & Elliott, 2015). This conceptual framework has been piloted using Canadian perceptions of food allergies, and applying it in the context of another emerging environmental threat will investigate its use as a tool to understand public response to emerging environmental health risks.

2.7 Chapter Summary

The preceding chapter highlighted a number of key themes related to understanding the links between the environment, allergic disease and physical activity in the organized youth team sport context in Ontario. The chapter began with a discussion of the subdiscipline of health geography, and the broad substantive, theoretical and methodological approaches of research in the geographies of health. Next, a substantive review of the global environmental change and health, allergic disease and asthma, and physical activity and sport participation literature was included. Finally, social constructionism as an approach to research in health geography, and the conceptual framework for understanding emerging environmental health risks, were discussed as theoretical approaches relevant in this research.

CHAPTER THREE

Study Design and Methods

3.1 Introduction

This thesis uses a mixed-methods case study design to investigate how the links between allergic disease, the environment, and physical activity are perceived and managed in organized youth team sport. A case study approach was chosen as a way to increase understanding of the youth team sport environment in the Greater Golden Horseshoe region of Southern Ontario. The research uses multiple methods (both qualitative and quantitative) in order to explore the rich context and different actors (e.g., sport users, providers) within the case. The case study therefore provides an avenue for a detailed analysis of *how* and *why* coaches, youth athletes, their parents, and sports organizations understand and make decisions with respect to the links between the environment, allergic disease and physical activity and sport participation in the region.

This chapter provides an overview of the study design and methods that were used to address the research objectives. The chapter is divided into two parts; the first outlines the study region, and the second examines the methodological design (e.g., recruitment, data collection and analysis) of the research.

3.2 Research Setting

This research takes place within the Greater Golden Horseshoe Region of Southern Ontario (Figure 3.1). The Golden Horseshoe Region is located west of the City of Toronto, and includes parts of the Greater Toronto Area. For this research, I have included the geographical

region encompassed by the Mississauga Local Health Integration Network (LHIN)¹ (which includes a south-west portion of the City of Toronto [Etobicoke], south part of Peel Region, and most of Halton Region [Mississauga Halton, 2014]), the geographical region encompassed by the Waterloo Wellington LHIN (which includes Waterloo Region, Wellington County, the City of Guelph, and the southern part of Grey County), and the City of Hamilton and the City of Burlington (see Table 3.1 for Case Study Region Breakdown). Part of the Hamilton Niagara Haldimand Brant LHIN was not included (only the urban centers of the City of Burlington and the City of Hamilton), because of Burlington’s proximity to the Mississauga Halton LHIN, and both Hamilton and Burlington’s proximity to the Waterloo Wellington LHIN. In addition, the Hamilton Niagara Haldimand Brant LHIN extends southeast to the United States border, significantly increasing its geographical area and social and physical characteristics.



Figure 3.1 Study Location – Golden Horseshoe Region of Southern Ontario (Adapted from Cardwell & Elliott, 2013)

¹ Local Health Integration Networks (LHINs) are community level agencies established by the Government of Ontario to plan, integrate and fund local-level health services (Central West, 2014).

The various municipalities in the study region were chosen for their geographic proximity and their physical and social diversity. The Waterloo-Wellington region has a population of 778,676, while Mississauga Halton has a population of approximately 1.2 million people and is one of the fastest growing LHINs in the province. Both regions have unemployment rates lower than the provincial average (7.5%) (Mississauga Halton, 2014; Waterloo Wellington, 2014). The Mississauga Halton LHIN has a large percentage of immigrants (44.3% of the population), compared with Ontario (28.5%), and visible minorities make up approximately 40.7% of the LHIN population (Mississauga Halton, 2014). The population in Mississauga Halton is generally healthier and has a higher life expectancy than the provincial average, with the majority living in a large urban or medium population center. In addition, compared with the province, residents have lower hospitalization rates for most chronic conditions including arthritis, cancer, diabetes, and chronic obstructive pulmonary disease (COPD) (Mississauga Halton, 2014).

In contrast, 20.6% of the population in the Waterloo-Wellington region are immigrants, and while around 90% of the physical land is rural, approximately 90% of the population lives in urban areas. Life expectancy in this region (81.8 years) is similar to the provincial average (81.5 years), and the chronic conditions with the highest mortality rates in the region include cancer, ischemic heart disease, and stroke. Further, 20.3% of residents report that they smoke, while over 50% of residents report being overweight or obese (Waterloo Wellington, 2014).

In the City of Hamilton, approximately 24% of the population was born outside of Canada, and it is anticipated that by 2036 the city's population will grow by 20% (City of Hamilton, 2015). 57.7% of the population ranks their health as 'very good' or 'excellent', which is slightly lower than the Canadian perceived health average (of 60.4%) (Statistics Canada, 2013). Approximately 60.4% of the City's population is classified as overweight or obese

(according to the Body Mass Index body weight classification), compared with 52.6% of the Canadian population (Statistics Canada, 2013). Other chronic health concerns in Hamilton include COPD, cancer, diabetes and arthritis, while 17.2% and an additional 4.1% of the population report that they smoke daily and occasionally, respectively (Statistics Canada, 2013).

Compared with the province (13.9%), Burlington is a fairly affluent community with a low proportion of the population below the low-income measure (7.6%). Further, approximately 13% of the population has no educational certificate or diploma, compared with 19% of the province. 96% of the Burlington population holds Canadian citizenship (Halton Region, 2011). While health statistics are less readily available for the City of Burlington specifically, along with Halton Hills, Milton and Oakville, Burlington falls within the Halton Regional Health Unit (Halton Region, nd). Within the Halton Region, approximately 68.7% perceive their health as ‘very good’ or ‘excellent’. The population classified as overweight (33.4%) or obese (20.8%) is collectively slightly higher than the Canadian rate (52.3%), and while often lower than Canadian averages, other chronic health concerns in the region include COPD, arthritis, diabetes, and cancer (Statistics Canada, 2013). Approximately 15.3% of the Halton Region population report smoking tobacco daily, while an additional 3.4% report occasional smoking (Statistics Canada, 2013).

The Mississauga-Halton region, and Cities of Hamilton and Burlington are also heavily urbanized and in close proximity to urban industrial cities like Toronto, where there have been significant efforts to increase awareness of air pollution (Clean Air Hamilton, 2018; Clean Air Partnership, 2018; Toronto Public Health, 2014), and community concern related to air quality exists (Cardwell & Elliott, 2013; Elliott et al., 1999). While Waterloo is in close proximity to certain major transportation networks (e.g. the 401 highway), few residents recognize poor air

quality as a year-round issue despite the occurrence of moderate to poor air quality days throughout the year (Region of Waterloo Public Health, 2005). Asthma prevalence rates (in the 12+ population) also vary geographically across Ontario and between the regions, as the 7.9% rate in the Waterloo Wellington Local Health Integration Network (LHIN) falls slightly below the Ontario prevalence rate of 8.3%, while the Mississauga-Halton LHIN records prevalence rates slightly above the provincial average at 9.1% (Mississauga Halton, 2014). The City of Hamilton and the Halton Region (as an indicator for the City of Burlington) report 8.3% and 7.4% asthma rates in the 12 and older population, respectively (Statistics Canada, 2013).

Urban regions in the study region are vulnerable to poor outdoor air quality, particularly in summer months. In total, approximately 2,618,282 people live in this region (the populations of the Mississauga Halton LHIN, Waterloo Wellington LHIN, City of Hamilton, and City of Burlington combined [Mississauga Halton, 2014; Statistics Canada, 2016; Waterloo Wellington 2014]). This is approximately 19.5% of Ontario's population, and 7.4% of the Canadian population (Table 3.1), placing a large proportion of Canadians at risk of exposure to pollutants that can affect respiratory health.

Table 3.1 Case Study Region Breakdown

Region	Cities/Townships/ Municipalities Included	Population	% of Ontario Population	% of Canadian Population
Mississauga Halton LHIN (Mississauga Halton, 2014)	Halton Hills, Milton, Oakville, Mississauga, South Etobicoke	1,182,375	8.3	3.2
Waterloo Wellington LHIN (Waterloo Wellington, 2014)	Waterloo Region, Wellington County, the City of Guelph	778,676	5.5	2.1
City of Hamilton (Statistics Canada, 2016)		536,917	3.8	1.5
City of Burlington (Statistics Canada, 2016)		183,314	1.3	0.5
Total Case Study Region		2,618,282	18.5	7.1
Ontario (Statistics Canada, 2017)		14,193,400	100	38.7
Canada (Statistics Canada, 2017)		36,708,100		100

3.3 Research Design and Methodology

3.3.1 Introduction.

This research uses a social constructionist approach to investigate how the links between allergic disease, the environment, and physical activity and sport participation are perceived and managed amongst youth team sport stakeholders in Southern Ontario. Multiple methods are used to increase our understanding of how coaches, athletes, and their parents engage and interact with allergic disease, the environment and physical activity, the meanings and the ways these

concepts are constructed, and the contextual factors which influence their understanding and construction of asthma risk perception.

In health geography research, quantitative and qualitative methodologies are both applied. Quantitative approaches are used extensively, and include data mapping to determine spatial patterning of health outcomes, graphing or statistical methods to explore possible associations between variables, and statistical modeling to test specific hypotheses (Gatrell & Elliott, 2014). Qualitative approaches have emerged extensively in the last few of decades (Kearns & Moon, 2002), and include in-depth interviews, focus groups, participant observation, textual analysis, and oral histories (Crabtree & Miller, 1999; Dyck, 1999; Gatrell & Elliott, 2014). Such approaches can be used independently of, or to support quantitative data, in order to gain a deeper understanding of the feelings, values, experiences, beliefs, and attitudes of participants (Cole & Eyles, 1997; Morgan, 1998). In addition to the valuable oral data that can be acquired using qualitative methods, face-to-face interactions (in interviews, focus groups, observation) are valuable to gauge multiple meanings from both verbal and nonverbal language (Baxter & Eyles, 1999).

3.3.2 Objective One.

The three research objectives in this study are addressed using multiple methods. The first objective, to explore the knowledge, attitudes, and practices of users and providers of child and youth sport with respect to the links between the environment, allergic disease and physical activity, is addressed using a qualitative approach. More specifically, semi-structured, in-depth interviews were chosen in order to develop an in-depth and extensive understanding (Jamshed, 2014) of how coach and youth athlete participants understand allergic disease and the environment in organized youth team sport. Face-to-face, semi-structured interviews were

chosen in order to ensure a flexible interview process that emphasizes how participants frame, understand and behave related to the topics discussed (Bryman & Teevan, 2005), while maintaining consistency with a predetermined set of themes and probes. Further, as we were discussing topics that may have been perceived as sensitive to some athletes diagnosed with asthma (e.g., social stigmatization), conducting interviews in person and in a private setting (with a parent present) allowed for rapport between the interviewer and participant, and to ensure participant comfort throughout the interview.

In order to fulfill objective one, semi-structured, in-depth interviews with youth team sport coaches, and youth team sport athletes diagnosed with asthma and their parents were conducted. Criteria for coach inclusion involved coaching an organized youth (under age 18) team sport (recreational or competitive, indoor or outdoor) outside of the school environment in the Greater Golden Horseshoe Region of Southern Ontario within one year of participation in the research. To participate in the athlete sample, participants must be between ages 11 and 18, have been involved in organized youth team sport outside of the school environment in the Greater Golden Horseshoe Region of Southern Ontario within one year of research participation, and be diagnosed with asthma. All athlete participants under the age of 18 had a parent accompany them to participate in their interview, while one participant (who was 18 years of age) participated without a parent present.

Coach (n=18) and athlete (n=11) participants were selected based on the purposeful sampling principle of maximum variation (Patton, 1990). Sampling based on maximum variation aims to select information-rich cases, in order to investigate a broad range of themes that cut across a range of participant variation (e.g., based on gender, age, socioeconomic status) (Patton, 1990). To ensure maximum variation, coach and parents of athlete participants were asked to

complete a one-page demographic and sport participation information questionnaire following the interviews (see Appendix A). For coaches, questions explored participant coaching roles (e.g., head or assistant coach), their primary sport, the age group and gender of the teams they coached, their qualifications, as well as general demographic information (e.g., gender, year of birth, marital status). Parents were asked to complete the form with their child (unless the athlete was age 18), and were asked to identify their child's allergies, primary sport involvement and level (e.g., recreational, competitive), gender and year of birth, and personal basic demographic questions (e.g., parent gender, year of birth, education). The surveys were optional, and coach and parent/athlete participants could decide to skip any questions they did not feel comfortable answering. Recruiting participants with a range of demographic, sport and asthma characteristics helps ensure views from a range of sociodemographic groups, sport environments (e.g., indoor and outdoor sports, recreational and competitive level), and geographic areas are represented, and allows for targeted snowball sampling toward the end of the research (e.g., female coaches). A summary of the coach and athlete/parent samples is depicted in Tables 3.2 and 3.3.

Table 3.2: Athlete and Parent Participant Demographic Breakdown

ID #	Parent Gender	Parent Year of Birth	Parent Marital Status	Parent Country of Birth	Level of Highest Education	Employment Status	Number of Children	Number of Children with Allergies/ Asthma	Sport Participation of Youth Athlete Participant	Level (e.g., Competitive, Recreational, Both)	Asthmatic Child's Gender	Asthmatic Child's Year of Birth	Other Allergies Identified	Municipality of Residence
1	Female	1964	Divorced	Canada	Masters	Full Time	3	3	Soccer, Hockey, Volleyball, Basketball, Football	Soccer - Competitive, Others - Recreational	Female	2001	Grass	Burlington
2	Male	1968	Separated	Canada	University Undergraduate	Full Time	2	2	Soccer, Swimming, Volleyball, Cross Country, Running, Gymnastics	Soccer - Competitive, Others - Recreational	Female	2002	Grass, Ragweed, Pollen, Horses, Feathers	Burlington
3	Male	1963	Married	Yugoslavia	University Undergraduate	Full Time	2	1	Soccer, Volleyball, Skiing	Recreational (all)	Male	2000	Pet Dander	Burlington
4	Female	1968	Married	Canada	College	Unemployed	2	2	Soccer, Football	Competitive (all)	Female	1998	Grass	Burlington
5	Female	1968	Widowed	Canada	University Undergraduate	Full Time	2	1	Soccer, Track and Field, Volleyball	Soccer - Competitive, Others - Recreational	Female	1999	Anaphylactic to Peanuts, Seasonal Allergies	Burlington
6	Female	1962	Divorced	Canada	College	Full Time	2	1	Soccer, Swimming	Soccer - Competitive, Others - Recreational	Female	1997	Ragweed, Birch, Cats	Burlington
7	Female	1967	Married	Canada	University Undergraduate	Part Time	3	3	Soccer	Competitive	Male	1999		Burlington
8	Parent Did Not Attend						2	1	Soccer, Snowboarding	Soccer - Competitive, Others - Recreational	Female	1995	Tree Nuts	Burlington
9	Female	1967	Married	England	College	Unemployed	2	1	Soccer, Basketball	Soccer - Competitive, Others - Recreational	Male	1999	Grass, Mould, Dust, Ragweed, Cats	Oakville
10	Male	1973	Married	Canada	College	Full Time	3	1	Soccer	Recreational	Male	2000		Burlington
11	Male	1964	Married	Canada	University Undergraduate	Full Time	3	2	Soccer, Football	Soccer - Competitive, Others - Recreational	Male	2000	Peanuts, Egg, Dairy	Waterloo

Table 3.3: Coach Participant Demographic Breakdown

Coach Role	Primary Sport	Age Group(s) Coached	Level (e.g., Competitive, Recreational, Both)	Years of Coaching Experience	Coaching Qualifications	Medical Qualifications (e.g., First Aid)	Coach Gender	Year of Birth	Marital Status	Municipality of Residence	Country of Birth	Highest Education	Employment Status	Parental Status
Head	Baseball	15 to 18	Competitive	7	Yes	Yes	Male	1989	Single	Dundas	Canada	College	Part Time	No
Head	Soccer	13 to 14	Competitive	21	Yes	No	Male	1957	Single	Oakville	Venezuela	University Undergraduate	Self Employed	No
Both	Soccer	13, 15	Competitive	10	Yes	Yes	Female	1966	Married	Kitchener	Canada	High School	Homemaker	Yes (2)
Both	Soccer	13, 15	Competitive	10	Yes	Yes	Male	1968	Married	Kitchener	Canada	University Undergraduate	Full Time	Yes (2)
Both	Soccer	4 to 12	Both	6	Yes	Yes	Female	1992	Single	Burlington	Canada	High School	Part Time	No
Both	Basketball	15	Competitive	10	Yes	No	Female	1987	Single	Erin	Canada	University Undergraduate	Part Time	No
Head	Soccer	3 to 14	Both	20	Yes	No	Male	1954	Married	Mississauga	Scotland	College	Full Time	Yes (1)
Head	Basketball	6 to 18	Both	30+	Yes	Yes	Male	1955	Single	Mississauga	Canada	Masters	Full Time	Yes (3)
Assistant	Ringette	12	Competitive	25	Yes	Yes	Female	1965	Married	Mississauga	Canada	College	Full Time	Yes (3)
Head	Ringette	12	Competitive	8	Yes	No	Female	1967	Married	Milton	Canada	Masters	Unemployed	Yes (2)
Head	Hockey	15 to 18	Competitive	3	Yes	No	Male	1969	Married	Burlington	Canada	University Undergraduate	Full Time	Yes (1)
Assistant	Hockey	14 to 15	Competitive	5	Yes	No	Male	1956	Married	Burlington	Canada	College	Full Time	Yes (3)
Both	Team Cycling	14 to 27	Competitive	1	Yes	Yes	Female	1984	Married	Dundas	Canada	College	Self Employed	No
Assistant	Hockey	9 to 10	Both	3	No	Yes	Male	1989	Single	Waterloo	Canada	Masters	Part time	No
Both	Curling	14 to 20	Both	8	Yes	Yes	Male	1989	Single	Kitchener	Canada	University Undergraduate	Student	No
Head	Volleyball	11 to 13	Competitive	17	Yes	No	Male	1978	Married	Waterloo	Canada	High School	Full Time	Yes (2)
Assistant	Volleyball	14 to 17	Both	N/A	No	No	Female	1977	Married	Waterloo	Canada	University Undergraduate	Full Time	Yes (N/A)
Head	Hockey	8 to 11	Recreational	22	No	No	Male	1943	Divorced	Breslau	Canada	High School	Retired	Yes (3)

In preparation for the interviews, two separate interview schedules (for the coach and the athlete/parent sample) were prepared (Appendix B). The interview schedules had some overlap (e.g., How might the environment impact participants of sport/your participation in sport?), while the coach and parent/athlete samples were also asked questions distinct to their roles in organized team sport. The guides were pre-determined in order to ensure the conversations flowed naturally while maintaining order (e.g., with respect to the objectives of the interview), but also allowed for various avenues of discussion based on participant perspectives (Bryman & Teevan, 2005). The interview schedules were prepared based on a review of the literature related to asthma and physical activity and sport (e.g., barriers to participation), and piloted prior to the start of the research. Another member of the research team reviewed the interview schedules prior to use. The interview schedule began with general introductory questions in order to ensure participant comfort, before introducing more specific questions related to asthma management in sport. While the guide consisted of primary open-ended questions as well as probes, it also allowed participants to introduce their own ideas that they considered valuable. The primary researcher conducted all coach and parent/athlete interviews. Following the interview, participants had the opportunity to add anything they perceived to be relevant or that had not been discussed, ask questions they had about the research or asthma management in sport, and provide recommendations for themes they perceived relevant.

Participants were recruited using multiple methods. First, an advertisement (Appendix C) that provided a brief overview of the research, participation criteria, and contact details for the primary researcher was posted on community notification boards in coffee shops, libraries, and community centers across the sample region. The advertisement was also posted on online, free, advertising websites, such as kijiji.ca. A list of sports organizations that provide recreational or

competitive, outdoor or indoor, child and youth team sport (e.g., for children under age 18) in the sample region was also compiled (N=219) (Appendix D). Using an online random digit generator, a random sample of clubs was contacted by email. For example, every sixth club was contacted; the first with an advertisement for coaches, and the next with an advertisement for parent participants. While some clubs decided to distribute the advertisement to their contacts, some clubs either did not reply or chose not to participate. As recruitment continued, every third club was contacted in order to increase distribution of the research advertisement. Certain sports organizations also list their coach contact email addresses on their websites; if these organizations were randomly generated, the coach email addresses listed were also contacted with a short advertisement describing the research. Interested potential participants (coaches or parents) were encouraged to contact the researcher for further details and a Letter of Information (Appendix E). Finally, in order to complete the sample, snowball sampling was employed, as participants were asked if they knew anyone they thought may be interested in participating (e.g., to direct the researchers toward other information-rich cases [Patton, 1990]). For example, parents of asthmatic athletes were asked if they knew other parents of asthmatic athletes that may be interested in participating. Data collection occurred between October 2013 and August 2014, and continued until saturation of themes was reached.

In total, 18 interviews with coaches, 10 interviews with athletes and parents, and one interview with an athlete (who was age 18) were conducted. Interviews were conducted in a quiet, public location of the participant's choice, including local libraries, coffee shops, community centers, or private rooms in the sports organization office from which they were recruited. Prior to and during the interviews, the researcher aimed to ensure successful interviews by increasing familiarity with the interview schedule, ensuring clarity in communication (e.g.,

simple and short questions, avoiding jargon), and behaving with a sensitive and open demeanor (Bryman & Teevan, 2005; Kvale, 1994). Coach interviews lasted between 26 and 75 minutes, while parent and athlete interviews lasted between 35 and 63 minutes. Prior to meeting, all participants were emailed a consent form to review (Appendix F). The form was discussed before beginning the interview, and all participants (coaches, parents, and athletes) signed the form and consented for the interview to be audio recorded. Participants were provided with a \$20 gift card of their choice (grocery store, coffee shop) to thank them for their participation.

Interviews were transcribed verbatim and proofed prior to thematic analysis. In order to facilitate data organization and analysis, a codebook for coach interviews, and a codebook for parent and athlete interviews were created and include macro and micro codes (Appendix G). Codes were developed both deductively (e.g., preconceived codes based on a review of the literature and possible responses to interview questions), and inductively (e.g., based on interaction between the researcher and the data to ensure the codes ‘fit’ the data generated) (Gatrell & Elliott, 2014). The inductive development of codes occurred as each interview was read and reviewed several times during the analysis process; if themes emerged that were not in the original codebook (but were important to participants), the codes were added and data organized accordingly. This allowed segments of interview text to be analyzed based on a particular theme that emerged throughout the interviews. Further, as interviews were coded each segment of text was reviewed in the context of its code to ensure the data was interpreted consistently throughout analysis. The codebook and the major themes that emerged were reviewed and discussed with another member of the research team to ensure consistency in thematic interpretation. Data organization and analysis were facilitated using Computer-Assisted Qualitative Data Analysis (CAQDAS). Using CAQDAS allows the researcher to code and

analyze large amounts of text electronically, and retrieve work later (Bryman & Teevan, 2005; Gatrell & Elliott, 2014). More specifically, NVivo for Mac was used to code and determine theme frequencies. Results of the data analysis are presented in Chapter 4. See Figure 3.2 for a breakdown of participant recruitment and data collected for each research objective.

	Objective 1 (Chapter 4)	Objective 2 (Chapter 5)	Objective 3 (Chapter 6)
Participants	Organized youth team sport coaches; Organized youth team sport athletes (with asthma) and their parents	Organized youth team sport coaches	Organized youth team sport coaches; Organized youth team sport parents (of children with asthma or allergy)
Data	Semi-structured, in depth interviews with youth athletes (n=11), and coaches (n=18)	Focus groups (N=2); one online (n=5), one in-person (n=6), and one semi-structured in-depth interview	Coach (n=94) and parent (n=90) online surveys
Recruitment Methods	Community notification boards; Sports organization recruitment emails; Snowball sampling	Coach participants from Objective 1 (n=5); Sports organization recruitment emails; Snowball sampling	Coach participants from Objective 1; Coach participants from Objective 2; Sports organization recruitment emails; Twitter

Figure 3.2 Participant, Data and Recruitment Breakdown

3.3.3 Objective Two.

The second research objective, to investigate the impact of a coach education module designed to increase awareness of the links between the environment, allergic disease and physical activity, was also addressed using qualitative methods. More specifically, focus groups and an in-depth interview were conducted with organized youth team sport coaches in the Greater Golden Horseshoe region to increase understanding of how coaches understand and

manage asthma in sport, how they perceive and value the module, and recommendations for future module development. The criteria for participation were the same as the coach participation criteria outlined in Objective One.

Coaches were invited to complete the Air Aware Coach Module, to our knowledge the world's first online coach education tool related to allergic disease and asthma in sport. The module was designed by Clean Air Champions (an organization that aimed to educate Canadians [e.g., sport coaches, teachers, athletes, students] with respect to air quality and its impacts on health [Clean Air Champions, 2013]), and developed in partnership with the Coaching Association of Canada. The module addresses respiratory health and air quality for coaches, in order to ensure positive sport experiences for athletes with asthma or allergy (Clean Air Champions, 2013). The module is hosted by the Coaching Association of Canada website, and targets not only coaches at any level (recreational or competitive), but physical education teachers, nurses, parks and recreation staff, and anyone involved in implementing physical activity programs (Coaching Association of Canada, 2017). Participating coaches were invited to complete the module online, and were subsidized the cost of completion (\$15 CAD). Participating coaches received certification for module completion, which can be applied to their National Coaching Certification Program online profile. Following module completion, focus groups were held with at least a three-month delay, in order to provide coaches the opportunity to apply components of the module in their seasonal training, to understand how the key messages in the module were understood and perceived, and investigate any barriers the coaches had to module completion or application.

Participants were recruited using multiple methods. First, all coaches participating in the semi-structured, in-depth interviews covered in Objective One were asked if they were interested

in completing the Air Aware Coach Module; five semi-structured, in-depth interview participants decided to complete the module and participate in the subsequent focus groups. Next, a random sample of clubs from the list of sports organizations in the sample region (every fourth club) was contacted by email with a short description of the research and the potential benefits to coach participation, asking the organization administration to distribute the research description to their competitive and recreational coaches. Coaches interested in participation were supplied a Letter of Information (Appendix H). Finally, snowball sampling was used to complete the sample.

In order to complete the module, participants were sent the Module Completion Procedure by email (Appendix I). At least three months following completion of the module, coach participants were invited to participate in either an online or an in-person focus group (n=12 participants in total). Focus groups were chosen to investigate how coaches make sense of the module and understand its main messages, how coaches may challenge or work through ideas with each other with regards to the content of Air Aware, and how and why coaches manage asthma in sport in certain ways (Bryman and Teevan, 2005). Offering both an in-person and an online focus group aimed to reduce possible participant dropout, and ensure maximum inclusion of coach participants. This was particularly important in this context as coaches often have limited availability in the evenings or on weekends (e.g., some are parents that also work during the day, many have training or games scheduled on weeknights/weekends).

Focus groups were conducted in March 2015. Six participants were available for participation in the in-person focus group, which was held in a public meeting room in a library accessible to participants. Participants were provided coffee and water to ensure comfort, and the researcher took notes during the discussion. The online focus group used the meeting website GoToMeeting.com, which allowed discussion to be audio recorded, and documents to be shared

in real time so that participants could view the Consent Form and research materials online. Conducting qualitative research online provides benefits that include reducing temporal, financial, mobility and geographical constraints (Janghorban et al., 2014), and may even increase articulation of experiences and ideas due to perceived increased anonymity (Tates et al., 2009). While all of the coach participants had access to a computer with the Internet and earphones, computer accessibility could present a barrier to participation in online research. Finally, one coach was unable to attend either the in-person or the online focus group, and chose to participate in a semi-structured, in-depth interview (using the same interview schedule) as an alternative. Participants of both focus groups and the semi-structured interview were emailed the Consent Form (Appendix J) prior to participation, and the form was reviewed before the start of the discussion. All in-person focus group participants signed the consent form, while the online focus group participants aurally confirmed their consent to participate. Finally, in attempt to achieve maximum variation, participants were distributed the coach demographic information questionnaire (see Table 5.1 for Participant Demographic and Coaching Breakdown), following completion of the focus group (Appendix A). All participants consented to audio recording.

The focus group interview schedule was developed in consultation with the online Air Aware Coach Module; that is, questions related to the key themes or management behaviours from the module were incorporated into the interview schedule (e.g., ‘What does the Air Quality Health Index, or AQHI, mean to you?’). Next, two asthma in sport scenarios (both including Parts A and B) were developed based on module content, and both asthma in sport scenarios included in the interview schedule (Appendix K) referred specifically to Air Aware Coach Module content. The scenarios, or vignettes (Wilkinson, 1998), were included as a way to present possible realistic contextual factors related to coach asthma management, help generate

discussion around how coaches understand module content (Bryman & Teevan, 2005), and provide an indicator of how coaches may act in certain scenarios related to management of asthmatic athletes.

The interview schedule was reviewed by another member of the research team, and piloted prior to the start of the focus groups. In order to increase rapport and participant comfort, focus groups began with introductory questions related to coach experiences in sport, followed by general questions related to coach perceptions of the module (e.g., ‘Could you describe how you think the content of the module is relevant to the sport you coach?’). Few specific probing questions were asked in this section. Next, the asthma in sport scenarios were presented to participants in chronological order; the scenarios were read aurally, and participants were provided a print copy (in the in-person focus group), or a copy on screen (in the online focus group) to refer to for clarification. Finally, the focus groups concluded with questions related to their experience completing the module, and any recommendations for future module development. Participants were provided the opportunity to elaborate on any themes they perceived relevant related to the focus group discussions or the education module prior to completion of the focus group. Like the in-depth interviews, the focus groups were transcribed verbatim and proofed prior to thematic analysis. A codebook consisting of macro and micro codes was developed, and focus groups were analyzed deductively and inductively using NVivo for Mac to facilitate data organization and thematic analysis (see Appendix L). The online focus group (n=5 participants) lasted for 1 hour and 12 minutes, while the in-person focus group was 60 minutes long (n=6 participants). The in-person interview (n=1) lasted for 35 minutes.

Themes were organized into three main categories; short-term outcomes, medium-term outcomes, and user experience of the module. These themes were chosen specifically based on

the evaluation literature. While there are a several types of public health program evaluations that can be conducted (e.g., economic evaluation), in investigating the value of the Air Aware Coach Module, this research drew on elements of both outcome and process evaluations. Process evaluations are important in order to improve future program activities (CDC, nd), and questions related to *User Experience* of the module (e.g., recommendations for future education, barriers to implementation of module guidelines) were developed based on questions posed during process evaluations. Outcome evaluations, however, aim to investigate program effects in the target population through assessment of the outcomes of a specific program (CDC, nd), and could explore short-, intermediate-, or long-term outcomes (e.g., increases in knowledge, changes in attitudes and behaviour) (Harris, 2010). Specifically, this research investigated short-term outcomes of module completion, related to coach knowledge and attitudes with respect to asthma in sport. Medium-term outcomes were investigated related to possible coach asthma management behaviours (beneficial or adverse); indicators for coach behaviours were explored based on content from the Air Aware Coach Module during related to the asthma in sport scenarios. During thematic analysis, an evaluation researcher was consulted to ensure thematic organization and use of these terms was suitable. Outcome evaluations may also investigate long-term outcomes of public health programs (Harris, 2010). Long-term outcomes of the education module were not investigated in this research, but could include improved management of asthmatic athletes by coaches who have completed the Air Aware Coach Module. Results are presented in Chapter 5.

For all participants involved in the research process addressing objectives one and two, the researcher provided an option to receive a summary of the research once it is completed.

Participants who asked for a research summary will be distributed a 1 page summary following research completion.

3.3.4 Objective Three.

Finally, multiple methods were used to explore the use of Harrington & Elliott's (2015) conceptual framework in order to document the factors shaping asthma risk perception. The framework was used as a guide to design two online risk perception surveys; one for coaches of organized youth team sport, and the other for parents of athletes affected by allergic disease and asthma. The criteria for coach participation included that they must reside in Ontario and have coached a community-level organized youth team sport (under age 18, recreational or competitive, indoor or outdoor) in the 12 months prior to survey completion. For the parent sample, participation criteria included residing in Ontario, and having a child affected by asthma or allergic disease who had participated in community-level organized team sport in the 12 months prior participation. While the other two research objectives focused on how coaches, parents and athletes perceive and manage asthma and allergic disease in the Greater Golden Horseshoe region, the surveys were open to coaches and parents across Ontario in order to increase the sample size and investigate perceptions across a wider geographical area.

The two surveys were web-based, and prospective respondents were invited to visit the questionnaire hosted by FluidSurveys (now owned by SurveyMonkey). Participants were recruited in multiple ways. First, the sports organization database that was created earlier in the research was used in order to generate a list of clubs to contact to advertise the research. Originally, every second club was contacted (unless they had been contacted in the other steps in the research), however to increase the sample emails were distributed to all sports organizations on the list (if an organization received the parent survey, they did not receive the coach survey).

When contacted, the organizations were asked to post a description of the research and a link to one of the surveys on their website, or distribute details and survey link to their parent or coach membership distribution lists. In addition, an environment and health-themed research Twitter account was set up in order to increase survey distribution. Sports, health and asthma and allergy organizations in the sample region were followed on Twitter, and the account would periodically Tweet the survey link to its followers. While limitations with respect to using Twitter as a recruitment tool exist (e.g., potential participants must have access to a computer and be following the research account or someone that retweets the advertisement), speed of recruitment, cost efficiency, and its ability to target specific groups of potential participants provide significant benefits to its use (Guillory et al., 2016). Finally, snowball sampling was used to increase distribution of the survey (e.g., coach and parent participants from Objectives One and Two were asked if they knew anyone who would be interested in completing the online survey).

The coach survey was active from October 2013 to September 2014, while the parent survey from November 2013 to December 2014. Although the surveys aimed to investigate environment and health risk perception determinants and outcomes, they differed slightly between samples based on user group roles and behaviours (see Appendix M). Both surveys included open- and closed-ended questions to explore demographics, asthma and sport experiences, and environment and health risk perceptions. For example, questions asking participants to rank their agreement with statements related to general environmental attitudes and measures of trust and coping employed Likert scale questions (e.g., using a 5-option scale varying from Strongly Agree to Strongly Disagree). Both surveys were reviewed by another member of the research team and piloted prior to recruitment. When investigating risk perception

outcomes, the methodology employed by Harrington et al. (2012) and Krewski et al. (2006) was followed, whereby participants were asked to rate the risk posed to the Canadian public by 17 health risks; options for participants included 'high', 'moderate', 'low', or 'unknown'.

Overall, 94 eligible coach participants, and 90 eligible parent participants completed the surveys (see Tables 6.1 and 6.2 for Survey Sample Characteristics and Region of Residence, respectively). If participation criteria were not met (e.g., reside outside of Ontario, not involved in sport in previous 12 months), responses were removed from the data set. This occurred most frequently if participants stated they lived outside of Ontario (e.g., a number of US states including Florida, Minnesota, Ohio, Kansas and Missouri, other provinces including British Columbia and Quebec, and the United Kingdom, were identified as locations of residence). Other participants were removed from the data set if the outcome variable (asthma risk perception outcome) was missing. When a participant had a missing value (e.g., did not specify their marital status or other sociodemographic variable), a replacement value was generated using a hot decking imputation. In this approach, a randomly selected value is selected to replace a missing value for the 'recipient' from a 'donor' pool from within the sample based on other similar demographic variables (e.g., based on education, employment status, education). Imputation allows for plausible values to be considered in order to continue with analysis in large-scale quantitative data sets (Allison, 2002; Andridge & Little, 2011). Survey data was stored in Microsoft Excel, and IBM SPSS Statistics Software Version 25 was used to carry out univariate, bivariate, and multivariate analyses.

The coach and parent surveys collected a range of data, including socioeconomic position and demographics, attitudinal data related to environment and individual, family and Canadians' health, indicators of levels of trust, data related to the sport physical and sociocultural

environments, risk exposure, and risk perception outcome data. Certain questions are consistent across both coach and parent surveys, while other questions (e.g., coaching or medical qualifications, time of training) are unique to each survey. For efficiency and to ensure our surveys were accurately measuring the stated concepts, certain survey items were grouped to construct a scale. For example, environment and health attitudes were measured using a series of five statements in both coach and parent surveys, and the survey items were used to construct an Environmental Attitudes score (Cronbach alpha value of .810 and .739 for the coach and parent scores, respectively). Similarly, in order to increase understanding of participant knowledge of asthma, nineteen survey items on asthma symptoms, and twenty survey items on asthma triggers were used to create an Asthma Symptom Knowledge score and an Asthma Trigger Knowledge score, respectively, for both coach and parent surveys (see Appendices P and Q for survey questions and the triggers and symptoms included). The Cronbach alpha value for the Symptom score was .855 for coaches, and .881 for parents, while the value for the Trigger score was .905 for coaches, and .891 for parents.

The risk perception outcome ratings were grouped together to represent high risk versus low risk (e.g., risks ranked as “moderate”, “low”, or “unknown”). Using the asthma risk perception measure as the outcome variable (“high” versus “other”), a bivariate analysis was conducted to investigate which variables were correlated with asthma risk perception outcomes. Depending on the nature of the data, Chi-square tests (e.g., for categorical data), Fisher’s exact tests (when a cell size count was less than 5), independent t-tests (e.g., for continual data), and a Mann-Whitney U test (e.g., to test the difference between coach and parent asthma risk perception outcomes) were conducted (see Table 6.4 for Bivariate Results).

In order to explore the possible determinants of asthma risk perception (“high” versus “other”), binary logistic regression was conducted with both coach and parent data. Variables were chosen for inclusion in the models based on bivariate results (e.g., Environmental Attitudes score, Trust variables), and environment and health risk perception literature (e.g., sociodemographic variables that make theoretical sense for inclusion). The fit of the models was assessed using the Omnibus Test of Model Coefficients ($p < .000$). The Nagelkerke R square value and percentage of correct predictions from the Classification Tables are reported.

Fulfilling the third research objective also involved investigating the role of the political environment in shaping risk perception outcomes. To understand how environment and health issues, particularly asthma, are prioritized and managed in the youth team sport context, a policy and guideline content analysis of community sport organization websites in the Greater Golden Horseshoe Region of Southern Ontario was conducted. This content analysis aimed to understand the frequency of certain themes or phrases (Bryman & Teevan, 2005; Gatrell & Elliott, 2014), identified either on the sport organization website, or in a policy or guideline document linked to the website.

The policy and guideline content analysis was conducted in January and February 2018. A list of 193 community-level, sport organization websites was compiled (Appendix D) through an online search of possible team sports in the region (e.g., the sample frame for the surveys and interview participants). The original sport organization sampling frame ($N=219$) (for interviews and focus groups, see Objectives 1 and 2) was reviewed and updated to account for sport organization changes (e.g., new affiliations or club closures). Criteria for inclusion included that the sports organization offers team sport for children and youth 18 years and below, is located within the sample region, and provides a website in English. Each of the websites was reviewed

using a Data Extraction tool (Appendix N), designed to investigate whether environment and health issues are identified on the organization website, and more specifically document whether asthma or factors that impact its management are included (e.g., asthma management, extreme weather management or related policies [e.g., use of the Air Quality Health Index]) (see Table 6.3 for Sport and Health Themes Identified). The primary researcher searched and reviewed each organization website, and completed the Data Extraction tool for each site before compiling the frequency of mentions related to environment and health themes (e.g., air quality, climate change, allergy and asthma management). Results addressing the third objective of this research are presented in Chapter 6.

3.4 Assessing Rigour

Strategies to ensure rigour in both the qualitative and quantitative components of this research were considered. Ensuring rigour in qualitative research is essential to ensure credibility of findings (Noble & Smith, 2015) and for effectively implementing findings in practice.

Qualitative (geographical) research often aims to reflect diversity within a particular population (e.g., including outliers) as geography researchers seek to investigate meaning, processes, and relationships across space and time (Barbour, 2001). In order to evaluate rigour in the qualitative component of this research, strategies to ensure four primary criteria (credibility, dependability, transferability, confirmability [Baxter & Eyles, 1997; Lincoln & Guba, 1986]) were applied.

Credibility is a critical principle for guiding qualitative research, and is defined as the degree to which descriptions of human experience are authentic representations of experience (Baxter & Eyles, 1997). Credibility assumes that no single reality exists, and the goal of the researcher is to adequately provide an accurate description of the research participants' accounts, behaviours, and perspectives in a way that is relatable to participants who provided those

account(s). To enhance credibility, multiple strategies can be employed. For example, purposive sampling is often used by qualitative researchers (Barbour 2001; Baxter & Eyles, 1997) in order to sample ‘information-rich cases’ and provide deep understanding of context. In this research, purposive sampling was employed to target specific groups (e.g., coaches of youth team sport, youth athletes affected by asthma), and snowball sampling was used to seek out ‘information-rich cases’ by asking other participants if they knew anyone that they believed would be interested in participating in the semi-structured in-depth interviews or completing the Air Aware Coach Module. Other strategies used to ensure credibility included peer debriefing (e.g., with another member of the research team to discuss interpretation of results), member checking (e.g., when participants were asked either during or following the interview to confirm their agreement with the interviewer’s summary of content they provided when discussing the interview questions), developing interview rapport (e.g., attempting to ensure participants were comfortable in order to foster deep conversation and reduce the power dynamics associated with interviewing), and triangulation (e.g., source triangulation when similar themes emerge from different participants or participant groups). Finally, the primary researcher aimed to ensure prolonged engagement (e.g., through personal involvement in the youth team sport community), in order to allow for deep contextual understanding of participant responses and accounts, understand and engage with the culture of the relevant groups and increase understanding of possible misinformation or bias introduced by respondents or herself.

Strategies to ensure dependability aim to minimize instability and design-induced change, and maintain reliability of the research over space and time (Baxter & Eyles, 1997). To maintain dependability, this research audio recorded interviews and focus groups, transcribed data verbatim, and the transcripts were proofed to reduce errors prior to coding. Peer debriefing

occurred as interviews were discussed with another member of the research team, who also reviewed the interview/focus group schedules and coding manuals prior to interviewing and analysis, respectively.

Transferability is defined as the degree to which findings can fit within contexts outside of the study, and is similar to the term generalizability in quantitative research (Baxter & Eyles, 1997). Qualitative results are often specific to a certain time, population, and setting, however experiences and meanings may be common to a larger group. In order to address transferability, this research provided a deep contextual description in multiple ways. First, providing a thick description of the research setting provides an increased understanding of the types of geographical contexts where results may be applicable. Further, offering detailed description of participant opinions and responses allows a more in-depth understanding of the types of contexts where similar findings may be applicable. Conducting interviews to saturation helps identify the possible perceptions and experiences related to asthma management in sport, that could be similar in different geographic or sociodemographic contexts.

The final criterion is confirmability, which is defined as the extent to which biases and interests of the researcher influence interpretations of the research. Ensuring critical reflexivity is essential in attempting to situate oneself in the research process, maintain objectivity in research design and analysis, and account for personal biases that may impact findings (Noble & Smith, 2015). Important in this process is the ongoing reflection of the researcher; the primary researcher reflected on (and adjusted) the interview schedule following the interviews/focus groups (e.g., based on interactions with participants), and aimed to ensure rapport with participants through general conversation (e.g., often related to team sport participation). This process aimed to ensure participants would not feel intimidated and uncomfortable, and facilitate

communication and understanding of participant perceptions and behaviours. Similarly, acknowledging positionality and its potential role in influencing participants and results is important. As a young female researcher with a background in organized team sport participation (both as an athlete participant at the time of interviews, and as a coach of competitive girls' soccer), common areas of interest related to their sport and team (with both the child and youth participants and coaches) enabled easy discussion and a comfortable environment prior to the beginning of the interviews. Further, non-threatening, athletic clothes were chosen for the interviews and focus groups (e.g., a soccer training jacket), to reduce the inherent power dynamics between interviewer and participant, and in attempt to demonstrate to participants an understanding and embeddedness in organized youth team sport in Ontario; this action aimed to encourage honest and detailed accounts related to interview content.

As this research uses mixed methods in order to better address the research objectives, rigour is assessed in different ways when using both qualitative and quantitative approaches (Brown et al., 2015). In the quantitative component of this work (Objective 3/Chapter 6), measures to ensure validity, reliability, and replicability were undertaken. Validity refers to the extent to which a concept is measured accurately (Heale & Twycross, 2015). For example, to ensure content validity, the surveys were reviewed by multiple members of the research team, and piloted prior to dissemination to potential participants. Further, other research investigating perceptions of Canadian health risks and environmental attitudes was consulted (Krewski et al., 1995; 2006; Harrington et al., 2012), in order to inform survey design to ensure a valid methodological approach that accurately measures the desired variables was applied. Reliability, which refers to the consistency of a measure (Heale & Twycross, 2015), was addressed in survey questions related to environmental attitudes, trigger knowledge, and symptom knowledge. For

example, the survey questions measuring concern about the possible impacts of the environment on human health were used to construct an Environmental Attitudes score. Cronbach's alpha value is most commonly used to test the internal consistency of a scale (Heale & Twycross, 2015), and was calculated for the coach and parent Environmental Attitudes score, Asthma Trigger Knowledge score, and Asthma Symptom Knowledge score. An acceptable reliability score falls between 0.7 and 0.95 (Heale & Twycross, 2015; Tavalok & Dennick, 2011); the coach and parent scores for each scale fell within the suitable score range (see Chapter 6 for reporting of results). Finally, replicability (defined as the degree to which a study supplies the relevant detail to verify the results through repeating the study) (Brown et al., 2015; Bryman et al., 2008) was considered in ensuring a clear and complete explanation of the participants, materials, procedures, and analysis of the quantitative component of this research.

3.5 Chapter Summary

The preceding chapter outlined the study area of this research, in addition to the research design and methodology used to address the three research objectives. Strategies to ensure rigour were discussed in the final section of the chapter.

CHAPTER FOUR

Manuscript #1 - They Say “Kids with asthma don’t play sports”: Geographies of Asthma

Asthma is common among children worldwide. Although complex, physical activity participation is important in asthma management, to decrease chronic disease risk, and to facilitate healthy lifestyles for children. Team sport participation is a common way for children to engage in physical activity, but the spaces in which team sport is experienced can present social, physical and emotional challenges for vulnerable children (e.g., those with asthma). This research aims to understand elements of the environment, broadly defined, that impact experiences of asthma in sport. In-depth interviews were conducted with youth team sport athletes (n=11) diagnosed with asthma, and youth team sport coaches (n=18) in Ontario, Canada. Results suggest that understanding the physical and social needs of vulnerable athletes, and ensuring well-controlled asthma, are critical to maximizing performance and improving quality of life for asthmatic athletes.

Submitted to: Children’s Geographies

4.1 Introduction

Asthma is a major health burden that can substantially impact the quality of life of those affected (To et al., 2012). There has been a substantial increase in the prevalence of asthma and allergic disease since the mid-20th century (D’Amato et al., 2015; Subbarao et al., 2009); asthma is now the most common chronic disease among children worldwide (Leinaar et al., 2016; WHO, 2017).

During an attack, airway linings become inflamed or partially blocked, causing the airways to narrow thus reducing airflow; this leads to coughing, wheezing and difficulty breathing (Subbarao et al., 2009). Attacks vary in severity and frequency, and some experience worsening symptoms during physical activity (WHO, 2017). Triggers also vary, and many are environmental (e.g., air pollutants, cold air; Subbarao et al., 2009). While the complete etiology of asthma remains unknown, complex gene-environment interactions, and the changing

environments in which we live likely play a significant role in asthma development (Subbarao et al., 2009) and severity (D'Amato et al., 2015).

In addition to the direct physical symptoms, asthma and respiratory allergy present challenges for participation in physical activity. This is critical, as physical activity plays a significant role in maintaining a healthy body weight, decreasing chronic disease risk (e.g., cardiovascular disease), improving mental health and quality of life, and facilitating healthy lifestyles for children (Lienaar et al., 2016). For asthmatic children, benefits beyond improved aerobic fitness include improved running performance, decreased intensity of wheezing, increased participation in activities with peers (Lucas & Platts-Mills, 2005), and reductions in hospitalization, school absenteeism, and medication usage (Welsh et al., 2005); indeed, the American College of Sports Medicine and the American Thoracic Society have endorsed a prescription of exercise for all asthmatic patients (Lucas & Platts-Mills, 2005). Despite the noted benefits, children with asthma face unique social, physical and psychological barriers to physical activity participation (Lienaar et al., 2016), and are generally less active than their non-asthmatic peers (Williams et al., 2008).

Participation in organized sport is a common way for children to engage in physical activity (Tofler & Butterbaugh, 2005), and can provide additional physical and social benefits as it increases vigorous activity and energy expenditure, is linked with improved social skills, teamwork, self-esteem, and provides a venue for developing gross motor skills (Merkel, 2013). In Canada, approximately 49% of children between 5-19 years take part in organized sport outside of school (Participaction, 2015). Approximately 1.8 million Canadians coach youth sport (CCES, 2008), however most are volunteers with little training in child development or environment and health issues. For example, in the US, less than 8% of high school coaches, and

fewer than 20% of the 2 to 4 million “Little League” coaches have any formal training (Merkel, 2013). A coach can significantly impact sport enjoyment, help minimize health risks, and promote athlete retention and long-term sport participation.

The team sport environment presents a setting for asthma management that can be either supportive or present barriers to successful management and prevention. While Weiss et al. (2010) found a lack of knowledge around athlete asthma diagnosis and symptoms amongst coaches, we do not know how coaches interact with asthmatic athletes, how athletes perceive and manage their own asthma, and how interactions with teammates and coaches impact participation, behaviour, and possible inequities (e.g., in playing time).

4.1.1 Geographies of asthma in sport.

The links between the team sport environment and athlete health are inherently geographical; the way health is shaped and experienced cannot be fully understood in isolation from environmental factors. We conceptualize the environment broadly to include both the physical and sociocultural contexts that can directly or indirectly shape health (Woolf & Aron, 2013). In this way, the spaces in which sport is experienced are impacted by the characteristics of their physical and sociocultural environments. With respect to the physical environment, although recreation facilities are generally considered health-promoting (e.g., ‘safe’ spaces for activity), their physical characteristics can and do impact health in other ways. For example, potential safety risks on a playing surface (e.g., dusty gym floor), the proximity of an outdoor playing field to pollutants (e.g., major roadways, construction of playing fields on brownfield sites), or climatic and weather-related factors (e.g., lightning) differ geographically and alter the ‘safe’ sport landscape.

Further, the sociocultural environment can play a significant role in athlete development, enjoyment, and performance. The actors with whom youth athletes interact (e.g., coaches, parents, teammates) impact the social and emotional sport experience. For example, for young athletes, primary goals of participation are often linked to enjoyment, being active, and developing new skills. Parent perceptions, however, of why children participate in sport relate primarily to success and winning. This disconnect between athlete and adult perspectives and behaviours in youth sport (e.g., coaches implementing physical punishment at a young age) can lead to a sociocultural environment that contributes to youth athlete stress and unhappiness (Merkel, 2013). The sport environment can also take a different shape for youth participants with a pre-existing medical condition, as a result of differential impacts of the social (e.g., teammate stigmatization) and physical (e.g., exposure to triggers) spaces in which sport occurs. In this way, stigmatization related to asthma can adversely impact an athlete's engagement with sport. Alternatively, an environment where stakeholders are committed to successful asthma management can encourage long-term participation for vulnerable athletes.

While sport organizations and coaches intend to create 'safe' sport spaces for children, participation in these spaces carries inherent risks, and 'safe' spaces can quickly transition to landscapes of risk ('risk-scapes' [Fenton et al., 2013]) for vulnerable participants. For example, an outdoor training session conducted on a day with high pollen counts may transition to a 'risk-scape' with increased exposure to asthma triggers. While coach decisions are likely made with what is perceived as the child's best interest, without understanding individual risk factors, the sociocultural and physical context of athlete vulnerability, and athletes' everyday experiences of risk, organizational policies and individual coach decisions risk unintended consequences to participant wellbeing, and can turn 'safe' spaces into spaces of physical and social risk.

The risk perception literature has traditionally framed risks to children from an adult perspective, giving little emphasis to the voice of children and youth themselves (Matthews & Limb, 1999). For example, Sonney et al. (2016) describe how parents rely on their objective symptom observations, rather than their child's description of asthma. Literature conceptualizing children as a potentially vulnerable social group that live and experience marginalization differently to adults is, however, emerging. In the context of asthma, Simon (2013) found that while urban adolescents understand triggers and symptoms, they often report that asthma cannot be controlled. This perspective conflicts with management goals, and in the context of physical activity, is consistent with Williams et al.'s (2008) description of asthmatic youths' acceptance of sub-optimal control of symptoms. Similarly, Gabe et al. (2002) reported that youth in London, UK describe restrictions due to symptoms. This emerged particularly with respect to physical activity, including participation in organized sport. Although participants described medication use for asthma management, attitudes embedded in the sociocultural environment (e.g., hiding symptoms to appear similar to non-asthmatic peers) were reported (Gabe et al., 2002). The desire to maintain ordinariness was also articulated in Prout et al.'s (1999) exploration of management strategies amongst English families, whereby parents and children considered a certain amount of coughing and wheezing as normal. Despite this perspective, children reported that their ability to participate in 'going out to play' or 'running fast' was at times reduced.

In team sport specifically, we know little of how children and youth with asthma understand and manage their asthma from their perspective. We aim to go beyond the policy and governance of asthma in sport, and focus on the experiences of vulnerable children and the physical and social spaces they themselves navigate. We use a methodological approach in which children and youth are directly asked about their experiences, giving voice to those

affected in order to understand their subjective risk experience, and how these perspectives intersect with the values adults (e.g., coaches and parents) assign to the environments in which children live, play, and experience health. This research therefore aims to fill these gaps from a geographical perspective; that is, we intend to understand elements of the environment, broadly defined, that impact the experience of asthma in youth sport. More specifically, this paper investigates the knowledge, attitudes, and practices (e.g., management and prevention behaviours) of organized youth team sport athletes (diagnosed with asthma) and coaches, in Ontario, Canada.

4.2 Research Design and Methods

This research investigates responses from semi-structured in-depth interviews with youth team sport athletes diagnosed with asthma, their parents, and youth team sport coaches. Interviews were conducted between October 2013 and August 2014 in the Greater Golden Horseshoe Region of Ontario, Canada. Participants were recruited from across sociodemographically diverse communities, consistent with our maximum variation sampling method.

This research was granted ethics clearance by the University of Waterloo Research Ethics Committee. Participants included community-level recreational and competitive youth team sport participants between 11 and 18 diagnosed with asthma (n=11), and coaches of organized youth team sport (n=18). Athlete parents (n=10) were also invited to participate. Coach and youth participants were recruited through sports organizations in the sample region, and inclusion of clubs in the sample frame was restricted to those providing recreational or competitive, outdoor or indoor, team sport focusing on children and youth. After compiling a list of organizations (N=219), a random sample was contacted by email and asked to distribute an

advertisement to their coaches and youth participants. Coaches whose email addresses were provided on the organization websites were contacted directly. To complete the sample and fill gaps in participant characteristics, snowball sampling was used. Interviews were conducted in person in a private room at a community venue (e.g., sports organization, library), or in a public location of the participants' choice (e.g., coffee shop). Data collection continued until theme saturation was reached, and player interviews lasted 35-63 minutes, while coach interviews lasted 26-75 minutes.

Semi-structured in-depth interviews were chosen to explore the rich perspectives and experiences of participants. Interview schedules were created following a review of the literature based on the links between the environment, physical activity, allergic disease, and sport participation. While player and coach interview schedules cover similar themes (overview of sport participation, environment and health, asthma knowledge, attitudes and practices), it is important to recognize that both sets of participants were recruited with slightly different understandings of the research. Recruitment advertisements targeted toward coaches described the researcher's interest in hearing coach perspectives on the links between environment and health in team sport, while athlete and parent recruitment was directly related to their diagnosis with allergic disease.

Interviews were conducted by the first author, and began with a general discussion of participant experiences in sport, in order to develop rapport before progressing to themes related to asthma. Interviews were digitally recorded, transcribed verbatim, and proofed to increase familiarity (Nowell et al., 2017). NVIVO for Mac was used to code and organize transcripts. Transcripts were reviewed by the first author and the major themes were discussed with the second author before proceeding with thematic analysis. Transcripts were coded deductively

(e.g., using the research objectives and broad themes from the interview guides), and inductively (e.g., recognizing emerging themes; in this work, this primarily consisted of the physical and sociocultural factors that contribute to experiences of asthma). The theme code set and interpretation of findings were discussed by both authors throughout analysis, to enhance credibility and confirmability (Nowell et al. 2017) .

4.3 Results

Following an overview of participant characteristics, the results section is organized around four primary themes. Athlete results are reported first, followed by coach perspectives.

4.3.1 Participant characteristics.

4.3.1.1 Players and parents.

There were n=11 athlete participants born between 1995 and 2002 (n=6 females, n=5 males). A parent attended all but one interview (Player 8, 18 years). All athletes were involved in soccer, as well as volleyball (n=4), ringette (n=4), football (n=3), and hockey (n=1).

4.3.1.2 Coaches.

Eleven male, and seven female coaches participated. The majority were head coaches (n=8), although six were involved with multiple teams/roles. Coaches had a range of experience in years of coaching, team age and gender (male and female teams between 8-18 years were represented), and qualifications; 17 coaches had some form of coaching qualification, while 9 had some form of medical certification (e.g., First Aid). Participants were involved in a range of sports, primarily soccer (n=6), hockey (n=4), and basketball (n=2). Other involvement included ringette, volleyball, baseball, and curling.

4.3.2 Primary themes.

4.3.2.1 Sport, environment and health.

4.3.2.1.1 Players and parents.

Players were asked to describe how the environment could impact health and participation in sport. Broad environment and health issues were described, and without probing, six participants reported asthma/allergies. This was often related to the links between the physical, and in particular the natural, environment (e.g., temperature [n=6]) and asthma:

When it's cold, it's harder to breathe... and when it's really hot it's hard to breathe and play hard for the whole time. (Player 1)

Other components of the physical environment described by players in this context were related to extreme weather, including temperature (cold [n=4], heat [n=4]), and precipitation (n=2):

Extreme heat, I've seen players who can normally play a full game... they don't have allergies, asthma, or anything, they'll just completely drop their level and ask to come off. They really struggle, so high heat is one factor. When the allergy seasons are bad, then I see players who have allergies and asthma, they struggle. They come off for their puffers. They're not able to give 100%. (Player 7)

Elements of the sociocultural environment were identified less frequently in the broad discussion of the impacts of the environment on sport; stress (n=2), interactions with teammates (n=2), or the coach (n=1) were briefly mentioned.

When asked about factors that impact players' performance or enjoyment, components of the physical environment were not mentioned frequently (n=2 for each enjoyment and performance). This was often in the context of asthma or allergies; for example, this parent described various pathways the physical environment can affect asthma, performance and enjoyment for her child:

The environment affects asthma and health. Whether it's a hot, humid day, whether it's smoggy, whether there's a lot of pollen in the air... it certainly does affect your enjoyment, because when you can't catch your breath or can't get as much oxygen, your performance suffers and your ability to perform at the level you know you can perform suffers. (Parent 11)

Similarly, a father and daughter, describing her experience as a soccer goalkeeper, articulated the impacts of asthma and allergies:

Player: I run around going [breathing hard].

Parent: With her goalie gloves on, and she's got a Kleenex in her waistband.

Player: When I rub my eyes with my goalie gloves on, all the grass from catching the ball goes into my eyes, and it goes crazy. (Player 2)

Elements of the sociocultural environment were identified more frequently when discussing performance (interactions with coach [n=5], interactions with others in sport [n=4], interactions outside sport [n=2]), and enjoyment (interactions with others in sport [n=3]):

If I'm stressed, like school... that might affect how I play... But usually when I do play, and I'm stressed, when I go out and play, it just goes away... So it actually kind of helps me get rid of that. (Player 9)

More in-depth discussion related to the sociocultural environment, however, emerged around asthma attitudes and behaviours. Other factors, such as players' confidence (n=8), personal contribution (n=5), and personal factors (e.g., rest) (n=6) were reported frequently when describing players' performance and enjoyment.

4.3.2.1.2 Coaches.

Coaches were asked about the links between the environment, health and sport.

Components of the physical (e.g., built [facility safety], natural [heat]), and sociocultural (e.g., team dynamics) environments were identified. Without prompting, asthma and allergies were mentioned by n=6 participants, while physical injuries (e.g., concussion) were mentioned frequently (n=12). Specifically, elements of the physical environment, including outdoor (n=4) and indoor air quality (n=3) were identified as respiratory risks:

Around the dome was an all dirt driveway... and exhaust from the vent to take the air out or bring the air in, all up the side of the dome was brown... as soon as I got out of there, I coughed for two hours straight with all this junk coming up into my lungs. (Coach 3, Soccer)

Coaches also identified health risks related to the physical environment (e.g., temperature [n=7], humidity [n=4], air quality [n=4]) not directly in the context of asthma:

Even the older kids having practices during the day, they'll complain about being out there when it's too hot. (Coach 1, Baseball)

Other possible environment and health impacts related to the physical environment included facility impacts (n=4) related to extreme weather/precipitation:

So we've had really wet springs, where it rains all the way to the beginning of June, that has a certain impact. When it's really, really arid, it also impacts the outdoor availability of fields and all the grass is dead, so you're playing on concrete instead of grassy fields. (Coach 4, Soccer)

The sociocultural environment was less frequently mentioned in the discussion of environment, sport and health. When reported, the environment set by coaches (n=2), and relationships and interactions with teammates (n=2) or family (n=1) were described:

They were sitting on the bench... and her dad is up in the stands, and she didn't play well. She knew in her mind, she knew she had to drive from London to Toronto with her father. The mother said the dad screamed at her all the way back. Just a piece of work this guy. (Coach 8, Basketball)

In this discussion, the environment's impacts on performance (n=7) and enjoyment (n=7) were identified. The potential for temperature (n=2), wind (n=1), rain (=1), and lightning (n=1) to impact an athlete's experience were described:

We have tournaments in the middle of summer, and they're five or six games. As a coach, you can't expect a kid to catch all six games in the heat behind the plate with the equipment on... so the long innings do affect your performance. (Coach 1, Baseball)

Elements of the sociocultural environment were identified by coaches as contributors to player performance and enjoyment, including interactions with the coach (n=9), team dynamics (n=4), and player stress and anxiety (n=2):

I think if anybody's in a team, and feels part of that, it's like being part of a family... You're always going to feel good about coming, feel good about yourself, and I think if comments are always positive from a coaching staff: 'Great job,' 'Hey you may have to

work on stuff, but that was a good effort,’ ‘Good job.’ Then I think the attitude stays good in the team. (Coach 12, Hockey)

Other identified factors include those at the individual level (e.g., physical fitness), events from outside of sport (e.g., school), and personal health.

4.3.2.2 Knowledge.

4.3.2.2.1 Players and parents.

Players and coaches were asked to identify what they consider triggers and symptoms (Table 4.1). Shortness of breath was identified by each athlete, and coughing (n=6), wheezing (n=5), and chest tightness/pain (n=5) were described. With respect to triggers, elements of the physical environment were reported (temperature [n=11], humidity [n=9], seasonal impacts [n=8]) (Table 4.2):

Player: I don't honestly know what could trigger asthma for me. It's running really fast, like as quick as I could. That's mostly it...

Parent: More so in the heat? Not so much in the cold. Right?

Player: Yea. The heat because it's making you sweat more, even though you might just be sitting outside. (Player 10)

While an element of the sociocultural environment (e.g., emotional stress) was identified as a trigger (n=7), when players were asked about the impacts of emotional stress, no participants believed it impacted their asthma. Exercise was the most frequently described trigger amongst athletes.

Table 4.1 Participant-Identified Symptoms

	<i>Players/Parents</i>		<i>Coaches</i>	
	# of Participants (% of total)	# of Mentions (% of total)	# of Participants (% of total)	# of Mentions (% of total)
Shortness of Breath	11(100)	40(41)	17(94)	43(53)
Coughing	6(54)	16(16)	3(17)	6(07)
Wheezing	5(45)	10(10)	7(39)	12(15)
Chest Tightness/Pain	5(45)	9(09)	4(22)	5(06)
Feeling Weak	4(36)	7(07)	1(06)	1(01)
Feeling Out of Shape	2(18)	4(04)	1(06)	1(01)
Turn Red	2(18)	3(03)	3(17)	3(04)
Dizziness	2(18)	2(02)	0(0)	0(0)
Emotion	1(09)	3(03)	6(33)	8(10)
Sweating	1(09)	2(02)	1(06)	1(01)
Loss of Colour	0(0)	0(0)	1(06)	1(01)
<i>Total</i>	<i>11*</i>	<i>97(100)</i>	<i>18*</i>	<i>81(100)</i>

**This is not equal to the sum of the numbers in the column due to multiple responses*

4.3.2.2.2 Coaches.

When discussing symptoms, shortness of breath (n=17) was most frequently identified (Table 4.1), in addition to wheezing (n=7), chest tightness (n=4), and emotional stress (n=6).

Symptoms were frequently identified related to coaches' personal experiences with asthma (e.g., personal diagnosis):

It goes straight back to wheezing. I remember being scared as a kid during attacks, and gasping for breath, and then I know there are other side effects, but that's the big one for me, just the wheezing and not feeling like you can get your breath, causing panic.
(Coach 1, Baseball)

When asked about triggers, exercise (n=15) was most frequently reported. Elements of the physical and sociocultural environments were identified, including temperature (n=11), humidity (n=7), and emotional stress (n=6) (Table 4.2):

I'd say the heat, because it seems like with the smog and things like that, you have poor air quality days... and just physical exertion as well related to sports. (Coach 15, Curling)

Table 4.2 Participant-Identified Triggers

	<i>Players/Parents</i>		<i>Coaches</i>	
	# of Participants (% of total)	# of Mentions (% of total)	# of Participants (% of total)	# of Mentions (% of total)
Exercise	11(100)	72(37)	15(83)	34(26)
Temperature	11(100)	36(18)	11(61)	21(16)
Humidity	9(81)	17(09)	7(39)	14(11)
Seasons	8(72)	18(09)	6(33)	13(10)
Emotion	7(63)	7(04)	6(33)	18(14)
Grass/Pollen/Ragweed	6(54)	11(06)	3(17)	4(03)
Outdoor Air Quality	4(36)	9(05)	5(28)	7(05)
Time of Day	4(36)	5(03)	3(17)	4(03)
Tobacco Smoke	3(27)	6(03)	1(06)	1(01)
Pet Dander	2(18)	6(03)	2(11)	3(02)
Dust	2(18)	4(02)	2(11)	2(02)
Vehicle Exhaust	2(18)	3(02)	3(17)	3(02)
Indoor Air Quality	2(18)	2(01)	3(17)	4(03)
Industrial Pollutants	1(09)	1(05)	0(0)	0(0)
Mould	0(0)	0(0)	2(11)	5(04)
<i>Total</i>	<i>11*</i>	<i>197(100)</i>	<i>18*</i>	<i>132(100)</i>

**This is not equal to the sum of the numbers in the column due to multiple responses*

Most coaches identified players they coach that are affected by asthma or allergy (n=13). Others (n=5) stated they rarely, or are unsure if they interact with asthmatic athletes. When describing those impacted, the sociocultural environment emerged as relevant. Some coaches

reported they perceived asthmatic players to be out of shape, that symptoms may be related to their physical fitness rather than asthma, or that players may use asthma as an excuse:

I know there's one that thinks she has asthma. Mom doesn't, Dad does... they're fighting over whether she has asthma or not, but she's not in shape... She's like 'oh, I have to come off. I have asthma.' ... But she does these sprints, and then she thinks that she's, you know, and she'll use that as an excuse, but she hasn't been diagnosed. (Coach 3, Soccer)

4.3.2.3 Attitudes.

4.3.2.3.1 Players and parents.

When discussing players' experiences of asthma, various attitudes were identified (Table 4.3). For example, impacts on performance were described in each interview (n=11):

I'd say that while the performance isn't the trigger, it does affect performance when he plays and you can tell just by the way he's breathing, as a parent you learn the signs... I can see when he's struggling with his asthma, a definite decrease in his ability to perform at the level I know he can. (Parent 11)

Feelings of frustration (n=5) were also described by players. For example:

It's very annoying when I really want to play in an important game, and I suddenly have an attack and have to go off the field, because I feel like I'm letting everybody else down, and I feel like I'm letting myself down by not participating, and it just gets in the way. (Player 5)

I don't want to come off, you know? I want it to go away, so I try and push through it, and then it's really bad, to the point where I have to come off... I also don't want to disappoint my coach. You know if I'm doing well, I want to stay out there, right? I just feel bad. (Player 8)

Fear associated with the impacts of asthma (n=5) was also described. This emerged related to symptoms, stigmatization and of letting coaches or teammates down:

I had to actually go down and off the field and rest ... it's just bad because I actually kind of got a bit panicked... like oh my god I can't breathe. I can't talk to try and tell the coach or tell the ref, I need to go down. So I felt a bit panicked. (Player 6)

Finally, participants reported feelings of embarrassment (n=4), particularly when using medication or reducing participation:

I don't like watching. It's annoying too and I feel embarrassed almost by it, because... I'm there to play. I'm not there to watch. When a coach is like urging me to get back... it just makes me feel worse. (Player 5)

It can be embarrassing as well. You know that you're reaching for a puffer and you're struggling for your breath and you don't want everybody to know about it. (Parent 4)

Table 4.3 Participant-Identified Attitudes

	<i>Players/Parents</i>		<i>Coaches</i>	
	# of Participants (% of total)	# of Mentions (% of total)	# of Participants (% of total)	# of Mentions (% of total)
Impacts Performance	11(100)	37(22)	14(78)	28(25)
Social Stigma	10(91)	49(28)	9(50)	19(17)
Barrier to Sport Participation	10(91)	46(27)	4(22)	5(04)
Frustration	5(45)	15(09)	3(14)	3(03)
Fear	5(45)	9(05)	0(0)	0(0)
Hide Symptoms	4(36)	8(05)	7(39)	15(13)
Communication with Teammates	3(27)	7(04)	0(0)	0(0)
Optimistic	1(09)	1(01)	0(0)	0(0)
Doubt Symptoms	0(0)	0(0)	7(39)	13(12)
Cynical/Skeptical	0(0)	0(0)	5(28)	19(17)
Do Not Know	0(0)	0(0)	4(22)	5(04)
Understanding	0(0)	0(0)	4(22)	5(04)
Uncertain How to Manage	0(0)	0(0)	1(06)	1(01)
<i>Total</i>	<i>11*</i>	<i>172(100)</i>	<i>18*</i>	<i>113(100)</i>

**This is not equal to the sum of the numbers in the column due to multiple responses*

In this context, the sociocultural environment emerged as significant. Most players (n=10) identified social stigma related to sport participation with asthma. Players described feelings of stigmatization by teammates or coaches, particularly related to being penalized by coaches (e.g., playing time) or teammates for symptoms beyond their control:

Certain players will understand... but others might say 'come on, you've got to run faster, you've got to run harder, and you have to do more work. You're jogging, you need to run!' (Player 3)

She's had experiences where it's been physical, like her asthma, and [the coach] has chosen to blame other things. (Parent 1)

Being punished for something I had no control over, so whether that be not allowed to go back in, or play in an important game... when I'm capable. (Player 5)

Player: Some people think that [with] asthma, you must be out of shape. No, I actually have asthma... I feel self-conscious about it. Not for any particular reason, just like when you have to come off because of your asthma, like are you serious?... It's hard sometimes, and you want people to understand. Some people don't, some people do.

Researcher: When you say some people, do you mean teammates ...?

Player: Teammates or coaches... I worry more about the players, because teenage girls... can be judgmental sometimes. (Player 8)

Some players (n=4) identified hiding their asthma from coaches or teammates. For example, this player and parent described the fear of disclosing adverse conditions when opportunities with competitive teams arise:

They had to fill out the most detailed medical form [at a tryout], and we had to list everything and anything... if they look at this form and there's nothing, they're just going to say, let's take him... It's kind of an unspoken thing. Yes, it's kind of discrimination, that's why it's unspoken... The parent's thinking is 'I better not put anything on the form, because that might work against them, and he may be cut because of this issue.' (Parent 7)

If it's a game, then I probably wouldn't [tell the coach] unless it's killing me and it's not going to help the team. (Player 7)

While hiding symptoms was reported to reduce stigmatization from coaches, the tension between being labelled and increasing vulnerability was described:

Here's the catch 22. We had to disclose it for obvious reasons, right? I had to let the trainer know, because she may need the rescue inhaler... but when she disclosed it, it's a label... so it's almost like sometimes a coach would look at that and say her asthma must be acting up, versus maybe she just needs a little more time on the field to warm up. (Parent 1)

4.3.2.3.2 Coaches.

Multiple attitudes emerged when asked about what asthma meant to them (Table 4.3).

Perceived severity varied, and while some expressed doubt related to players' symptoms (n=7), others described being understanding of players' needs (n=4):

I find that they're cunning in that way and if they don't want to... run during fitness, everybody gives me excuses why, but I never see any excuses when there's a game day. (Coach 2, Soccer)

I think with asthma being so popular and being something that I'm familiar with, there's not really an attitude of 'Well, get through it and then go for your Ventolin'. People know that it's such a common thing. (Coach 1, Baseball)

The value of asthma awareness was acknowledged; this coach described that prior to knowing an athlete was impacted, they thought they were 'dogging it':

I never knew about it, and then after that it was, because again I thought they were dogging it, and I found out – oh asthma! Then from that point on, if it was before he started, [I'd say] 'have you got your puffer?' (Coach 7, Soccer)

Attitudes that shape the sociocultural environment emerged, particularly related to asthma stigmatization. Most coaches discussed impacts on performance (n=14), and some described asthma as a barrier to participation (n=4):

Unfortunately asthmatics don't do well in basketball...because of what we demand... but there's a lot you can do if you offer a safe, friendly environment, to help even asthma. (Coach 8, Basketball)

The social stigma and potential for bullying was also described (n=9):

I think there's a culture, especially with teenagers making fun of anything, but if a kid pulls out his puffer, you get the wheezing jokes, and you kind of see him like the way it's depicted in pop culture. The kids with asthma are nerdy kids who don't play sports. Obviously not everyone believes that, but it's an easy thing for teenagers to make jokes about. (Coach 1, Baseball)

For this reason, coaches recognized that players may hide symptoms to avoid stigmatization, being penalized, or viewed as weak/different:

I had [a player] who's got more energy than anything, but she can't double shift because she loses her breath too fast... you know girls, especially competitive girls, do you think if I told her, 'you've got a sore knee so you aren't going to play as well?' She'll tell me to go to hell. So, no they'll never admit it... I know it affects her at times. (Coach 11, Hockey)

4.3.2.4 Management and prevention behaviours.

4.3.2.4.1 Players and parents.

Players were asked about asthma management and prevention behaviours. All athletes identified medication, and most commonly an emergency puffer (Table 4.4). Behaviours described by participants were often contextualized in the sociocultural environment. For example, all participants described increasing water breaks when experiencing symptoms, however stigma from coaches or teammates when asking for breaks was identified. Players also described the value of communication with and support from coaches (n=8); when this player was asked if coaches could do anything differently, she emphasized the value of their support:

When it's happened, they've been pretty understanding. They'd make sure I got off the field. They'd say, 'come off... go get your inhaler.' But I know from past teams, that when I've been catching my breath, using my inhaler, calming my breathing down, 'oh, you should be back in this drill now!' Rushing me to get back, not being very understanding about the severity of it, or how I need to calm down. (Player 5)

Players also discussed coach, family and teammate support networks. Although some felt they should hide symptoms for fear of being labelled or penalized, others (n=3) reported discussing symptoms with friends and teammates for support:

Another girl had asthma too. I would help her with her breathing. She would help me, to calm each other down. (Player 4)

Finally, players (n=5) described improving physical fitness to manage asthma:

Player: My fitness level has increased, I can last longer.

Parent: As soon as her fitness level increased, we noticed a big difference in that she wasn't using the puffer as often. We didn't recognize that at the beginning, we really thought it was more, the outdoors, the heat and the cold and everything, but as soon as we

had seen that she was working on the running, then it was OK... her fitness level is helping offset the attacks. (Player/Parent 4)

When asked how coaches can support athletes with asthma, consideration of the sociocultural environment was emphasized. Players described the value of increased awareness (n=4), communication (n=4), and coach understanding (n=9):

I think it's recognizing, ... being aware of kids that have asthma, being aware of the signs and symptoms, and recognizing what needs to be done. (Player 11)

I think they need to acknowledge it. I think they have other things going, but make sure that she's okay of course, and I just think perhaps asking and some communication, like if she says she's okay to go back in and play, then take her word for it... Just that communication I think is sufficient. (Parent 5)

Table 4.4 Participant-Identified Management Behaviours

	<i>Players/Parents</i>		<i>Coaches</i>	
	# of Participants (% of total)	# of Mentions (% of total)	# of Participants (% of total)	# of Mentions (% of total)
Emergency Medication	11(100)	87(47)	16(88)	53(25)
Increase Breaks/Water	11(100)	44(24)	16(88)	48(22)
Maintenance Medication	9(82)	20(11)	4(22)	6(03)
Communication with Coach	8(73)	16(09)	16(88)	45(21)
Increase Physical Fitness	5(45)	15(08)	4(22)	16(07)
Decide Not to Participate	2(18)	4(02)	3(17)	6(03)
Use of Resources	1(09)	1(.05)	0(0)	0(0)
Coach Behaviours	0(0)	0(0)	12(67)	40(19)
<i>Total</i>	<i>11*</i>	<i>187(100)</i>	<i>18*</i>	<i>214(100)</i>

**This is not equal to the sum of the numbers in the column due to multiple responses*

4.3.2.4.2 Coaches.

When discussing management and prevention behaviours, both individual and team behaviours were identified (Table 4.4). Coaches reported many behaviours in the context of the sport sociocultural environment, emphasizing its role in asthma management. For example, while coaches frequently identified the use of medication (n=16), contextualizing puffer use through communication of asthma diagnosis/symptoms was described to avoid misconceptions of poor physical fitness:

If I see a kid and all of a sudden she can't skate or breathe, then I think she's just out of shape... If you tell me what you've got, and you've got asthma, and I know you need a puffer, a puffer will help. Take the damn puffer and let's go play hockey. (Coach 11, Hockey)

Communication with the coach (n=16), increasing education and awareness of symptoms and triggers (n=9), and creating safe (physical and social) environments for players (n=6) were identified:

We need to be educated on the seriousness of it, and we also need to have open lines of communication where we should probably be more aware of what they're going through, especially when they're younger and they might not be able to self-medicate... just to make sure that it's a safe environment, that a kid should never feel embarrassed whatever they're going through ... Because it's an awful feeling for a kid, we need a good environment, and if they're embarrassed by their asthma, or if they're embarrassed with what they're going through, then it's tough. (Coach 1, Baseball)

I think the biggest thing... is education, like for me, I don't really notice symptoms of asthma. I don't really know the signs, or I don't really know the best practices in terms of say how much physical activity within a practice to plan or how much to spread out, like how basically to best meet the needs of the individual, while still allowing them to engage and be physically active... I think a lot of that boils down to training and I'm not sure I've ever heard of an asthma workshop for NCCP-level coaches. (Coach 15, Curling)

Modification of the physical environment was also identified. Considering weather and increasing frequency of water breaks/rest (n=16), planning sessions accordingly (n=4) (e.g.,

reducing intensity in extreme heat), and reducing training length (n=3) were described to protect respiratory health.

There are some days where it's extremely hot and you're worried about the kids hydrating and getting enough water. Even without asthma or allergies, there are still concerns with the heat. (Coach 6, Basketball)

No coaches or players identified using an *Asthma Action Plan* (a customized plan developed with a doctor [Asthma Canada, 2017]), or other resources (e.g., Air Quality Health Index [Environment and Climate Change Canada, 2017]) to inform their behaviours.

4.4 Discussion

This research qualitatively explored athletes', parents' and coaches' perceptions and management of asthma in youth team sport in Ontario. In doing so, we aimed to increase understanding of elements of the environment, broadly defined, that impact how asthma is experienced in sport. More specifically, this work investigates the experiences of an at-risk population, and those responsible for their management, health and wellbeing in sport. While we gave voice to youth athletes, coaches were included as they provide a unique perspective on the physical and social risk experiences of asthmatic athletes. Further, coaches play a significant role in asthma management, as they are well-positioned to support athletes and reduce vulnerability. Finally, this work applied a broad definition of environment (Woolf & Aron, 2013) to understand factors that contribute to how asthma is experienced and managed in different physical and sociocultural spaces (e.g., 'risk-scapes' that emerge in youth sport). While elements of the physical environment are relevant, attitudes and behaviours related to asthma management and prevention are grounded within the sociocultural environment. This research therefore emphasizes how sociocultural factors influence how asthma is experienced and managed in youth sport by both athletes and other stakeholders (parents, coaches).

While other research has explored how environmental ‘risk-scapes’ can impact different populations (e.g., Fenton et al.’s [2011] investigation of how children experience anaphylaxis in the school environment; Morello-Frosch & Lopez’ [2006] exploration of how the relationship between health outcome and pollution exposure is modified by racial residential segregation), this research increased our understanding of the physical and sociocultural ‘risk-scapes’ that emerge in Ontario team sport and how they impact asthmatic athletes. Inevitably, landscapes of risk present differently based on individual vulnerability and other geographical factors. For example, while the physical and social environments of organized sport may present specific health risks to athletes (e.g., exposure to extreme heat when training outdoors during a heat wave), these landscapes become particularly ‘risky’ based on a variety of factors (e.g., exposure, individual athlete characteristics such as the presence other health conditions, access to information, social or financial capital). This research therefore increased our understanding of the ‘risk-scapes’ of organized youth team sport in Ontario for a vulnerable population, who may experience environmental risks differently to other groups (e.g., adults, non-asthmatics, those who in individual sports). Expanding this work to consider other groups who may experience the ‘risk-scapes’ of organized youth team sport differently is an important avenue for future work. For example, considering not only asthmatic youth athletes who participate in organized sport, but those who have ceased or limited participation due to their asthma, allergic disease, or other health conditions (e.g., post-concussion syndrome, chronic pain) will offer deeper insights into the environmental determinants of sport participation, and can further our understanding of the environmental ‘risk-scapes’ of organized sport.

The in-depth interviews allowed for a detailed discussion of the knowledge, attitudes and practices of athletes and coaches. By including youth athletes in the interview process, we

provide a voice to a potentially vulnerable group. This research therefore goes beyond asthma management in sport, and investigates how youth sport stakeholders understand and manage the sociocultural and physical contexts of risk in place. We employed a maximum variation sampling method and recruited participants with varying sociodemographic characteristics and from multiple sport backgrounds (e.g., level of competition). Due to the sample size, qualitative nature of this research, and research objectives, we aimed to explore various possible perspectives and experiences of asthma, but did not investigate variation between respondent groups. This could be a direction for future research, as there remains a need to understand how perceptions and behaviours can be generalized, vary spatially, in different populations (e.g., by gender), or in different sport environments (e.g., geographical location, competitive/recreational).

Due to unique developmental, behavioural, and physiological factors, children and youth are particularly vulnerable to environmental health risks (Ferguson et al., 2017). Those participating in high-endurance activities are vulnerable to respiratory disease, and asthma or asthma-like conditions that are not well managed can limit athletes' ability to perform (Boulet & O'Byrne, 2015). Athletes articulated this concern, as they described pressure and stigmatization from coaches and teammates. While pressure from family members was not often identified by youth participants, parents were present for all but one athlete (who was 18 years of age). This presence could have impacted players' responses, and understanding youth athletes' perceptions of familial pressure or expectations could be an avenue for future research.

The potential for stigmatization described by coaches, players and parents could increase risk of symptom exacerbation if the presence or severity of asthma is hidden (for fear of reduced playing time), and impact sport participation if asthma is poorly managed. Attitudes and

behaviours, such as those that do not align with effective control (e.g., physical punishment when air quality is poor), could discourage players from returning to sport (Merkel, 2013), decreasing physical activity participation and contributing to the chronic disease burden associated with youth asthma (Williams et al., 2008). This, combined with other environmental factors (e.g., climate change), could impact future healthy participation in physical activity (Townsend et al., 2003), and organized sport.

Players and coaches reported minimizing symptoms and the desire for normalcy for those affected. Athletes described hiding symptoms from coaches and teammates, and not wanting to inhibit participation in activity. While some coaches described doubt related to whether an athlete ‘really’ had asthma, others reported that athletes would minimize symptoms in attempt to reduce its impact on sport. This is consistent with other work related to youth perspectives of allergic disease; Prout et al. (1999) describe that parents and children stress the ordinariness of their (child’s) asthma (even when symptoms are severe), while Dean et al. (2015) identify that children with food allergy minimize their allergic status, and emphasize its normalcy. While focusing on normalcy can reduce feelings of difference, the emphasis for some could indicate steps toward awareness and acceptance (Dean et al., 2015). Findings also indicate stigmatization in sport by teammates and coaches. Athletes reported the interpersonal stigma they faced, and related repercussions (e.g., embarrassment). This echoes other research in which individuals with chronic conditions (including allergies) report stigma (e.g., isolation, labelling, exclusion), and discrimination by peers, family, and those in authority (Dean et al., 2015; Fenton et al., 2013). This is particularly concerning given that social exclusion and stigma can exacerbate pre-existing health conditions, and contribute to other physical (e.g. stress) and social impacts (e.g., bullying) (Dean et al., 2015).

Finally, coaches and players identify the need to increase awareness and improve education related to triggers, symptoms, and management. It is therefore critical to understand levels of awareness, identify priorities of coaches and athletes, and target prevention and management initiatives toward specific populations (e.g., coaches of recreational or competitive athletes, players based on age). These calls are consistent with the need for education related to other health issues in sport, including injury recognition and concussion (McLeod, et al., 2007). Further, framing coach and parent education to maximize user buy-in is necessary to ensure sustainable asthma management. For example, since coaches and athletes identified asthma as a factor that contributes to performance, ensuring sport stakeholders understand how symptom prevention and management can improve performance and help athletes reach personal and team goals will ensure asthma education is valued and applied by sport stakeholders.

4.5 Conclusion

This paper explored perceptions and experiences of organized youth team sport users and providers with respect to asthma knowledge, attitudes and practices. Understanding elements of the environment, broadly defined, that impact the experience of asthma will be increasingly important as the environment continues to change, impacting asthmatic and non-asthmatic athletes' ability to participate in sport. Recognizing the needs of vulnerable athletes is critical to maximize athlete performance, and maintain sport participation into adulthood.

CHAPTER FIVE

Manuscript #2 - Investigating Youth Sport Coach Perspectives of an Asthma Education Module

Francesca S. Cardwell and Susan J. Elliott, "Investigating Youth Sport Coach Perspectives of an Asthma Education Module," *Journal of Environmental and Public Health*, vol. 2018, Article ID 2512010, 11 pages, 2018. <https://doi.org/10.1155/2018/2512010>.

Physical activity can reduce symptoms and improve wellbeing in people who have asthma, and organized sport is one way for children and youth with asthma to engage in exercise. While asthmatic youth may experience a number of barriers to sport participation, healthy physical and social sport environments supported by coaches can help asthmatic youth athletes maintain long-term engagement in activity. This paper reports results of an assessment of an online coach education tool related to air quality, physical activity, and allergic disease (e.g., asthma). Focus groups with youth team sport coaches in Southern Ontario (n=12 participants) were conducted to explore how users experience the module and short- and medium-term outcomes of implementation. Although coaches perceive the module as relevant, it is considered less valuable in certain contexts (e.g., indoor environments) or when compared with other coach education (e.g., tactical). Although broad asthma management behaviours (e.g., athlete medical forms) were recognized, specific module-identified prevention and management techniques (e.g., the Air Quality Health Index) were less frequently described. Ensuring environment and health coach education emphasizes athlete performance while reducing risk is critical to promoting module application and providing safe and enjoyable youth team sport spaces.

5.1 Introduction

Asthma is one of the most common chronic diseases of childhood worldwide (McConnell et al., 2002; Swerczek et al., 2013) and affects approximately 600,000 Canadians under age 12 (Asthma Canada, 2017). In Ontario, one of Canada's largest provinces with a population of 14 million (Statistics Canada, 2017), asthma prevalence increased by 70.5% between 1996 and 2005, attributable, in part, to an increase in children's incidence (Gershon et al., 2010). It is projected that almost 1 in 8 Ontarians will have asthma by 2022 (To et al., 2013), leading to calls for public health strategies for asthma prevention and management (Gershon et al., 2010). A growing body of evidence indicates that environmental changes, such as temperature change,

extreme weather events, and air pollution, are likely to impact respiratory health (Beggs, 2010; Bernstein & Rice, 2013; D'Amato et al., 2017; Haines et al., 2006; Younger et al., 2008), particularly in vulnerable groups such as children (Beggs, 2010; Gerardi & Kellerman, 2014). Impacts will vary geographically; for example, urbanization and vehicle emissions in high-traffic areas are correlated with an increased frequency of respiratory allergy (D'Amato et al., 2015; Feng & Astell-Burt, 2017).

Physical inactivity is also associated with asthma symptoms in asthmatic children and youth (Lucas & Platts-Mills, 2005; Eijkemans et al., 2012; Lochte et al., 2016); although physical activity can act as a trigger for those whose asthma is not well managed, there have been calls for a “prescription” for exercise (Lucas & Platts-Mills, 2005), as physical activity is an important component of a comprehensive asthma management program and can not only improve asthma management and wellbeing of asthmatic patients, but also minimize other chronic health risks associated with sedentary behaviours (Li & Siegrist, 2012; Williams et al., 2008). Children and youth often choose to participate in organized sport, and there is considerable evidence demonstrating the physical and social benefits of participation (Marlier et al., 2015; Trussell & McTeer, 2007). In North America, children’s organized sport outside of school is largely run through community-based programs and youth sport organizations (Trussell & McTeer 2007), led primarily by volunteer coaches and athlete parents, although (in fewer, and more competitive instances) subsidized coaches exist.

While children and adolescents with asthma may experience an increased number of barriers to physical activity and sport participation compared with non-asthmatics (e.g., hesitation to participate in highly competitive environments) (Williams et al., 2008; Glazebrook et al., 2006), well-managed asthma in a supportive environment created by coaches, teammates,

and sport providers can help asthmatic youth athletes perform in, enjoy, and maintain physical activity and sport participation into adulthood.

In order to address the growing public health concerns associated with the links between physical activity, respiratory disease, and the physical environment (e.g., climate change), the organization Clean Air Champions, in partnership with the Coaching Association of Canada, developed the world's first online coach training tool focusing on air quality and respiratory disease management in sport. The Air Aware Coach Module was developed and peer-reviewed by Canadian coaching, air quality, and medical and healthcare experts to increase awareness of air quality and allergic disease associated with sport participation (Clean Air Champions, 2013; Coaching Association of Canada, 2017). (As of the date of submission, the module is not currently offered by the Coaching Association of Canada as the Clean Air Champions organization has been terminated due to lack of funding. At the time of research, the module was live online.) The module provides tools, resources, and training on how to reduce asthma attacks, support optimal performance, and ensure healthy environments for athletes. Coaches are encouraged to apply content in their seasonal plans (Clean Air Champions, 2013). It was released in 2013 and is completed online via the Coaching Association of Canada website, and participants receive an Air Aware certification upon completion. The module is available across Canada for \$15 (CAD) and is offered in both official languages (French and English).

This module is the first online coach education related to air quality, physical activity, and allergic disease. Investigating how coaches understand the content, value and prioritize environment and health risks in sport (specifically, asthma), and apply module recommendations with respect to asthma management and prevention is therefore critical. In order to assess the impact of the module with respect to coach knowledge, attitudes and practices related to asthma,

and physical activity, the objectives of this paper are (1) to understand the short- and medium-term outcomes of the Air Aware Coach Module and (2) to investigate the user experience of the module's implementation.

5.2 Materials and Methods

This research investigates responses from focus groups and one semi-structured in-depth interview with recreational and competitive youth team sport coaches. Focus groups were conducted in March 2015 in the Greater Golden Horseshoe Region of Southern Ontario. While the Air Aware Coach Module is available for coaches across Canada (Coaching Association of Canada, 2017), participants were recruited from the Greater Golden Horseshoe region due to the quantity and variety of youth team sport organizations, and as these communities demonstrate diversity in their sociodemographic profile and physical environment. Recruitment was conducted to ensure maximum variation in sampling.

Participants include community-level recreational and competitive coaches (n=12) of organized youth indoor and outdoor team sport. Purposive sampling was employed, and participants were recruited through sports organizations in the sample region. Inclusion of clubs in the sample frame was restricted to those providing recreational or competitive, outdoor or indoor, organized child and youth team sport. After compiling a list of organizations (N=219), a random sample of clubs was contacted by email using a random number generator and asked to distribute an advertisement to coaches. Coaches whose email addresses were provided on organization websites were contacted with an information letter by email. Snowball sampling was used to complete the sample and fill gaps in participant characteristics.

Coach participants completed the Air Aware Coach Module and were invited to participate in a follow-up in-person (n=6 participants) or online focus group (n=5 participants)

(depending on geographic location and personal availability). The focus groups were held at least three months following the provision of the module so that coaches would have an opportunity to apply content in their training. The cost of the module was subsidized for all participants. The in-person focus group was conducted in a public meeting room at a local library, while the online focus group used the online meeting website <https://www.gotomeeting.com>. One coach was unavailable for the focus groups, so he/she participated in a semi-structured interview (using the same interview schedule). Focus groups began with general conversation related to participant demographics and sport participation in order to increase rapport and comfort between participants and the researcher. The focus groups and interview were digitally recorded, transcribed verbatim, proofed, and coded using NVivo for Mac. Prior to coding and thematic analysis, the coding manual and major themes that emerged in the focus groups and interview were discussed with another member of the research team in order to reduce possible bias. This research was granted ethics clearance from the University of Waterloo Research Ethics Committee, and the research was conducted with participants' understanding and consent.

Short- and medium-term outcomes and the user experience of the module were investigated. Short-term outcomes related to coach knowledge and attitudes toward the module, air quality, respiratory health, and sport were explored. Few specific probing questions were asked, and the discussion was open-ended and flowed naturally. To investigate medium-term outcomes, participants were provided with asthma in sport scenarios that described module content (Figures 5.1 and 5.2) and were asked to discuss asthma and athlete management in these scenarios. More specifically, we wanted to understand what information from the module, if any, was recalled, and how it may have impacted attitudes or encouraged specific behaviours related to asthma in sport. There were 2 scenarios, broken down into parts A and B. For each scenario,

part A was read to participants, and the group was provided with a hard copy. After discussion related to part A, part B was read and discussion followed. Finally, user experience was explored to understand perceptions of module implementation, barriers related to content application, and coach recommendations for future module development.

5.3 Results

Findings are presented in four sections. An overview of participant characteristics is followed by short-term outcomes of the Air Aware Coach Module. Medium-term outcomes are then reported, followed by themes related to user experience. Results are presented using participant quotes to illustrate themes that emerged both deductively and inductively from the focus group transcripts.

5.3.1 Participant characteristics.

Overall, n=12 coaches participated in the online (n=5) or in-person focus group (n=6), or the in-person interview (n=1) (Table 5.1). Three coaches worked with a single team in a head coach role, while four served as assistant coaches. Five coaches worked with multiple teams, in both a lead and assistant capacity. No participants worked solely in a recreational program, although four were involved with both competitive and recreational programs, and often in multiple sports. The majority of coaches (n=7) were involved with soccer as their primary sport, and the coaches were involved with children from a range of age groups between 8 and 18 years of age.

Table 5.1 Focus Group Participant Demographic and Coaching Breakdown

Participant Gender	Male	5
	Female	7
Focus Group Involvement	In Person	6
	Online	5
	Interview	1
Coach Position	Head	3
	Assistant	4
	Both	5
Level Coached	Recreational	0
	Competitive	8
	Both	4
Sport Coached	Soccer	7
	Basketball	1
	Baseball	1
	Curling	1
	Multiple Sports Coached	2
Age Group Coached	8 to 10	2
	11 to 13	1
	14+	5
	Multiple Age Groups Coached	4

5.3.2 Short-term outcomes.

Focus groups continued with a broad discussion of participants' perceptions of the relevance of the module to their coaching experiences and activities. Coaches generally believed elements of the module to be valuable. One coach suggested the module “was relevant given that the sport [they coached] is played outdoors, [and] air quality is an important factor in that it can affect performance” (Soccer Coach). Coaches often spoke to their experiences either as athletes, or with athletes with asthma they have coached. Social factors, such as the possible stigmatization of asthmatic athletes, were identified when emphasizing the module's value:

More while I was a player, I had asthma and there were times it felt like you couldn't say you have asthma... you would hide your puffer... and it wasn't as accepted to ask the coach for a 10-minute break... and so I think the more it's understood that it's a real thing that certain kids struggle with it, the more appropriately we can handle it... I remember not really wanting coaches to know, or teammates... Boys especially will pick on anything you can pick on in a group setting like that, so I think if you're the one kid with asthma or you're caught wheezing there is kind of a stigma attached to that, especially with being in a vulnerable situation around other teenage boys, and not all parents are there. It's easily picked up on by boys that make fun of each other. (Baseball Coach)

The need for increased education and awareness of the risks associated with asthma was also identified:

It's a good module for other coaches to experience. A lot of people don't know too much about asthma and as we see asthma growing... I think it's really important for coaches to actually get an education about what asthma is and how can it be treated. (Soccer Coach)

While participants generally perceived the module to be valuable, some (n=3) declared its relevance was limited to certain contexts. This attitude was closely tied to coaches whose sports were predominantly played indoors (e.g., basketball), and less reliant on cardiovascular endurance (e.g., curling). While they identified that the module "did talk a little bit about indoor sports" (Curling Coach), it was not perceived as relevant for their context:

It probably wasn't as strongly relevant to my sport, firstly being that it's an indoor sport and that you don't have the same kind of issues... you know the airborne elements, obviously they would still exist within an indoor space, but probably not to the same degree. As well, we don't have to deal with the same things as smog and things like that. So you do have issues but probably not as strongly related to any outdoor sport. (Curling Coach)

Although many asthma-related themes from the module are relevant in indoor and outdoor contexts, and a component of the module specifically focused on indoor environments and associated air pollutants, indoor coaches generally articulated that the indoor environment was not sufficiently covered in the module. For example, this coach of a gym-based sport described insufficient coverage of asthma in their sport:

Researcher: Would you have found it more useful if it had information related to triggers in a gym environment, for example?

Participant: Absolutely, and I think even if you're looking at other sports too, it would be beneficial because you're not always training outside... Like in wintertime if you're an outdoor sport and you're playing indoors. (Basketball Coach)

Further, although climate change is discussed in the module with respect to respiratory health, athlete vulnerability, and increasing temperatures and air quality (e.g., particulate matter, ground-level ozone), coaches did not mention climate change when asked about the module's relevance. Similarly, although specific preventative and management behaviours such as using resources like the Air Quality Health Index (AQHI) – a community-level health protection scale designed to provide air quality and health messages (see: <http://www.ec.gc.ca/cas-aqhi/default.asp?lang=En&n=065be995-1>; Environment and Climate Change Canada, 2017) - were a significant theme of the module, coaches did not identify asthma management behaviours until probed.

5.3.3 Medium-term outcomes.

To investigate medium-term outcomes, asthma in sport scenarios were discussed by participants. Part A of scenario 1 (Figure 5.1) describes a 14-year-old male hockey player who has not been using his reliever medication (e.g., an inhaler) and has seen a reduction in his performance. The player is complaining about fatigue and is sitting out of games implying he is not fit to compete, but the coach observes no common signs of asthma. When asked to speculate why this player is not using his reliever medication, participants articulated that the player might not attribute the symptoms to asthma or feel a need for medication. A soccer coach described that they “wouldn't have even thought the asthma thing right away,” and they would have considered other factors such as “what's going on at home... healthy eating right before

practice... mental grit, what's going on if [they're] fatigued... and then maybe eventually his health”.

Part A:

You have been coaching a group of teenagers, aged 14-15, in a competitive hockey league. You notice that Simon, a talented fourteen year-old with asthma who played really well last season, hasn't been using his reliever medication before or during practice, seems more tired than usual and covers less ground during practices and games. Last season, Simon was capable of outperforming many of his competitors when he had his asthma under control, and he was even noticed by scouts for the provincial development team. Being a high-level player whose competitive nature also transfers to school and his other extra-curricular activities, Simon was excited at the prospect of joining the development team at the age of 15 and expressed a strong desire to continue working toward this goal.

Simon is complaining of fatigue and is sitting out of more games, claiming he doesn't think he is fit enough. Simon has also been acting more withdrawn than usual, and he isn't communicating with his teammates as much compared to last year. You also notice that he's not using his rescue/reliever medication before practice or games. At the same time, he's not showing any obvious signs of common asthma symptoms like coughing, wheezing, chest pain/tightness or shortness of breath.

Part B:

Simon is the only player on your team who is diagnosed with asthma, and the only player who uses an inhaler. Your team is playing at a tournament out of town, and between games you notice that while all of the members of the team are socializing, one of the louder boys makes a condescending comment in Simon's direction that indicates social stigma around his inhaler use. Simon ignores the comment and continues chatting with another teammate. After observing this interaction, you suspect Simon may be uncomfortable using his inhaler in front of his teammates, and this could be affecting his interactions with his teammates as well as his asthma management and performance.

Figure 5.1 Focus Group Coach Discussion Scenarios – Scenario 1, Parts A and B

Coaches also described potential stigmatization related to asthma. A soccer coach identified that “maybe he wants to hide it from his teammates,” and others discussed the possible fear of being stigmatized, perceived as weak, or having reduced playing time during games:

So I think what really comes in is you see some of those competing pressures that this individual has in terms of the fact that maybe there is peer pressure within their circumstance on the competitive team but as well there is also the fact that you have him being a high-ranked athlete with the scouts being present and things like that. So it might be a sign of weakness or a sign of impeding their performance in some ways, it might be an attitude that the athlete has within their mind. (Curling Coach)

Other reasons described include medication cost, frustration related to medication need, and previous ineffective medication use impacting perceived necessity:

Participant: Sometimes teenagers at this age, if it runs out they may not tell their parents.

Researcher: Why do you think that would be?

Participant: Cause they don't want to take it anymore... or it's a pain in the butt, and depending on his family situation, like at school we see it all the time with EpiPens. Oh, we just haven't gotten to the doctor, and like seriously this is your EpiPen! This is your lifeline! Oh yeah, we're just so busy we can't get there...

Researcher: Like perceived as lower on the priority list?

Participant: Especially if he hasn't had major attacks. (Soccer Coach)

Part B (Figure 5.1) describes this player as the only player diagnosed with asthma using reliever medication. At a tournament the coach overhears discussion amongst teammates indicating social stigma around the player's medication use. While coaches identified possible stigmatization during part A, they were also asked about their role in managing the situation. The module emphasized coach support for asthmatic athletes, and participants echoed the value of inclusive social environments that ensure player comfort during medication use:

I would make sure that it's not tolerated on the team because there could be many other reasons, not just his inhaler. There could be another kid who can't afford the top line hockey equipment and that shouldn't be an issue either. (Basketball Coach)

Further, the importance of communication with the asthmatic player, and possibly teammates and parents was described:

I think this kid that's saying it, you might have to have a little one-on-one conversation with him and make sure that they understand what asthma is and what it's all about and the risks and the dangers, cause he may not realize what it is. Like 14-, 15-year-old kids if they've never had any experience with it, they're pretty, for lack of a better word, they're ignorant about it... He may not fully understand it. (Soccer Coach)

Scenario 2 (Figure 5.2) discusses a hot day early in an 8 to 10-year-old girls' soccer season. A new player is attending and her mother describes her symptoms before leaving practice. Participants were asked about important factors to consider in the scenario.

Unsurprisingly given the module content, heat and air quality were mentioned by coaches. For

example, a basketball coach described “keep[ing] things light because it’s a hot and muggy day,” indicating consideration of the physical environment when session planning. Despite identification, many coaches did not focus primarily on the physical environment, and questioned the parent’s absence, especially given the age of the children:

First of all, the mom should not be leaving the practice, especially at the age of 8 to 10, and even more so because of the hay fever. I think the parents should feel a bit more liable and show a bit more accountability and stay at that session. (Soccer Coach)

Part A:

It is an unusually hot, muggy day in early May, and the beginning of the season for your soccer team; you are in charge of coaching a group of 8-10 year olds. There are a few new players in the group that you did not coach last year. Just before your practice starts at noon, 9-year-old Sammy, a new player, gets dropped off by her mother. Sammy immediately runs out onto the field with her ball, and is excited to be playing on the team. You have never met her mother before, but she comes over to you and despite being in a rush mentions that Sammy has had hay fever all her life and that lately she has noticed wheezing when she exerts herself, but doesn’t think it’s a problem. She casually suggests that Sammy has been playing more video games lately with her older brother and isn’t in as good shape as she was a couple of years ago, since she hasn’t participated in organized sport in the last 12 months. She also mentions that Sammy is just getting over a lingering cold but should be fine to practice. Sammy’s mom gives Sammy a hug and tells you that she will be back to pick her up at the end of practice.

Part B:

On Wednesday the following week, you check the forecast and find that Saturday is forecast to be another unusually hot and muggy day. In anticipation of a hot day ahead, on the morning of your practice you check the Air Quality Health Index (AQHI) for your community, and it provides a reading of 7. You are aware that four of the players on your team are affected by respiratory allergy, and an additional two are diagnosed with asthma. All six of these players are attending practice today, which starts at noon.

Figure 5.2 Focus Group Discussion Scenarios - Scenario 2, Parts A and B

When coaches were asked more specifically about behaviours to help the player, multiple possible actions were described. The need for a completed medical form and communication with the mother were expressed:

Although the mother is in a rush, still emphasizing the importance of having the dialogue and getting as much information as possible, and then depending on the protocol of your club or team, getting some kind of paperwork health document filled out as soon as possible. (Curling Coach)

While some coaches identified allowing the child to participate in training, others were less comfortable without completed medical documentation. This discussion highlighted the tension between ensuring athlete development, managing health risks, and organization guidelines/policy.

When asked more specifically if their organization affiliations enforce medical form completion, coaches described that while policy may exist, often the deadlines are ignored, coaches do not comply, and compliance is not enforced at the organizational-level:

Participant: Sometimes at organized clubs they are kind of like, yes we get kid's health forms, but they come late. At school kids aren't even allowed to try out for the team unless you have a health form. So that kid wouldn't be allowed to train if it was a school thing.

Researcher: But in an organization?

Participant: Sometimes it just kind of flows into happening. (Soccer Coach)

When asked if their club had medical form policy, participants were often unsure. Regardless, coaches described completing medical forms for their own records:

Researcher: So, there isn't policy around that?

Participant 1: Do you know [asking Participant 2]? I don't know.

Participant 2: Policy around what?

Participant 1: Of having health forms submitted before they train at the club?

Participant 2: Like I've always had one done. Not from the club, I did a personal thing that said any asthma, diabetes, EpiPen, are they allergic to certain fruits?

Participant 1: For teams yes, but the way clubs are going with these divisional programs...

Participant 3: There's nothing making us do that.

Participant 1: ... sometimes you get like, oh here's a new kid and they show up for the first time and you haven't seen anything about it... and that's to me, from a liability standpoint, it's super dangerous (laughter). But it happens at the soccer-level all the time. (In-person Focus Group Discussion)

Part B (Figure 5.2) stated that similar weather is forecast for the following Saturday, and the AQHI reads 7 the morning of practice. Four players have respiratory allergy and two have asthma, and the session is at noon. Participants were asked about the AQHI and possible coach behaviours. Some coaches described that “before this Air Aware Module [they] didn’t even know what the AQHI was” (Curling Coach), and prior to part B of scenario 2, the AQHI was not identified by participants. When probed, coaches often provided a vague description or were not confident in their description:

The ones with respiratory allergies or asthma are going to feel it more the higher the scale climbs, right? So personally, I don’t know what a 7 would feel like... versus an 8, 9 or 10. (Soccer Coach)

When asked about a reading of 7, others were able to identify broad themes related to the index, but could not describe specific recommended behaviours:

I see 7 out of 10 and so I know that’s high... other than knowing where a 7 lies on the scale, I don’t know what that feels like, I don’t know how it affects the kids directly, just as I’m sure there are other impacts such as where the field is located, what kind of practice you are going to be running, all that kind of stuff. (Baseball Coach)

Although participants identified the AQHI’s value, and that it was “another resource to check” (Basketball Coach), a lack of coach autonomy was identified as a barrier to its use.

Coaches described that decisions are often made at the club-level related to training cancellation and scheduling:

I think going forward now knowing more about it I would be more likely to maybe make a note about it. I think in the past I wouldn’t really be motivated to bother checking... it might be something that I would check to see if it was actually as bad as it felt out, and that if I should maybe alter my practice a little bit, but ... I really don’t know if I would ever check it otherwise, and even saying that it’s usually someone else’s decision if it’s going to be closed that day, like a league or the City will send out a notice that games won’t be allowed. (Baseball Coach)

Coaches of indoor sports also described the AQHI as less relevant:

Probably if I ever coached sports... involving an outdoor environment I would pay more attention to it. (Curling Coach)

According to the AQHI, a reading of 7 suggests reducing/rescheduling strenuous outdoor activities for those at risk (e.g., children), or if symptoms (e.g., coughing, throat irritation) are experienced (Coaching Association of Canada, 2017). Based on this reading and the training conditions, the module recommends possible coach behaviours. Coaches echoed some of the module recommendations, including allowing players to take breaks and “more hydration times during the session” (Soccer Coach), modifying session plans to focus on skill development versus endurance training, communicating with parents and players with respect to athlete asthma support, and monitoring players for symptoms:

Sometimes when it's been really hot and we have our training sessions, I have a 'go-to really hot practice session,' where it's not as cardio-focused and... there are some sections of the field that are better shaded than others. You kind of move your stuff to certain areas... and you modify your session accordingly. It is quite dangerous to train at that time, cause 7 I think is kind of in the borderline danger zone? If I remember, I'm not going to say I remember 100%, but I feel like it's getting up there. But making it not as cardio fitness focused would be a good idea and to keep a very watchful eye on those players and have regular check-ins. (Soccer Coach)

Some of the more specific terminology or guidance from the module was not described. For example, the use of an individualized Asthma Action Plan, or following the 1-2-3 rule (using a rescue inhaler once before and a second time during activity, but ceasing participation if needed three times), was not identified.

Possible structural changes were also identified. For example, coaches described changing the training venue location and time, or moving training indoors for improved air quality. Club policy and organizational control were identified as barriers to these behaviours, specifically related to facility availability, and training time and location:

Participant: In an ideal world, you get to choose your facilities, you get to choose your time slots, you get to create a really positive inclusive environment.

Researcher: Now when you say in an ideal world, what are some of the barriers you see to doing those things?

Participant: What's the right word, logistics from a club. Trying to slot everybody in, and use for [the fields is] growing and that's a fantastic thing, but we had three or four age groups training at the same time with limited fields, especially in those odd seasons like Fall and Spring when you are not allowed on certain grass fields. It can get dicey with what's available.

Researcher: And do you think that's something other sports see as well?

Participant: Other sports where you need permits for stuff, for sure. (Soccer Coach)

Finally, social dynamics related to environment and health behaviours (e.g., canceling training) were also identified. One coach explained perceived parent judgment:

If I am being honest I think there is probably a little bit of a social effect as far as coaching and if you have, you know, parents that are more old-school... cancelling a practice for older boys because it's, you know, cause it's too smoggy or too hot out I think there is a little bit of, you could get a little bit of backlash or a little bit of murmur from the old-school parents, or parents that used to be coaches, where 'we never cancelled practices back in our day'... not saying that they're right, I'm just saying that might be something that I can think of that would probably cross my mind if I was cancelling a practice because of the AQHI. (Baseball Coach)

This attitude highlights the tension between managing athlete health and parental and player expectations, and maximizing performance (and team success). The module described avoiding the 'tough it out' attitude, in order to reduce stigma, and ensure players communicate symptoms with teammates or coaches. Ensuring well-managed social and physical environments is critical to both team success and reducing health risks in sport.

5.3.4 User experience.

Most coaches did not report problems related to module usability. While one participant described their preference for classroom learning, this theme was only identified once:

I don't love learning online, I like in a classroom setting or having someone instruct you... it makes you interact with the material versus just skimming through and reading and answering multiple choice questions. It just gives you another way to kind of really absorb the information and let it hit home, so I would prefer if it was added on into a classroom setting. (Basketball Coach)

When asked if they participated in the optional components or accessed additional resources, the uptake was fairly low; some coaches saved the resources for later reference, while others did not read the content. One coach recommended resource availability following module completion:

I think it would be important... to be able to provide resources that coaches can refer back to... or they could disseminate, whether that being to athletes, parents or coaches just to broadcast at least the basic messages as widely as possible. (Curling Coach)

Coaches were asked about barriers to module participation. While some articulated that \$15 was reasonable compared with other coach education, others identified cost as a barrier as “if it was put out there for \$15... your pool of people you’d be getting information to would be limited” (Soccer Coach). Coaches discussed the value of organization subsidization of coach education costs, and identified that asthma coach education would not be prioritized if paying out-of-pocket.

Similarly, coaches described a lack of interest in asthma education compared with other possible courses, such as tactical or technical skill development:

I don’t know that as a head coach that would be something I would have sought out and purchased on my own, but I think more since it’s covered for research or if it was covered by the club to go do, I don’t think as just a head coach I would necessarily look into it and choose to spend my own money on that... If I was going to spend my own money or if I was going to try to prove a need to justify a regular course, I would be more comfortable and probably more prone to look into more strategy or drills-type of courses, more than even concussion or asthma or anything like that. (Baseball Coach)

Participants generally recommended the module, particularly if subsidized. In order to improve the module or increase engagement, coaches identified combining asthma content with sport-specific coach education, and emphasizing the benefits to specific sports and team performance. Coaches believed this would increase interest in Air Aware content, and provide co-benefits related to coaching their sport. A summary of results is presented in Table 5.2.

Table 5.2 Focus Group Summary of Results

Results Section	Major Themes Explored	Sub-Themes Explored
Participant Characteristics	Gender, Coach Position, Level Coached, Sport Coached, Age Group Coached	
Short-Term Outcomes	Module Relevance/Value	
	Personal Experiences	
	Social Factors	
	Increased Education/Awareness of Asthma	
Limitations of Relevance	Context Specific, Key Components Not Identified (Climate Change, Asthma Management Behaviours)	
Medium-Term Outcomes	Medication Use (Scenario 1)	Not Necessary for Symptoms, Stigmatization/Perceived as Weak, Medication Cost, Frustration, Ineffective Medication Use
	Coach Stigmatization Management Role (Scenario 1)	Inclusive Environment, Communication
	Team Management (Scenario 2)	Physical Environment (Heat, Air Quality), Role of Parent, Medication Information Form, Communication, Athlete Participation, Role of Organization (Policy, Non-Compliance)
	Asthmatic Player Management (Scenario 2)	Coach Behaviours (Increased Breaks, Hydration, Modified Training Content, Communication with Athletes and Parents), Resources (AQHI, Asthma Action Plan, 1-2-3 Rule), Barriers to Behaviours (Coach Autonomy, Content Relevance, Club Policy and Organizational Control), Facilitators to Behaviours (Structural Factors, Social Factors)
User Experience	Module Usability	
	Learning Preference	
	Additional Resource Use	
	Barriers to Participation	Cost, Interest in Content
	Recommendations	Long-Term Resource Accessibility, Combining with Sport-Specific Content, Benefits to Team Emphasized

5.4 Discussion

This exploratory work has not only increased our understanding of how environment and health risks (specifically allergic disease and asthma) are understood amongst coaches in Ontario but offers an applied example of how organized youth team sport coaches perceive and apply an environment and health online coaching module. This research qualitatively assessed the impact of the Air Aware Coach Module. The module aims to provide an overview of issues related to the environment, respiratory health, and physical activity, supply protocols and resources for coaches to prevent or reduce asthma attacks, and increase coach understanding of risk factors as part of their due diligence (Coaching Association of Canada, 2017). This research investigated how coaches understand, recall, and apply module content in their team and athlete management and their recommendations for future module development. Understanding how coaches use the module and manage child and youth asthmatic athletes is critical to maximize athlete performance and ensure healthy and safe sport environments for participants.

While other health-focused coach education exists (e.g., Making Head Way Concussion eLearning Series, offered in Canada by the Coaching Association of Canada), to our knowledge, the Air Aware Coach Module is the first and only coach education tool focusing on air quality and respiratory health (Coaching Association of Canada, 2017). This module is situated amongst other asthma education tools targeted toward a range of audiences. For example, Bruzzes et al. (2004) discuss an Asthma Self-Management for Adolescents program aimed to improve adolescent self-management skills, while Swerczek et al. (2013) describe a nurse telephone coaching intervention that supports asthma self-management behaviours for parents. Education programs for asthmatic children, parents, and stakeholders in the school environment also exist (Coffman, Cabana, & Yelin, 2009; Environment and Climate Change Canada, 2017; Gupta &

Gupta, 2001; Harris, 2002). The successful application of this module therefore fills a significant gap as it engages a population that may not have formal coach training (Magzamen et al., 2008), or asthma management or child and youth health education. How other organized team sport stakeholders (e.g., sport organization guideline and policy-makers) prioritize or understand asthmatic athletes is an avenue for future research.

When coaches were asked about module relevance, broad themes related to asthma management in sport (e.g., athlete stigmatization) were identified. Specific details (e.g., the AQHI, applying an Asthma Action Plan) were less frequently described, even when probed. Coaches often drew on their own asthma symptoms and behaviours or experience coaching asthmatic athletes (e.g., use of reliever medication). Given all participants were involved with competitive teams, they may have longer-term relationships with athletes and exhibit a deeper understanding of athlete health concerns compared with a recreational coach sample (who typically coach players for a single season). Understanding how coaches from recreational environments value and apply the module may provide a deeper understanding of how coaches engage with and understand athlete health, encourage buy-in from different coach populations, and ensure both competitive and recreational athletes experience healthy participation in sport. This is critical given the number of children involved in organized sport (approximately 51% of Canadian children) (Gilbert & Trudel, 2004) and the unique barriers recreational coaches may face to pursuing coach education (e.g., time availability given the voluntary nature of recreational coaching).

The imbalance of competitive and recreational coaches may also have influenced focus group dynamics, as competitive coaches may be more likely to emphasize team performance and results compared with recreational coaches. This emphasis could also influence how coaches

form relationships with and manage asthmatic athletes. Future research focusing specifically on recreational coach perceptions and experiences will allow for increased understanding of how asthmatic athlete management is prioritized in different sporting contexts in Ontario. Further, we know undesirable coaching behaviours, injury, lack of fun, and excessive pressure are possible reasons for dropout and decreased sport satisfaction for youth athletes (Magzamen et al., 2008; Statistics Canada, 2014; Fraser-Thomas & Côté, 2009). While some competitive coaches may be familiar with their athletes' health and social behaviours, some may engage in risky management behaviours (e.g., encouraging athletes to compete through physical pain) or interact more frequently with athletes who are healthy or do not disclose their symptoms. This was emphasized when coaches reported increased interest in education focusing on improved team performance compared with health in sport. This is unsurprising, as while social developmental outcomes beyond on-field success are important to coaches (Sullivan et al., 2012), athlete development and enhanced performance are the primary objectives in competitive sport environments (Vella, Oades, & Crowe, 2011).

When asked about future coach education, participants prioritized other health outcomes (e.g., concussions) or tactical or technical skill development in their particular sport. While the module includes sport-specific components, it is purposefully designed to include coaches of all sports (e.g., team/individual, indoor/outdoor). Certain content was not perceived as relevant, and coaches described possible increased engagement if content was specific to their interests or incorporated in pre-existing sport-specific education. Given the value competitive coaches put on team success and player improvement in addition to social development (Williams & Kendall, 2007), emphasizing the links between well-managed asthma and team success and improved individual performance should be a major component of future coach education.

Other research (Williams et al., 2008; Glazebrook et al., 2006; Vella, Oades and Crowe, 2013) has described the possible barriers (e.g., organizational policies, avoidance of symptoms) that children or youth with asthma or respiratory disease may face related to participation in and enjoyment of physical activity. While children with asthma are generally less active than non-asthmatic youth (Williams et al., 2008), evidence indicates that physical activity can act as a protective factor against asthma development (Eijkemans et al., 2012), and medical professionals recommend well-managed participation in physical activity for both respiratory and other health benefits (Lucas & Platts-Mills, 2005; Mancuso et al., 2006; Rice, 2008; Satta, 2000). This gap between evidence and behaviours (perceived barriers to involvement versus long-term physical activity) highlights the need for coach education emphasizing well-managed asthma and the provision of safe physical and social environments.

This research focused heavily on the role of the coach in understanding and managing respiratory health risks in youth team sport. While coaches are fairly autonomous, focus group participants described the role of structural factors in their ability to manage asthmatic athletes (e.g., club policy for practice/game cancellation). Further, coaches identified the value of organization subsidization of the module's cost in order to increase coach participation. While this may be possible in certain contexts, clubs may not have available resources for coaches to complete supplemental education, particularly given the challenge of declining sports participation (Vail, 2007) and the competition for often scarce resources between increasing participation costs, coach education, facility maintenance, and competition entry fees (Gilbert & Trudel, 2004).

Finally, while focus group discussions indicate coaches aim to improve their athletes' ability to execute their sport in a safe environment, a limitation of this research exists in the

social dynamics associated with focus group participation. Coaches often described asthma management or health-promoting behaviours when discussing the scenarios presented; however research participants tend to provide socially desirable responses, especially when the scope of the work involves a sensitive topic (Vail, 2007). While the scenario-based focus groups are a good indicator of coach attitudes and behaviours, participant intentions may not dictate exactly how they would behave in practice or with different contextual factors. In competitive environments where winning is heavily emphasized and valued, some coaches may still not manage asthma according to Air Aware guidelines, potentially increasing athlete vulnerability.

5.5 Conclusion

In conclusion, ensuring environment and health coach education emphasizes how coaches can work with athletes to maximize performance while reducing risk is critical to ensure module content is accepted and applied in organized youth team sport. Improving coach understanding and management of environment and health issues, specifically related to asthma management, will help reduce athlete vulnerability, provide safe and enjoyable youth team sport spaces, increase sport participation and performance, and ultimately reduce the public health burden associated with physical inactivity and respiratory disease in Canada.

CHAPTER SIX

Manuscript #3 - Understanding an Emerging Environmental Health Risk: Investigating Asthma Risk Perception in Ontario Youth Sport

The environment, broadly defined, plays a significant role in determining human health. Understanding how environmental health risks are perceived in different settings and amongst different stakeholders is critical to their management. Using a place-based conceptual framework and mixed-methods approach, this research aims to investigate the broad asthma risk perception determinants and outcomes amongst organized team sport stakeholders in Ontario. Two online surveys (coaches, n=94; parents of athletes diagnosed with allergic disease, n=90), and a sports organization website (n=193) policy and guideline content analysis were conducted. Binary regression was used to investigate determinants of risk perception. Asthma ranked seventh highest of 17 health hazards by coaches (23% ranked as high) and parents (34%), and determinants of risk included trigger knowledge, risk exposure, propensity for risk, indicators of trust, and socioeconomic variables (e.g., gender). While environment and health issues were mentioned on approximately half of websites reviewed (n=97), asthma and its management, specifically, were not identified. Recommendations to further develop the place-based framework are offered, to ensure broad contextual factors are considered when managing risk. As policy makers look to manage health risks in sport, considering the places in which risk is experienced is critical to improve environment and health management in Ontario organized team sport.

To be submitted to: The Canadian Geographer

6.1 Introduction

The environment plays a pivotal role in determining human health. While healthy environments can prevent premature death and disease (Pruss-Ustun et al., 2016), a host of literature (e.g., The *Lancet's* recent Commission on pollution and health [Landrigan et al., 2017]) documents the hazards and associated health burdens that accompany the effects of environmental change. As humans continue to interact with the natural environment, widespread environmental changes and associated health hazards will become increasingly prominent, and can include both anthropogenic and natural risks (e.g., natural disasters, industrial accidents, emerging health risks associated with global environmental change [Harrington & Elliott, 2015;

Myers & Patz, 2009)). Management of emerging environmental health risks is especially challenging; due to their relative nascence, there may be less certainty regarding the causes, exposures, and impacts (e.g., the social, demographic and economic disruptions of climate change [McMichael et al., 2006]), challenging our ability to objectively quantify and calculate the spatial and temporal magnitude of risk through classic risk management strategies (Beck & Levy, 2012; Harrington & Elliott, 2015).

How such risks are perceived and managed by the public is therefore particularly important. While risk management policy- and decision-makers are in a unique position to respond to emerging environmental health risks, it is often with some level of uncertainty (e.g., through the use of the Precautionary Principle [Saltelli & Funtowicz, 2004]). Further, risks are both real and socially constructed (Zinn, 2006), and the general public often rely on personal knowledge and subjective experiences to define risk (Harrington & Elliott, 2015; Slovic, 2000); for these reasons, policy makers must react to risks both perceived to be important by the general public (Gierlach et al., 2010), as well as those hazards objectively quantified as risky. In this way, understanding not only objective determinations of risk, but the way the public perceives and responds to risk is necessary to improve risk communication and management (Harrington & Elliott, 2015).

6.1.1 Place-based conceptual framework.

While traditional risk perception literature focuses on characteristics of specific hazards as determinants of risk perception (e.g., level of dread [Slovic, 2000]), critiques have focused on the simplistic nature of these risk perception models. There has been increased recognition of the need for emphasis on the broader social, political and cultural contexts in which risk is

embedded, and the relationships with and between people, risk perception, and the places where risk is experienced (Abraham, 2009; Harrington & Elliott 2015).

To address these critiques and ensure the broad contextual influences are considered when investigating how the public forms perceptions of risk (Abraham, 2009), Harrington and Elliott (2015) developed a framework to ensure the role of place is considered when investigating the way the public perceives emerging environmental health risks. The framework builds upon three existing risk perception paradigms and the place effects on health literature; Slovic's (1987) *psychometric paradigm*, Douglas and Wildavsky's (1982) *cultural theory* paradigm of risk perception, and Kaspersen et al.'s (1988) *social amplification of risk framework* form the basis of the framework. Slovic's (1987) paradigm considers the individual demographic and cognitive characteristics that influence risk perceptions. More specifically, level of dread risk (e.g., potential for negative consequences) and unknown risk (e.g., perceived level of control) of a specific hazard combine to shape risk perception. The *cultural theory* paradigm focuses on how a population's social and cultural values and relationships contribute to the formation different worldviews (e.g., hierarchical, fatalism), which in turn influence levels of perceived risk. The third paradigm, the *social amplification of risk framework*, posits that perceptions of risk can be amplified or attenuated based on the nature and relevance of the message being communicated and the channel of communication (e.g., through the mass media). Based on critiques of these paradigms (primarily with respect to a lack of attention to the broad environmental contexts in the risk perception process), Harrington and Elliott (2015) take a place-based approach, and specifically categorize the environment into the physical, economic, political and sociocultural. Place represents the backdrop of the framework, recognizing varying characteristics and meanings of space, and the role they play in shaping perceptions, behaviours, and health. The

framework is depicted in Figure 2.1, and a detailed theoretical underpinning of the model is described at length elsewhere (Harrington & Elliott, 2015). While the framework has been applied using food allergy risk perception data from a national Canadian survey (Harrington et al., 2012), Harrington & Elliott (2015) call for future testing using different health risks, at different scales, using different methodological approaches, and with different populations. We aim to investigate risk perception determinants (e.g., contextual and individual-level factors) and outcomes of another emerging environmental health risk (asthma) within coaches and parents in the organized youth team sport environment in Ontario, Canada.

6.1.2 Applying the framework to an emerging environmental health risk.

During the past few decades, asthma prevalence worldwide has increased, and asthma is now one of the most common chronic conditions affecting both adults and children (Lundback et al., 2016; Subbarao et al., 2009; Williams et al., 2008). Asthma is a chronic inflammatory disease of the airways, and can present with a range of symptoms including shortness of breath, wheezing, coughing, and chest tightness. Symptoms vary in severity and differ over time and on a case-by-case basis (Asthma Canada, 2017). While the complete etiology of asthma is unknown, we know that genetic predisposition and the environment play a large role as either protective or risk factors (Subbarao et al., 2009). For example, factors that may influence asthma development include exposure to environmental tobacco smoke or air pollution (Lundback et al., 2016), as well as lifestyle factors such as stress and physical inactivity (Corbo et al., 2008; Subbarao et al., 2009). A range of contributing factors are likely, and a leading theory that may partially account for the reported increase in allergic disease prevalence is the hygiene hypothesis. This theory suggests that although children exposed to western lifestyles may be protected from traditional infectious disease burdens, exposure to protective microbes is necessary for healthy immune

system response development. These children are therefore more susceptible to conditions related to hypersensitive immune systems, such as allergic disease (AAAI, 2017; Harrington & Elliott, 2015). While a genetic component exists, environmental factors play a significant role in the expression of allergic disease, including asthma, as an *emerging environmental health risk*.

Though our understanding of asthma etiology is incomplete (Subbarao et al., 2009), asthma appears to be increasing in many parts of the world (Lundback et al., 2016). Asthma prevalence varies geographically and with socioeconomic status. For example, in Asian countries prevalence (rates between 2-4%) appears to be lower than other western countries including the United Kingdom, Canada, Australia, and New Zealand (where prevalence varies between 15-20%) (Subbarao et al., 2009). Asthma is the most common respiratory disease in Canada (Crighton et al., 2012), and in Ontario more specifically, prevalence of asthma (15.4% [Ontario Asthma Surveillance Information System, 2016]) increased by 70.5% from 1996 to 2005, likely due, in part, to increasing incidence in children (Gershon et al., 2010).

In addition to the physical symptoms of respiratory allergies and asthma, social and emotional impacts are reported, including decreased wellbeing and quality of life, feelings of difference, frustration, anxiety, and depression (Bender, 2007; Blaiss, 2000; Protudjer et al., 2008; Rydstrom et al., 1999). The psychosocial dimensions of living with asthma have other health-related impacts; for example, children with asthma are generally less physically active (Williams et al., 2008), for reasons including inaccurate symptom perception by caregivers or those diagnosed (e.g., perception that breathlessness or taking inhalers is harmful), individual or family illness beliefs (e.g., acceptance of physical inactivity as inevitable [Callery et al., 2003]), or organization policies (e.g., limited asthma management knowledge in the school environment [Mansour et al., 2000; Meyer et al., 2002]) (Williams et al., 2008).

The impacts of asthma on children and youth are therefore diverse. Understanding risk perception and management of children and adolescents with asthma in organized youth team sport is important for multiple reasons. Physically, as exercise increases ventilation in both speed and endurance athletes, exposure to potential asthma triggers (e.g., cold air, pollen) in different physical environments is enhanced among athletes (Helenius & Haahtela, 2000; Carlsen et al., 2011). Increased ventilation and exposure to pollutants close to the ground (e.g., ground-level ozone) (Weiss, 2000), make child and youth athletes both vulnerable to asthma development and worsening symptoms (Carlsen et al., 2011), as well as potential mismanagement. Living with asthma (like food allergy), also has emotional implications with respect to experiences in ‘safe’ risk environments (Fenton et al., 2013; Harrington & Elliott, 2015). For children and youth participating in organized sport as a form of physical activity, the management of environment and health risks is particularly unique. Not only do environment and health risks challenge those impacted (e.g., asthmatic athletes), but others who regularly interact with them; in organized sport, environment and health risk management can fall on caregivers, teammates, sports organizations, and coaches, many of whom are volunteers with little training in child development or environment and health issues (Merkel, 2013). Further, there is currently limited asthma education available for coaches or sports organizations (Clean Air Champions, 2013), and inadequate prevention and management practices by those in charge could increase asthmatic youth athlete vulnerability (Bellamy & Harris, 2005). Parents and members of other social networks (e.g., teammates) are also involved in the risk-management process (Brown et al., 2010; Gallant, 2003), and are therefore impacted by the physical and emotional experiences associated with living with and managing asthma in sport.

The links between elements of the environment, asthma and its management, and the role of various stakeholders in organized youth team sport are inevitably complex. Increasing our understanding of how two groups (e.g., parents of athletes with allergic disease, coaches) within organized youth team sport perceive asthma as an emerging environmental health risk is therefore critical to ensure children with asthma have the same opportunities for well-managed physical activity and sport as their non-asthmatic peers. Using Harrington & Elliott's (2015) framework, we therefore investigate the broad factors that influence asthma risk perception outcomes, including the context in which risk perceptions of asthma are shaped. This research therefore has three primary objectives: 1) to document asthma risk perception outcomes amongst youth team sport coaches and parents of allergic athletes, 2) to investigate the factors shaping asthma risk perception amongst two distinct populations (parents, coaches) in youth team sport, and 3) to apply Harrington and Elliott's (2015) place-based framework using asthma in sport as a case study.

6.2 Methods

The data used to address the research objectives in this manuscript stem from a larger mixed-methods study that seeks to understand how users and providers of sport in Ontario understand and manage the links between allergic disease, the environment and physical activity. Results from two online risk perception surveys, and a sports organization website policy and guideline content analysis will be reported. The online risk perception surveys were conducted between October 2013 and December 2014 in Ontario, Canada, and were granted ethics clearance by the University of Waterloo Research Ethics Committee. The sports organization policy and guideline content analysis was conducted in January and February of 2018.

6.2.1 Research design.

This research presents responses from two online risk perception surveys. The first survey was completed by community-level youth team sport coaches in Ontario. Both recreational and competitive, indoor and outdoor coaches were included (n=94). The second survey was completed by parents of children diagnosed with allergic disease (including asthma) (n=90). The surveys were hosted by FluidSurveys, which is now operated by SurveyMonkey (www.surveymonkey.com). Coach and parent participants were recruited through sports organizations in Ontario. A list of organized youth team sport organizations from the Greater Golden Horseshoe Region of Southern Ontario (spanning municipalities including Guelph, Halton Region, Hamilton, Peel Region, Waterloo Region, and Wellington County) was compiled (N=219 organizations) using an online search with key terms including a list of possible team sports (e.g., soccer, baseball, softball, rugby, cricket) and municipalities within the region. All clubs were contacted with a brief description of the research, and asked to either post a link to the surveys on their website or distribute an email with the survey links to their membership. If coach email addresses were listed directly on an organization's website, a summary of the research and invitation to participate was distributed. A research Twitter account was also created; sports organizations, and health, environment or asthma and allergy organizations (e.g., Asthma Canada) across Ontario and Canada were followed. Links to both surveys were periodically tweeted by the research account, which were then occasionally retweeted by followers. The coach and parent surveys were active from October 2013 to September 2014, and November 2013 to December 2014, respectively. For both surveys, a criterion for inclusion was being an Ontario resident. For coach participants, inclusion criteria included coaching youth (under age 18) organized team sport within 12 months of participation, while parent participants

were required to have a child aged 18 years or younger affected by asthma or allergic disease (e.g., food allergy, asthma, respiratory allergy), that participated in organized team sport within a year of survey completion. If criteria were not met, responses were removed from the dataset.

To increase understanding of the broad political context in which environment and health risks in sport are experienced, a policy and guideline content analysis of community-level team sport organization websites in the Greater Golden Horseshoe region of Southern Ontario was undertaken. This analysis increased our understanding of how environment and health issues, particularly asthma, are prioritized and managed amongst youth team sport stakeholders, and the contextual factors that may impact how risk perceptions are formed in community-level sport in this region of Ontario. The list of sport organization websites used for survey distribution was revised and updated in early 2018 (to account for organizations closing or merging), and 193 sport organization websites were included.

6.2.2 Analysis.

Harrington and Elliott's (2015) conceptual framework (Figure 2.1) and the relevant literature on asthma, physical activity, and sport participation were used to guide survey question design; questions cover a range of topics including the sport physical and sociocultural environments, risk exposure, indicators of levels of trust and general environmental risk attitudes, and risk perception outcomes. Socioeconomic position and demographic data was collected for both parent and coach samples, and compared with Statistics Canada (2016) data for the Ontario population (Table 6.1). While certain questions are consistent across the coach and parent surveys (e.g., environmental attitudes, symptom and trigger knowledge), some questions are unique to each survey (e.g., coaching qualifications, allergic child's gender).

The survey collected attitudinal data related to the environment and individual, family and Canadians' health. These questions were used to measure concern about the possible impacts of the environment on human health, and used as an indicator of participant attitudes toward environmental health risks (as applied by Harrington et al. [2012]). For efficiency, the five survey items were used to construct an Environment and Health Attitudes score (Cronbach alpha value of .810 and .739 for coaches and parents, respectively), whereby participants received a point for each statement in which they either 'Agreed' or 'Strongly Agreed' with a pro-environmental attitude (for a total of 5). Further, nineteen survey items on asthma symptoms were used to create an Asthma Symptom Knowledge score (Cronbach alpha value of .855 and .881 for coaches and parents, respectively), while twenty survey items on asthma triggers were used to create an Asthma Trigger Knowledge score (Cronbach alpha value of .905 and .891 for coaches and parents, respectively). These scores are used as indicators of participant knowledge of asthma. Cronbach's alpha measure is used to assess the reliability of a set of scale items, and while there are differing reports about acceptable values of alpha, those between 0.7 and 0.95 are generally considered suitable (Tavalok & Dennick, 2011).

Risk perception outcome data are measured for both parents and coaches, using Krewski et al., (1995; 2006) and Harrington et al.'s (2012) methodology as a guide. Coach and parent participants were asked to rate the degree of health risk (e.g., "high", "moderate", "low" or "unknown") posed to the Canadian population by asthma and 16 other health risks. Risk ratings were grouped together to represent high risk, versus low risk (risks ranked as "moderate", "low" or "unknown"). Respondents with no opinion were grouped into the unknown risk category. To increase understanding of whether respondents who rate health risks higher are more likely to rate asthma risk as higher, a Propensity for Risk score was calculated. For each of the 17 health

risk variables, risks ranked as “high” were given 3 points, “moderate” were given 2 points, “low” were given 1 point, and “unknown” were not given any points. The total possible Propensity for Risk score was 51.

Using the asthma risk perception measure (“high” vs “other”) as the outcome variable, we conducted a bivariate analysis to investigate which variables of interest were correlated to asthma risk perception outcomes both when survey data from the coach and parent surveys were combined (for variables included in both surveys), and for the coach and parent surveys individually. Chi-square and Fisher’s exact tests (for categorical variables), and independent t-tests (for continuous variables) were conducted. In order to compare asthma risk perception outcome differences between coaches and parents, a Mann-Whitney U test was conducted.

Finally, binary logistic regression was used to investigate determinants of asthma risk perception. Variables were chosen to be included in the models (coach, parent, and combined) based on significance in the bivariate analysis, and the relevant asthma and allergic disease risk perception literature. Overall fit for the models was assessed using the Omnibus Tests of Model Coefficients. All univariate, bivariate, and multivariate analyses were carried out using IBM SPSS Statistics Version 25.

With respect to the youth team sport political environment, a policy and guideline content analysis of organized team sport websites was conducted. Each website was reviewed for broad content related to environment and health, and organization policy or guideline documents. If environment and health content or guideline and policy documents were present, the content was analyzed using a data extraction tool designed to record what, if any, environment and health issues are identified, whether they relate to specific environment and health issues (e.g., air

quality, allergy and asthma), and if they address asthma management in sport (e.g., specific coach behaviours). The review was completed between January and February 2018.

Certain components of the framework (e.g., economic environment) were not directly addressed in the online surveys or the policy and guideline content analysis of sport organization websites. In these cases, we briefly draw on existing literature to describe possible factors that may contribute to how that component of the framework could influence perceived risk of asthma in organized youth team sport.

6.3 Results

Univariate and bivariate results are presented in seven categories that parallel Harrington and Elliott's (2015) place-based framework; Survey Sample Characteristics, Risk Perception Outcomes, Political Environment, Physical Environment, Sociocultural Environment, Economic Environment, and Environmental Health Risk. Regression Results are then detailed.

6.3.1 Sample characteristics.

Compared with the Ontario population (Statistics Canada, 2016), coach and parent samples had higher proportions of younger and middle-aged respondents (46% of coach and 63% of parent respondents were between 40-49 years of age, compared with 14% of Ontarians). While coach participants' gender is split fairly evenly (55% males), the large majority of parent respondents (77%) were female. Respondents with lower levels of education were under represented, as 100% of coaches and parents had completed secondary school, compared with 82% of Ontarians. Coach and parent samples had a lower proportion of immigrants (14% and 19%, respectively), while a larger proportion of coaches (66%) and parents (81%) are married compared with Ontarians (58%) (Table 6.1). Although the surveys were open to participants

from across Ontario, the Regional Municipalities of Halton and Waterloo, and Middlesex County have the largest proportion of respondents³ (Table 6.2).

Table 6.1 Survey Sample Characteristics

Demographic Variable		Number of Coach Respondents	% of Coach Respondents	Number of Parent Respondents	% of Parent Respondents	% of Ontario Population (2016)^
Gender	Male	52	55%	18	20%	49%
	Female	41	44%	69	77%	51%
	Did Not Identify	1	1%	3	3%	
Age	20-29	24	26%	0	0%	13%
	30-39	14	15%	17	19%	13%
	40-49	43	46%	57	63%	14%
	50-59	11	12%	13	14%	15%
	60-69	2	2%	0	0%	12%
	70+	0	0%	1	1%	11%
	Did Not Identify	0	0%	2	2%	
Education	Less than secondary school	0	0%	0	0%	18%
	Secondary school	12	13%	8	9%	27%
	Postsecondary (e.g., college or university bachelor level)	63	67%	60	68%	46%
	Master's/PhD/professional degree	19	20%	21	23%	9%
	Did Not Identify	0	0%	0	0%	
Immigrant Status	Canada Born	81	86%	73	81%	69%
	Immigrant	13	14%	17	19%	31%
Marital Status	Married	62	66%	73	81%	58%
	Single	22	23%	0	0%	28%
	Separated/Divorced	8	9%	13	14%	9%
	Widowed	0	0%	3	3%	6%
	Did Not Identify	2	2%	1	1%	
<i>Total</i>		94	100%	90	100%	100%

^Source: Statistics Canada (2016)

Table 6.2 Survey Sample Region of Residence

Region of Residence	Number of Coach Participants	Number of Parent Participants
Regional Municipality of Halton	26	37
Middlesex County	25	2
Regional Municipality of Waterloo	23	27
Regional Municipality of Peel	6	3
City of Hamilton	6	5
City of Ottawa		5
Regional Municipality of Durham		4
County of Perth		2
Did Not Specify	1	2
Other (e.g., Regional Municipality of Niagara, Brant County, Wellington County)	7	3
<i>Total</i>	94	90

6.3.2 Risk perception outcomes.

To understand how coaches and parents perceive asthma risk compared with other environment and health risks, participants were asked to rank seventeen health hazards as “high”, “moderate”, “low” or “unknown”. Figures 6.1, 6.2 and 6.3 illustrate the respective combined, coach-only and parent-only perceived level of risk for the health hazards. Overall, obesity (69% rated as high), stress (59%), cigarettes (41%), respiratory allergy (38%) and food allergy (34%) were the highest rated risks amongst the total sample. Amongst coaches specifically, obesity (82%), stress (61%), cigarettes (44%), crime and violence (32%), and respiratory allergy (32%) were the top five risks, while parents perceived stress (57%), obesity (54%), respiratory allergy (43%), smog and air quality (43%), and food allergy (41%) as their top risks. Asthma was ranked

seventh by both coaches and parents; rated highly by 23% and 34%, respectively. Other allergic disease determinants and outcomes were also included as health risks, such as food allergy (ranked highly by 27% of coaches and 41% of parents), smog and air quality (23% of coaches, 43% of parents), and cigarettes (44% of coaches, 38% of parents).

In order to determine whether asthma risk perception outcomes differ between coach and parent participants, a Mann-Whitney U test was conducted (risks ranked as “High” were scored as 3, “Moderate” as 2, “Low” as 1, and “Unknown” as 0). Distribution of the risk perception outcomes for coaches and parents were similar, as assessed by visual inspection. Parent mean risk perception scores were 2.26 (SD=.63), while coach mean risk perception scores were 2.10 (SD=.62). A Mann-Whitney U test showed that there was a significant difference (U=3,553.5, z=-1.812 p=.07) between coach and parent risk perception outcomes.

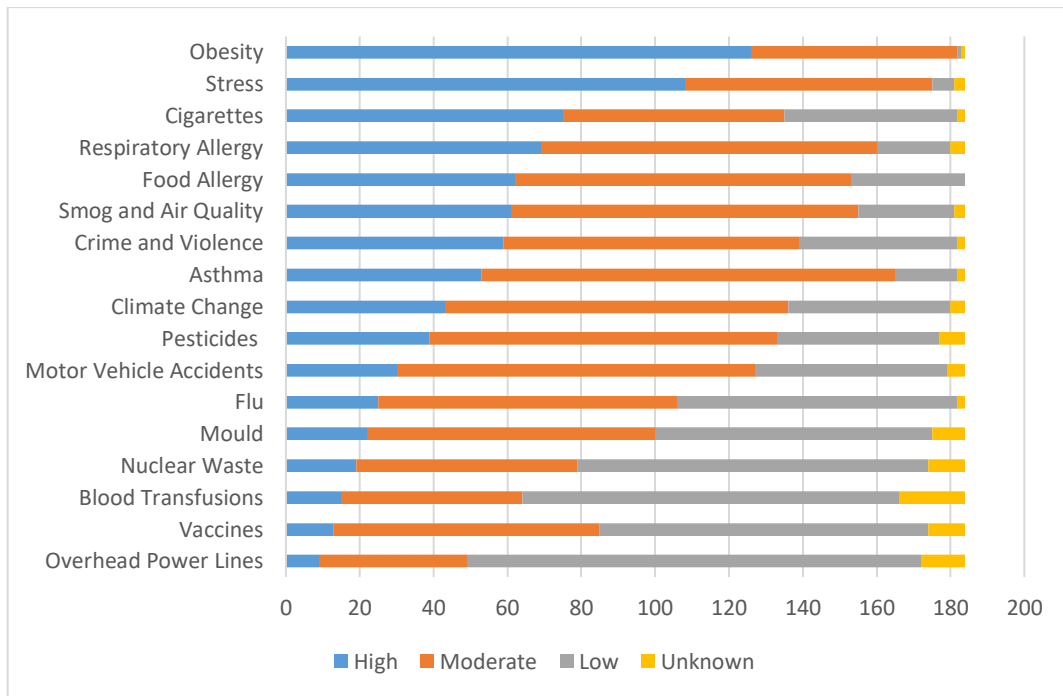


Figure 6.1 Coach and Parent Perceived Level of Risk to the Canadian Public for 17 Health Hazards

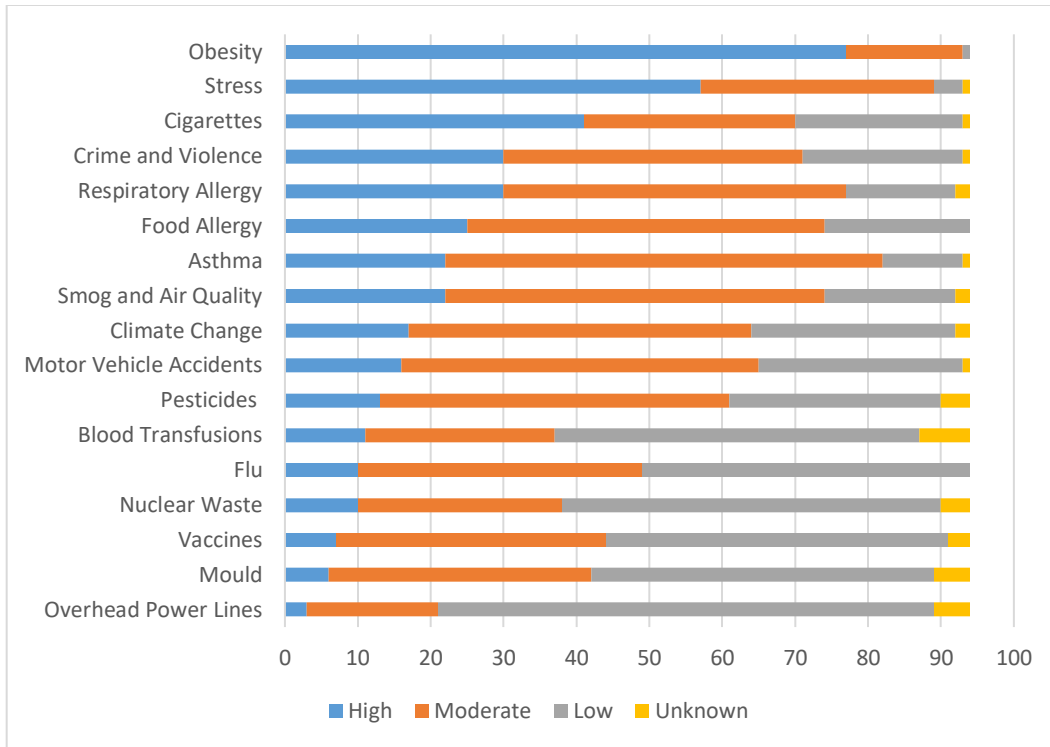


Figure 6.2 Coach Perceived Level of Risk to the Canadian Public for 17 Health Hazards

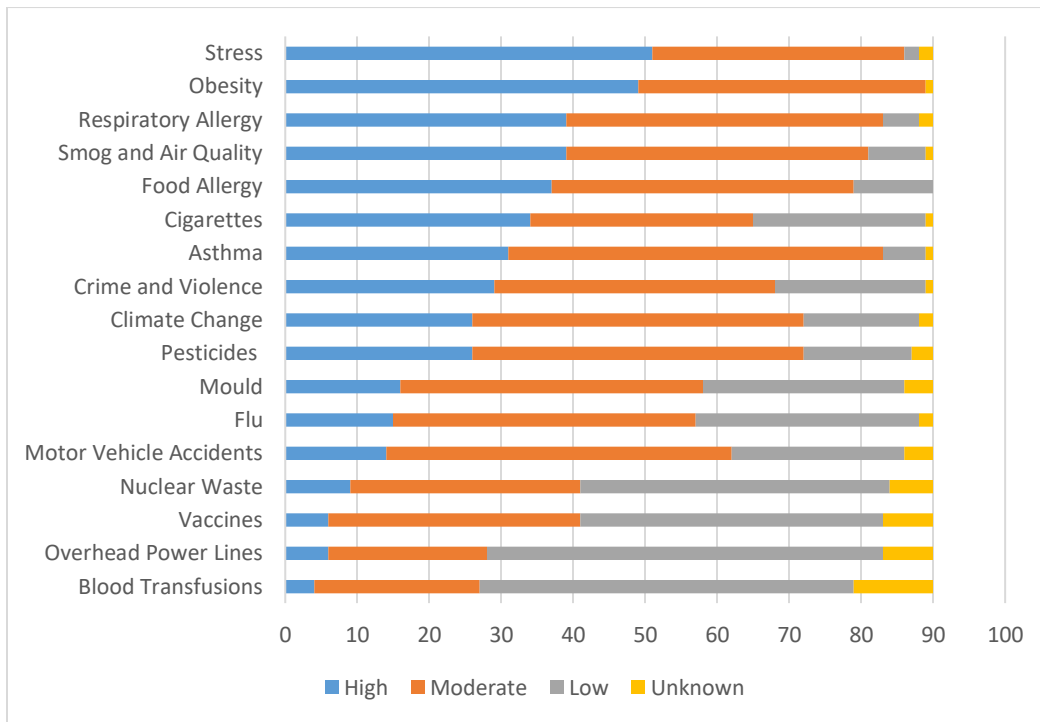


Figure 6.3 Parent Perceived Level of Risk to the Canadian Public for 17 Health Hazards

6.3.3 Political environment.

To increase understanding of the political context in which asthma risk perceptions are formed, we draw from a policy and guideline content analysis of community-level team sport organization websites. Overall, 193 websites were included in the analysis, located across Hamilton (n=38), Mississauga (n=30), Kitchener-Waterloo (n=21), Burlington (n=13), Guelph (n=13), Cambridge (n=10), Etobicoke (n=6), Milton (n=6), and others (n=43). The organizations offered a wide variety of indoor (n=78), outdoor (n=67) and multi-environment (n=48) sports, including soccer (n=37), hockey (n=33), baseball (n=25), basketball (n=20), volleyball (n=14), softball/t-ball (n=14), ringette (n=9), rugby (n=8), and others including lacrosse, cricket and rowing (n=13).

Results found that sport, environment and health issues were identified on roughly half (n=97) of the sport organization websites reviewed. Sport and health guidelines, policies or related content primarily focused on soccer (n=29), hockey (n=23), baseball (n=18), ringette (n=6), football (n=6), lacrosse (n=5), and volleyball (n=4), and offered in indoor (n=37), outdoor (n=26), or both environments (n=34).

With respect to thematic relevance, asthma and its management were not mentioned on any of the sport organization websites reviewed, indicating asthma may not be prioritized or perceived as particularly risky by sport providers in Southern Ontario. Possible broad impacts on respiratory health (e.g., related to heat or tobacco-related policies) were identified, however they were not mentioned in the context of asthma or allergic disease (e.g., heat stress was described related to the importance of hydration and heat stroke avoidance). Extreme weather related to lightening (n=28) and the prevention and management of physical injuries related to sport (e.g.,

concussion [n=47]) were most frequently mentioned. See Table 6.3 for full breakdown of sport and health themes identified.

Table 6.3 Sport Organization Website Sport and Health Themes Identified

Sport and Health Theme		Number of Websites Identified	% of Total Websites Reviewed
Extreme Weather	Lightening	28	15%
	Heat Stress	8	4%
	Other (e.g., rain)	15	8%
Concussion		47	24%
Medical Information Form		27	14%
Other Respiratory Health (e.g., tobacco-free policy)		25	13%
Other (e.g., diabetes, physical injury)		25	13%
Other Food Policy/Guidelines (e.g., healthy snacks)		10	5%
Emergency Action Plan		8	4%
Food Allergy Management		2	1%
Asthma Management		0	0%

6.3.4 Physical environment.

We draw on results from the coach and parent surveys in order to populate the physical environment component of the framework. Based on the youth team sport organizations contacted for recruitment, a range of physical environments, including outdoor grass and turf fields, outdoor baseball (e.g., dirt) fields, and indoor ice rinks, pools, turf and gymnasium environments are relevant.

Broadly, most coaches (59%) reported participating in their sport primarily in outdoor environments, while 33% coached solely in indoor environments. Parents also reported their allergic child's primary sport environment; 12% participated solely in outdoor environments, 29% participated in indoor environments, while 59% were involved in both indoor and outdoor environments. Coach respondents also reported their season(s) of participation (Fall [76%],

Winter [74%], Spring [80%], Summer [71%]), and typical training/game times (6am-9am [11%], 9am-12pm [24%], 12pm-4pm [30%], 4pm-6pm [25%], 6pm-9pm [88%], 9pm-12am [34%]). Chi-square tests were performed for all physical environment variables in both surveys, and no relationships were found between physical environment and asthma risk perception. When the surveys were combined, an association between sport environment and asthma risk perception was observed ($\chi^2(2)=4.97$, $p=.083$), as participants in solely indoor (23% ranked as high) and outdoor (24%) sports were less likely to rank risk perception as high compared with those involved in both sport environments (44%) (Table 6.4).

6.3.5 Sociocultural environment.

Similarly, we address the sociocultural context in which organized youth team sport occurs through data from the coach and parent surveys. As an indicator of the sociocultural environment, and to understand if coaches interact with parents of the athletes they coach related to athlete health, they were asked “Do parents typically speak to you about their children’s health concerns?” Seventy-five percent reported discussing athlete health with parents. Similarly, 69% of parents ($n=62$) state that they have discussed the symptoms of their child’s asthma/allergies with the coach. These 62 participants were asked if their coach was receptive, and all reported coach receptivity. More specifically, 57% of parents ($n=51$) reported discussing the appropriate steps to manage their child’s asthma/allergies with the coach, and 100% of these parents described their coach as receptive. Of the 51 parents who reported discussing management with coaches, 82% ($n=42$) reported that their coach followed through with the appropriate asthma management steps. Bivariate analysis was performed using the sociocultural environment variables, and no relationships were found with asthma risk perception (Table 6.4).

6.3.6 Economic environment.

While we did not directly address elements of the economic environment, we speculate regarding how the economic environment can contribute to how environment and health risks are experienced and managed. For example, training and competition facility location and quality could be impacted by broader economic conditions (e.g., location of industrial polluters near facilities in marginalized communities [Harrington & Elliott, 2015]). Further, the economic environment could influence exposure to asthma information, impacting the way asthma risk perception is attenuated or amplified (Harrington & Elliott, 2015; Kasperson et al., 1988). For example, while Clean Air Champions and the National Coach Certification Program have created an asthma education tool for providers of sport in Canada, it is currently not available to Canadian coaches due to a reduction in funding (Coaching Association of Canada, 2017). Even when active, research suggests economic barriers to coach education completion, both at an individual level (e.g., when paying out of pocket coaches may not prioritize asthma education), and amongst sport organizations (e.g., coach education subsidization may be limited compared with other priorities) (Vail, 2007).

6.3.7 Environmental health risk.

6.3.7.1 Socioeconomic position and demographics.

In addition to the broad coach and parent sample characteristics, the coach and parent surveys investigate other general and sport-related demographic characteristics. Broadly, 71% of coaches reported having their own children (compared with 100% of the parent sample). When asked the gender of their allergic child, parents most frequently reported having a female (60%) allergic child. More specifically related to sport participation, the majority of coaches (50%) fill head coach roles, while 19% and 31% of coaches fill assistant or other (e.g., goalkeeper coach) roles, respectively. Coaches were involved with a number of age groups (under 9 [14%], 10-13

year old [18%], 14+ years [35%], multiple age groups [32%]), and have a range of years of experience (0-5 years [37%], 6-15 years [45%], 16+ years [18%]). The majority of coaches reported having some form of coaching (79%), or medical qualifications (e.g., First Aid) (65%). Coaches were involved frequently in competitive sport (54%) or with multiple teams in both competitive and recreational environments (18%). When asked about the level of their allergic child's primary sport, the majority (62%) of parents also reported competitive sport. Coach participants were primarily involved in soccer (56%), ice hockey (18%), and football (7%), while parents were involved most frequently with soccer (66%), ringette (20%), and ice hockey (14%).

Bivariate analysis was performed with all socioeconomic coach and parent variables. An association between coach years of experience and asthma risk perception was observed ($\chi^2(2)=5.45$, $p=0.07$), as experienced coaches (6-15 years) were less likely to rank asthma risk perception as high (6% ranked high), compared with newer (0-5 years) coaches (20%), or mid-level experienced (6-15 years) coaches (33%). Further, an association between coach gender and asthma risk perception was also observed ($\chi^2(1)=2.8$, $p=0.09$), as females were more likely to rank asthma risk perception as high (32%), compared with males (17%). When the sample was combined, bivariate analysis revealed a relationship between gender and risk perception; females were more likely to rank asthma risk as high (35%), compared with males (18%) ($\chi^2(1)=6.21$, $p=0.013$). When combined, a relationship between asthma risk perception and coach or parent participant status was also observed ($\chi^2(1)=2.73$, $p=0.098$), as coach participants were less likely to rank asthma risk perception as high (23%), compared with parent participants (34%).

6.3.7.2 Risk characteristics.

We both speculate and draw on results from the coach and parent online surveys to populate the risk characteristics element of the framework. While we did not directly investigate

levels of dread risk, there is evidence to suggest asthma prevalence is increasing (Subbarao et al., 2009), and is increasingly common amongst children in Ontario (Gershon et al., 2010). Although asthma is an involuntary and inequitable risk (e.g., disproportionately impacts children, minority groups) (Holsey et al., 2013), and has potentially fatal consequences (e.g., Ontario student Ryan Gibbons suffered a fatal asthma attack at school in 2012 [CBC, 2015]), it can be controlled (e.g., with medication) and has low widespread catastrophic potential.

Amongst coaches and parents, we assume that asthma is a relatively known risk. Although asthma in sport is involuntary and there exists uncertainty regarding asthma etiology and prevalence, prevention and management behaviours can reduce symptoms and allow children and youth to participate in high-levels of physical activity (Glazebrook et al., 2006). To understand levels of asthma knowledge, coach and parent participants were asked to identify symptoms and triggers of asthma from a list of 19 and 20 possibilities, respectively; participants then received an Asthma Symptom score and an Asthma Trigger score based on the number of correct responses. Independent t-tests were performed for the score variables when the surveys were combined and for coaches and parents individually, and no relationships were found between symptom and trigger knowledge and asthma risk perception (Table 6.4).

6.3.7.3 Exposure.

We used data from the coach and parent surveys to understand direct exposure. Twenty-seven percent of coach participants reported being diagnosed with an allergic disease, whereas 46% of parents stated that they have a personal diagnosis. Chi-square tests were performed with direct exposure variables and asthma risk perception outcomes (Table 6.4). An association between coach personal allergic disease and asthma risk perception was observed ($\chi^2(1)=5.23$, $p=0.02$), as coaches with allergic disease were more likely to rank asthma risk perception as high

(40% ranked as high) compared to those without (17%). When surveys were combined, an association between personal allergic disease and asthma risk perception was also observed ($\chi^2(1)=4.13, p=0.04$), as participants with allergic disease were more likely to rank asthma risk perception as high (38%), compared with those without (24%).

To investigate indirect exposure, we draw from multiple variables in both coach and parent surveys. Twenty-seven percent of coaches reported having another family member (e.g., child, parent, sibling) affected by allergic disease, and while all parents have a child with a form of allergic disease, 77% of respondents report a child diagnosed with asthma specifically, and 60% have a child with another form of allergic disease (e.g., other respiratory allergy, food allergy). Fewer parents (42%) had a child affected by three or more forms of allergic disease. Chi-square tests were performed with the indirect exposure variables, and no relationships were found between indirect exposure and asthma risk perception (Table 6.4).

6.3.7.4 Mediators of expectation.

Amongst coaches, the Propensity for Risk score varied between 18 and 45, with a median ranking of 32. The mean Propensity for Risk was 31.89 (SD=6.39). Amongst parents, the score varied between 18 and 47, with a median of 34. The mean Propensity for Risk was 33.29 (SD=6.53). Independent t-tests were performed between Propensity for Risk and asthma risk perception outcomes, and associations were found between high Propensity for Risk and asthma risk perception for coaches ($t(92)=4.15, p=.000$), parents ($t(88)=7.2, p=.000$), and when combined ($t(182)=8.08, p=.000$).

Due to the role of the environment in the etiology of asthma, and in order to understand how general environmental attitudes mediate asthma risk perception, coach and parent participants were asked to rank their agreement with a series of five statements related to the

environment and individual, family, and Canadians' health. Coach participants generally expressed higher levels of concern related to the environment broadly (e.g., 60% reported being concerned about the effects of the environment on the health of their friends and family), but less related to questions about climate change and health (e.g., 34% reported concern related to the health impacts of climate change on family and friends). Seventy-nine percent of parent participants reported high levels of concern related to the effects of the environment on the health of their friends and family, and the majority (55%) expressed worry related to the health impacts of climate change on their family and friends. Associations between the Environmental Attitudes score and asthma risk perception for coaches ($t(92)=3.05$, $p=.003$), and when combined ($t(182)=3.37$, $p=.001$) were found. Chi-square tests were also performed between each environmental attitudes statement and asthma risk perception for coaches, parents, and the combined survey, and a number of associations were found (see Table 6.4).

Finally, to investigate how measures of trust and coping mediate asthma risk perception, coaches and parents were asked to rank a series of statements related to the social environment and coping mechanisms on their team. Amongst coaches and parents, high levels of trust and coping were reported. For example, when asked if another parent or assistant coach helps run training or a game if they are unable to attend, 90% of coaches agreed. Further, 86% of parents agreed that if their child suffers an injury during the game and they are absent, that they trust another parent or coach will choose the appropriate course of action. Chi-square tests were performed with the measures of trust and coping from the coach surveys, and associations were found between two trust and coping variables (Table 6.4). When Chi-square tests were performed with the parent measures, no relationships were found between trust and coping and asthma risk perception.

Table 6.4 Perceived Asthma Risk – Bivariate Results

Component of Framework	Explanatory Variables	Combined		Coaches		Parents	
		Value of X ²	X ² Sig [^]	Value of X ²	X ² Sig [^]	Value of X ²	X ² Sig [^]
Physical Environment	Sport Physical Environment: Indoor vs Outdoor/Both	4.97	*	0.42	-	3.11	-
	Season of Participation: Fall Sport			0.05	-		
	Season of Participation: Winter Sport			0.05	-		
	Season of Participation: Spring Sport			0.07	-		
	Season of Participation: Summer Sport			0.5	-		
	Training/Game Time: 6am-9am			2.31#	-		
	Training/Game Time: 9am-12pm			0.05	-		
	Training/Game Time: 12pm-4pm			1.85	-		
	Training/Game Time: 4pm-6pm			0.61	-		

			Training/Game Time: 6pm-9pm			1.42	-			
			Training/Game Time: 9pm-midnight			0.6	-			
			Do Parents Discuss Health Issues with You: Yes			0.82	-			
Sociocultural Environment			Do You Discuss Allergic Disease with the Coach: Yes					0.62	-	
			Do You Discuss Asthma Management with Coach: Yes					0.04	-	
Environmental Health Risk	Risk Characteristics	Unknown	Asthma Symptom Knowledge Score%	t=1.04	-	t=.72	-	t=.78	-	
			Asthma Trigger Knowledge Score%	t=.31	-	t=.006	-	t=.91	-	
	Exposure	Direct	Personal Allergic Disease: Yes	4.13	**	5.23	**	0.15	-	
			Indirect	Proportion of Team Affected	2.56	-	1.89	-	0.31	-
				Other Family Members Affected: Yes			0.007	-		

		Child with Asthma: Yes				0.02	-	
		Child with Other Allergic Disease: Yes				0.03	-	
		Child with 3+ Allergic Diseases: Yes				0.74	-	
Mediators of Expectation	General Environmental Risk Attitudes	Propensity for Risk Score%	t=8.08	***	t=4.15	***	t=7.20	***
		Environmental Attitudes Score%	t=3.37	***	t=3.05	***	t=1.33	-
		The environment is a major concern for Canadians: Agree	5.49	**	0.5	-	6.27	**
		The environment poses a significant health concern for Canadians: Agree	7.39	***	2.59	-	3.41	*
		I am concerned about the effects of the environment on the health of my family and friends: Agree	8.78	***	5.9	**	1.91	-

	Climate change is a major concern for Canadians: Agree	5.30	**	8.43	***	0.86	-
	Climate change is a major concern for my family and friends: Agree	3.11	*	11.2	***	0.32	-
Measures of Trust/Coping	If I am unable to attend/coach a practice/game, another parent or assistant coach will run the practice/game in my place: Agree			0.55	-		
	If I am unable to attend/coach a practice, I will reschedule: Disagree			9.19	***		
	I have an assistant coach or parent volunteers that help out during practices and games: Agree			0.04	-		

		related issues: Agree						
		Carpooling options are easily available for my child's team: Agree					0.23	-
		If I am unable to attend a practice or game, my child usually will not attend either: Disagree					0.35	-
Socioeconomic Position and Demographics	Sport-Related	Coach or Parent	2.73	*				
		Coaching Role: Head vs Assistant			4.59	-		
		Sport Level: Competitive vs Recreational	.74	-	1.4	-	0.1	-
		Age Group Coached			1.15	-		
		Coaching Qualifications: Yes			0.16	-		
		Medical Qualifications: Yes			1.35	-		

			Years of Experience (Years Coached)		5.45	*	
			Primary Sport Participation	3.43	-	2.08	- 5.19 -
	General		Gender	6.21	***	2.80	* 1.49 -
			Parental Status	.01	-	0.82	-
			Canadian Born	.36	-	0.001	- 0.42 -
			Marital Status: Partnered vs Unpartnered	1.13	-	0.6	- 1.47 -
			Education Level	1.21	-	1.28	- .43 -
			Employment Status: Employed vs Other	1.08	-	0.11	- 2.24 -
			Age%	t=.238	-	t=1.16	- t=.63 -
			Child Gender				.01 -

^Significance: *** p<.01, **p<.05, *p<.1

a Fisher's Exact test was conducted

% an Independent t-test for Equality of Means was conducted

6.3.8 Regression results.

Three binary regression analyses were conducted to characterize the perception of risk around asthma in organized youth team sport (combined sample; coaches; parents). Coefficients are presented as odds ratios (ORs) with 95% confidence intervals (CIs) (significance with p-values < 0.1 are also reported). When reference categories are reported (e.g., with the exception of the scores), odds ratios can be interpreted as the odds of a respondent to rate the risk of asthma as high relative to the reference category, while controlling for other variables included in the model. The models (Table 6.5a [Combined], 5b [Coaches] and 5c [Parents]) achieved Nagelkerke R square values of .471 (combined), .727 (coaches), and .738 (parents), with 80.3% (combined), 92.6% (coaches), and 86.7% (parents) of cases correctly classified.

6.3.8.1 Physical environment.

When combined, participants of sport in solely an indoor (OR: 0.34, 95% CI: [.1, 1.18]) or outdoor (OR: 0.37, 95% CI: [.12, 1.16]) physical environment were less likely to rate the risks of asthma as high compared with those participating in both sport environments. Similarly, amongst parents specifically, participation in indoor (OR: .001, 95% CI: [.001, .36]) or outdoor (OR: .08, 95% CI: [.01, 1.33]) physical environments were less likely to rate asthma risk perception as high compared with participants of sport in both contexts.

6.3.8.2 Environmental health risk.

6.3.8.2.1 Risk characteristics; unknown.

In both the combined and parent models, the Asthma Symptom Trigger score emerged as significant. For each increase by one in the score, the likelihood that a respondent would rate the risk of asthma as high decreased (Combined: OR: 0.84, 95% CI: [.71, .99]; Parents: OR: .59, 95% CI: [.31, 1.1]).

6.3.8.2.2 Risk characteristics; exposure.

Direct exposure emerged as a significant predictor amongst coaches only, as those who were not personally affected by allergic disease were less likely to rate asthma risk as high (OR: 0.04, 95% CI: [.002, .79]). With respect to indirect exposure, coaches who had other family members affected were less likely to perceive asthma risk perception as high (OR: 0.02, 95% CI: [.001, 1.24]). Amongst parents, those who did not a child impacted by three or more allergies were less likely to rate asthma risk as high (OR: 0.02, 95% CI: [.001, .67]).

6.3.8.2.3 Mediators of expectation.

The Propensity for Risk score was a significant predictor of asthma risk perception in all three models. For each increase by one in the score, the likelihood that a respondent would rate the risks of asthma as high increased (Combined: OR: 1.30, 95% CI: [1.18, 1.44]; Coaches: OR: 1.32, 95% CI: [.99, 1.77]; Parents: OR: 2.45, 95% CI: [1.37, 4.50]). Similarly, amongst coaches, the Environmental Attitudes score was a significant predictor of rating asthma risk as high (OR: 1.94, CI: [.92, 4.08]). This relationship was inverse amongst parents (OR: 0.49, CI: [.23, 1.06]).

Two variables used as indicators of trust and coping were included in the coach and parent models; coach respondents who disagreed with the statement 'If I am unable to attend/coach a practice, I will reschedule', were less likely to rate asthma risk as high (OR: 0.1, 95% CI: [.01, 1.22]).

6.3.8.2.4 Socioeconomic position and demographics.

Related to sport specifically, coach participants with medical qualifications were less likely to rank asthma risk perception as high (OR: 0.03, 95% CI: [.001, 1.29]) compared with those without medical qualifications (e.g., First Aid). Coaches in the recreational sport

environment were also less likely to rank asthma risk perception as high (OR: 0.01, 95% CI: [.001, .66]).

When exploring general socioeconomic variables, gender was a predictor amongst coaches; males were less likely to rate asthma risk perception as high (OR: .04, 95% CI: [.001, 1.17]), compared with female coaches. Education was also significant in both the combined and coach models. In the combined model, those with postsecondary education were less likely to rate the risk of asthma as high (OR: 0.24, 95% CI [.05, 1.22]), compared with those with secondary education. Amongst coaches, those with increased education (postsecondary: OR: 0.001, 95% CI [.001, 1.22]; above postsecondary: OR: 0.017, 95% CI [0.001, 2.28]) were less likely to perceive asthma risk as high.

Table 6.5 a) Perceived Asthma Risk – Binary Regression Results, Combined Participants

Component of Framework			Explanatory Variables	Adjusted Odds Ratio	95% Confidence Interval	Signif.^
Physical Environment			Sport Environment: Both (ref.)	1.00	-	-
			Sport Environment: Outdoor	0.37	(.12, 1.16)	*
			Sport Environment: Indoor	0.34	(.1, 1.18)	*
Environmental Health Risk	Risk Characteristics	Unknown	Asthma Symptom Knowledge Score	N/S	-	-
			Asthma Trigger Knowledge Score	0.84	(.71, .99)	**
	Exposure	Direct	Personal Allergic Disease: Yes (ref.)	1.00	-	-
			Personal Allergic Disease: No	N/S	-	-
	Mediators of Expectation	General Environmental Risk Attitudes	Propensity for Risk Score	1.30	(1.18, 1.44)	***
			Environmental Attitudes Score	N/S	-	-
		Measures of Trust/Coping	Contact information for team members and their families is available for them to keep in touch: Agree	N/S	-	-
	Socioeconomic Position and Demographics	Sport-Related	Coach (ref.)	1.00	-	-
			Parent	N/S	-	-
			Sport Level: Competitive (ref.)	1.00	-	-

		Sport Level: Recreational	N/S	-	-
		Sport Level: Other	N/S	-	-
	General	Gender: Female (ref.)	1.00	-	-
		Gender: Male	N/S	-	-
		Canadian Born: Yes (ref.)	1.00	-	-
		Canadian Born: No	N/S	-	-
		Marital Status: Partnered (ref.)	1.00	-	-
		Marital Status: Not Partnered	N/S	-	-
		Education: Secondary (ref.)	1.00	-	-
		Education: Postsecondary (e.g., Bachelors or equivalent)	0.24	(.05, 1.22)	*
		Education: Above (e.g., Masters, Doctorate)	N/S	-	-
		Employment Status: Employed (ref.)	1.00	-	-
		Employment Status: Other (e.g., unemployed, volunteer)	N/S	-	-
		Age	N/S	-	-

*** p<.01, **p<.05, *p<.1

Table 6.5 b) Perceived Asthma Risk – Binary Regression Results, Coach Participants

Component of Framework			Explanatory Variables	Adjusted Odds Ratio	95% Confidence Interval	Signif. ^
Physical Environment			Sport Environment: Both (ref.)	1.00	-	-
			Sport Environment: Outdoor	N/S	-	-
			Sport Environment: Indoor	N/S	-	-
Environmental Health Risk	Risk Characteristics	Unknown	Asthma Symptom Knowledge Score	N/S	-	-
			Asthma Symptom Trigger Score	N/S	-	-
	Exposure	Direct	Personal Allergic Disease: Yes (ref.)	1.00	-	-
			Personal Allergic Disease: No	0.04	(.002, .79)	**
		Indirect	Other Family Members Affected: No (ref.)	1.00	-	-
			Other Family Members Affected: Yes	0.02	(.001, 1.24)	*
	Mediators of Expectation	General Environmental Risk Attitudes	Propensity for Risk Score	1.32	(.99, 1.77)	*
			Environmental Attitudes Score	1.94	(.92, 4.08)	*

Socioeconomic Position and Demographics	Measures of Trust/Coping	Contact information for team members and their families is available for them to keep in touch: Agree	N/S	-	-
		If I am unable to attend/coach a practice, I will reschedule: Disagree	0.10	(.01, 1.22)	*
	Sport-Related	Sport Level: Competitive (ref.)	1.00	-	-
		Sport Level: Recreational	0.01	(.001, .66)	**
		Sport Level: Other	N/S	-	-
		Medical Qualifications: No (ref.)	1.00	-	-
		Medical Qualifications: Yes	0.03	(.001, 1.29)	*
		Years of Experience: 0- 5 (ref.)	1.00	-	-
		Years of Experience: 6- 15	N/S	-	-
		Years of Experience: 16+	N/S	-	-
	General	Gender: Female (ref.)	1.00	-	-
		Gender: Male	0.04	(.001, 1.17)	*
		Canadian Born: Yes (ref.)	1.00	-	-
		Canadian Born: No	N/S	-	-

Marital Status: Partnered (ref.)	1.00	-	-
Marital Status: Not Partnered	N/S	-	-
Education: Secondary (ref.)	1.00	-	-
Education: Postsecondary (e.g., Bachelors or equivalent)	0.001	(.001, 1.22)	*
Education: Above (e.g., Masters, Doctorate)	0.017	(.001, 2.28)	*
Employment Status: Employed (ref.)	1.00	-	-
Employment Status: Other (e.g., unemployed, volunteer)	N/S	-	-
Age	N/S	-	-

*** p<.01, **p<.05, *p<.1

Table 6.5 c) Perceived Asthma Risk – Binary Regression Results, Parent Participants

Component of Framework			Explanatory Variables	Adjusted Odds Ratio	95% Confidence Interval	Signif. ^
Physical Environment			Sport Environment: Both (ref.)	1.00	-	-
			Sport Environment: Outdoor	0.08	(.01, 1.33)	*
			Sport Environment: Indoor	0.001	(.001, .36)	**
Environmental Health Risk	Risk Characteristics	Unknown	Asthma Symptom Knowledge Score	N/S	-	-
			Asthma Trigger Knowledge Score	0.59	(.31, 1.1)	*
	Exposure	Direct	Personal Allergic Disease: Yes (ref.)	1.00	-	-
			Personal Allergic Disease: No	N/S	-	-
		Indirect	Child with Asthma: Yes (ref.)	1.00	-	-
			Child with Asthma: No	N/S	-	-
			Child with Other Allergy: Yes (ref.)	1.00	-	-
			Child with Other Allergy: No	N/S	-	-
			Child with 3+ Allergies: Yes (ref.)	1.00	-	-

		Child with 3+ Allergies: No	0.02	(.001, .67)	**
Mediators of Expectation	General Environmental Risk Attitudes	Propensity for Risk Score	2.45	(1.37, 4.50)	***
		Environmental Attitudes Score	0.49	(.23, 1.06)	*
	Measures of Trust/Coping	Contact information for team members and their families is available for them to keep in touch: Agree	N/S	-	-
		If I am unable to attend a practice or game, my child will usually not attend either: Disagree	N/S	-	-
Socioeconomic Position and Demographics	Sport-Related	Sport Level: Competitive (ref.)	1.00	-	-
		Sport Level: Recreational	N/S	-	-
		Sport Level: Other	N/S	-	-
	General	Gender: Female (ref.)	1.00	-	-
		Gender: Male	N/S	-	-
		Canadian Born: Yes (ref.)	1.00	-	-
		Canadian Born: No	N/S	-	-
		Marital Status: Partnered (ref.)	1.00	-	-
Marital Status: Not Partnered	N/S	-	-		

		Education: Secondary (ref.)	1.00	-	-
		Education: Postsecondary (e.g., Bachelors or equivalent)	N/S	-	-
		Education: Above (e.g., Masters, Doctorate)	N/S	-	-
		Employment Status: Employed (ref.)	1.00	-	-
		Employment Status: Other (e.g., unemployed, volunteer)	N/S	-	-
		Age	N/S	-	-

*** p<.01, **p<.05, *p<.1

6.4 Discussion

This paper applied Harrington & Elliott's (2015) place-based conceptual framework for understanding public experience of risk, in order to investigate the factors shaping asthma risk perception, and document asthma risk perception outcomes amongst youth team sport coaches and parents of allergic athletes in organized youth team sport in Ontario. While the framework has previously been piloted using Canadian perceptions of food allergy and anaphylaxis risk, to increase understanding of its value and limitations, Harrington & Elliott (2015) report the need for increased application of the framework in different contexts, at different scales, and with different environmental hazards. We address these calls, and apply the framework in our research design and data analysis to increase understanding of the relationship(s) between different environmental contexts, and risk perception determinants and outcomes.

This research sought to investigate the various factors that shape risk perception outcomes. Results of the multivariate analysis revealed that amongst coach respondents, those directly affected by allergic disease perceived asthma risk as higher than those not diagnosed. While we know exposure can influence perceived risk, the relationship is complex and direct experience can either enhance or mitigate perceptions of risk (Harrington & Elliott, 2015). For example, van der Linen (2014) found that personal experience with extreme weather acts as a predictor of perceived risk of climate change, and Whitmarsh (2008) found that flood victims are less likely to perceive the possible effects of climate change as catastrophic compared with non-flood victims. Alternatively, Mayer et al. (2017) report that direct personal exposure does not strongly predict risk perception outcomes related to air pollution and climate change. While coach direct exposure is associated with asthma risk perception outcomes, the relationship was inverse for indirect exposure (other family members affected). Further, the relationship between

direct exposure and asthma risk perception did not exist amongst parent respondents (or in the combined model); all parent respondents are indirectly exposed to allergic disease (survey participation criteria included having a child diagnosed with allergy), and a larger proportion are directly impacted themselves (46% of parents compared with 27% of coaches). Parent respondents may therefore possess increased knowledge about asthma control measures, and may have increased familiarity (a possible determinant of risk [Harrington & Elliott, 2015; Slovic, 1987]) with asthma risk. Finally, parents whose child was diagnosed with 3 or more allergies were more likely to rank asthma risk perception as high. This is consistent with food allergy risk perception, as Harrington et al. (2012) found that respondents who had multiple allergies in the home were more likely to rank food allergy risk as high.

When combined and amongst parents, asthma trigger knowledge was negatively associated with risk perception. Previous knowledge and attitudes are known factors that influence perception of risk (Siegrist & Cvetkovich, 2000; Sjoberg & Drottz-Sjoberg, 1991; Wachinger et al., 2013; Zinn, 2006), however the relationship is not consistent. For example, Sjoberg & Drottz-Sjoberg (1991) found that knowledge was negatively associated with level of perceived nuclear risk, while with respect to food allergy, Harrington et al. (2012) reported that those who received information about food allergies in the six months prior to survey completion were more likely to rank the risk of food allergy as high. The variance between measures of knowledge and risk perception is consistent in this work, as while asthma trigger knowledge is associated with lower perceived risk of asthma, knowledge of asthma symptoms is not significantly related to asthma risk perception amongst coaches or parents. Parents of children with allergic disease with high levels of asthma trigger knowledge may be more likely to sustainably manage their child's asthma, and therefore perceive its risk as reduced.

Similarly, education is another indicator of knowledge that is significantly associated with asthma risk perception. Education is a significant predictor of risk perception in other work, as those with higher levels of education generally perceive risk as lower (Ohman, 2017) (e.g., Harrington et al. [2012] found those with the highest levels of education were less likely to rate food allergy risk as high). This is consistent in this work; participants with a Bachelors or equivalent degree were significantly less likely to perceive asthma risk as high compared with those with secondary education (when analyzed in the combined model), while coaches with postsecondary education (e.g., Bachelors or equivalent) or above (e.g., Masters, Doctorate) were less likely to rank asthma risk as high compared with those with secondary education. Further, while completion of coach education was not significantly associated with asthma risk perception in the bivariate analysis (and was consequently excluded from the multivariate model; at the time of the research, no Canadian coaching education included environment and health, or allergic disease content), coaches with medical qualifications (e.g., First Aid) were less likely to perceive asthma risk perception as high. This is not surprising, as in Ontario, environmental emergencies are covered in a Standard First Aid course (e.g., EpiPen guidelines [Canadian Red Cross, 2018; CBC, 2016]), potentially increasing familiarity with how to manage allergic disease amongst coaches.

Data populating the *Mediators of Expectation* component of the framework was also associated with asthma risk perception. In all three models, the Propensity for Risk score was significantly associated with asthma risk perception. This is unsurprising, and indicates that participants who rate risk highly generally (e.g., demonstrate risk adverse attitudes), are more likely to rate asthma risk perception as high. The Environmental Attitudes score was also related to risk perception outcomes amongst coaches and parents; in the multivariate models, the score

was associated with increased asthma risk perception amongst coaches. Interestingly, this relationship was inverse amongst parents. The positive association amongst coaches is consistent with previous findings in the context of allergic disease (food allergy), as general risk attitudes were strongly related to food allergy risk perception in a national Canadian study (Harrington et al., 2012). More broadly, we know pre-existing attitudes and knowledge of social, environmental and health risks contribute to the way risk is perceived (Krewski et al., 2006; Lee et al., 2005).

Interestingly, one trust (that other people can be relied on [Siegrist et al., 2006]) and coping (ability to manage [perceived] risks, access to resources, feelings of social support [Harrington & Elliott, 2015]) indicator also played a role in mediating risk perception outcomes; this relationship existed only amongst coaches, and the relationship was inverse (coaches who disagreed that they would reschedule a practice if they are unable to attend were less likely to rank risk perception as high). While the relationship between risk perception and trust varies by geographical context, trust measure, and type of risk (Viklund, 2003), an inverse relationship between trust and risk perception is consistent with other work that documents elevated levels of trust and reduced perceived risk (Siegrist et al., 2006). Amongst coaches, higher levels of trust and coping may therefore increase feelings of social support and reduce perceived vulnerability with respect to environmental health risks in sport.

Finally, gender was a significant predictor of risk perception outcomes amongst coaches. Male coaches were less likely to perceive asthma risk as high compared with females, which is consistent with previous research related to gender and risk perception (Finucane et al., 2000; Harrington et al., 2012; Krewski et al., 2006), whereby white males are more likely to perceive risks to be low (Finucane et al., 2000; Marshall, 2004), and nonwhite females often provide the highest risk ratings (Finucane et al., 2000). While reasons for the gender discrepancy in risk

perception remain unclear, in the context of health risks in sport, female coaches may socially construct risk, and asthma risk more specifically, differently (e.g., as more hazardous) compared to male coaches, for reasons that could include the social construction of females as primary caregivers (Harrington et al., 2012), and the reported propensity for females to consult physicians more frequently than males related to health-related symptoms (Hunt et al., 2011).

With respect to risk perception outcomes, following the methodology employed by Harrington et al. (2012) and Krewski et al. (1995; 2006) we found that amongst 17 possible health hazards in Canada, when combined participants rank asthma as eighth highest, and when separate coaches and parents rank asthma as seventh highest. The majority of both coaches (n=60) and parents (n=52) rank asthma as a moderate risk. While other forms of allergic disease (e.g., food allergy, anaphylaxis [Harrington et al., 2012]), and hazards either related to, or determinants of respiratory allergy and asthma appear in previous measurements of perceived health risk of hazards to the Canadian public (e.g., cigarette smoking, air pollution/outdoor air quality [in Harrington et al., 2012; Krewski et al., 2006; Krewski et al., 1995], climate change, indoor air quality [in Harrington et al., 2012]), risk perceptions of asthma specifically, and respiratory allergy more broadly, were not measured in previous work. Interestingly, in both the coach and parent surveys, asthma falls amongst similar health hazards; in the coach survey, asthma (23% rank as high risk) falls behind respiratory (32%) and food allergy (27%), and while a higher proportion of parents perceive asthma and other respiratory allergy as high compared with coaches, asthma risk is still perceived as high less frequently (34%) relative to other allergic disease and related health hazards (e.g., respiratory allergy [43% rank as high risk], food allergy [41%]). While respiratory allergy is closely aligned with asthma (e.g., asthma can be allergic or non-allergic [e.g., exercise-induced] and therefore can fall within the category of respiratory

allergy), respiratory allergy also includes other forms of allergic disease including allergic rhinitis (Molinari et al., 2014), impacts 20% of Canadians, and is associated with more severe or frequent asthma symptoms (Asthma Canada, 2018).

There are some limitations to this research. First, splitting coach and parent participant responses in order to conduct separate multivariate analyses reduced the sample size of both surveys. While this allowed additional variables (e.g., survey questions that were only included in the coach or parent survey) to be included in the models, it may not be representative of the entire coach or asthmatic parent populations in Ontario. Similarly, while this research contributed to increasing our understanding of how coaches and parents in Ontario may perceive asthma risk, the coach and parent respondent samples were not geographically representative (e.g., the Regional Municipalities of Halton and Waterloo were most strongly represented), and significant relationships may exist beyond these results. Increasing the survey sample and ensuring representation from across Ontario (e.g., through broader recruitment) could increase reliability and reduce variability of results. Next, the recruitment strategy could present a source of bias in results. Coach participants were recruited to complete a survey related to the links between coaching, physical activity, the environment and health (but were not aware the survey was related to allergic disease), while parents were recruited based on their child being affected by asthma or allergy. This could therefore impact how parents rank asthma (and other allergic disease) in their responses. Thirdly, while this research aimed to understand subjective risk perception, there are inherent risks with self-reported data; although results are anonymous, participant responses may in some cases differ from objective health assessments (e.g., perceived diagnosis of asthma/allergic disease), questions may be misunderstood, and participants may respond in what is perceived as a socially desirable way (rather than responding based on true

feelings) (Grimm, 2010). Finally, although a variety of demographic backgrounds were represented, certain groups were under/over-represented (as compared with the Ontario population), and analysis based on region of residence was not possible due to the small sample size and lack of geographical representation. Extending the survey to other stakeholders in youth sport using different recruitment methodologies could address this gap and allow for future analysis based on other environmental factors (e.g., physical or political environment based on region of residence).

While understanding public perception of risk is necessary for effective risk management, communication, and decision making (Krewski et al., 1995; Slovic et al., 1982), understanding how the public forms risk perceptions and understands risk outcomes is complex. Harrington & Elliott's (2015) paper emphasized the need to understand the social, physical and cultural places where risk is experienced and perceptions are formed, through the construction of a conceptual framework that not only incorporates existing perspectives for understanding public perceptions of risk, but investigates how different types of environments both produce and reflexively interact with public perceptions of environmental health risks (Harrington & Elliott, 2015). In our research, the framework facilitated research design, data organization, and reporting of results, and was used as a guide to emphasize the social, political and physical contexts in which the experience and management of asthma in organized youth sport are embedded. These contexts have been overlooked in previous risk perception literature, and this has been highlighted in critiques of traditional approaches to risk perception (Abraham, 2009; Harrington & Elliott, 2015).

While the appeal of the framework lies in its comprehensiveness, which allows for a range of environmental factors to be considered in the risk perception process, this research

demonstrates that a major challenge of utilizing the framework is the possibility of oversimplification. For example, it is important to recognize that interaction between different components of the environment exists (e.g., sociocultural and economic factors may interact to influence the political context of asthma management in sport), and that certain variables may fall into multiple categories (e.g., measures of trust and coping also act as indicators of the sociocultural environment in sport; coaching qualifications can act as both a measure of socioeconomic status and demographics, as well as indirect exposure to asthma information and management protocol). Successful future application of the model therefore requires cognizance of the overlap and interactions (e.g., between various environmental contexts, categories contributing to risk perception outcomes) that go beyond the defined boundaries of the framework.

Similarly, while Harrington & Elliott (2015) acknowledge the widespread, global nature of many emerging environmental health risks, risk perceptions often remain prominent at the local level and are situated within a particular local context (Bush et al., 2002). Use of the conceptual framework therefore requires consideration of scale; while the four environmental contexts (sociocultural, political, economic and physical) make up the backdrop of the framework, defining scale in these environmental categories may be useful in future applications. For example, the ANGELO Framework (Swinburn et al., 1999) is a tool designed to help conceptualize how factors beyond the individual affect obesity (Asanin Dean & Elliott, 2011). Like Harrington & Elliott (2015), Swinburn et al. (1999) consider four types of environmental settings (physical, sociocultural, political, economic), then sub-categorize the environments by scale; in the context of the ANGELO framework, consideration of the micro (e.g., home, workplace, neighbourhood), and the macro (e.g., provincial health policies) therefore influence

physical activity and dietary patterns that contribute to obesity (Asanin Dean & Elliott, 2011; Swinburn et al., 1999). More specifically, this research primarily explored micro-level environments (e.g., at the team, household and community level; compared with the provincial or national level) and associated individual-level factors (e.g., demographics) that may determine asthma risk perception outcomes. For example, in the investigation of the political environment, community-level sports organization websites were prioritized; although provincial or national sport organizations were not included, the macro-level political environment likely still contributes to how asthma is managed in community-level organized team sport. Similarly, participants were asked about the sport physical environment they participate in (e.g., indoor or outdoor sport), and the sociocultural environment on their primary team of participation.

Moving forward, consideration of the micro and macro scale factors that contribute to how environmental factors influence risk perceptions may therefore be a useful amendment to Harrington & Elliott's (2015) framework. For example, the results of our policy and document content analysis emphasize the importance of consideration of scale. While we investigated the *community-level* sport organization political environment, our understanding of how different political contexts could impact how risk is perceived is incomplete. We found that policy and guidelines related to allergic disease, and more specifically asthma and its management, are generally not included on community sport organization websites. Investigating macro-level sport-specific policy from sport governing bodies at the provincial or national level (e.g., organizations that oversee or govern community-level sport, such as Ontario Soccer, the Ontario Basketball Association, or Hockey Canada), could therefore provide a more comprehensive understanding of the political environment in which asthma risk is managed in Ontario youth sport. Using additional methods (e.g., qualitative approaches) with other stakeholders in

organized youth sport (e.g., sport policy makers, providers of programs at the community-level) could further increase understanding of the political environment. While lack of asthma-related policy on community-level websites may *indicate* how it is constructed in the organized youth sport environment, it is possible that our methods did not access policy that is implemented at the community-level in Ontario.

6.5 Conclusion

Harrington and Elliott's (2015) place-based framework is a valuable conceptual framework and proved useful in both the research design and organization of results. The framework is particularly helpful for conceptualizing how different types of environments may influence risk perceptions of asthma. Its application should continually be refined in order to increase understanding of the value of the framework, in addition to the complex relationships between risk perceptions, management, and place (Harrington & Elliott, 2015). In the context of asthma in organized youth team sport in Ontario, there is room for future investigation of elements of the framework to more comprehensively understand how asthma risk perceptions are formed and managed; for example, in this work we did not investigate the economic environment, and our exploration of the sociocultural environment was limited. Understanding how factors at a range of scales (e.g., micro and macro) in these environmental contexts interact with other elements of emerging environmental health risks (e.g., individual risk characteristics and exposures) could be a direction for future work. As health policy makers and sport governing bodies prioritize and manage the myriad of health risks that could impact child and youth athletes in organized youth team sport in Ontario, considering the places in which risk is experienced (e.g., physical, sociocultural, economic and political contexts) will be critical for

effective risk communication and management, and to ultimately improve asthma management and governance in Ontario organized youth team sport.

CHAPTER SEVEN

Discussion and Conclusion

7.1 Introduction

The links between elements of the environment (broadly defined), asthma and allergic disease, and physical activity and sport participation are complex. During the last half century, there has been an increase in the worldwide prevalence of asthma and allergic disease (Subbarao et al., 2009), and asthma directly affects approximately 3.8 million Canadians (Public Health Agency of Canada, 2018). Participation in physical activity is recommended as part of a comprehensive asthma management plan for children and youth affected (Lochte et al., 2016; Lucas & Platts-Mills, 2005; Williams et al., 2008), and offers additional physical and social benefits (including reduced risk of other chronic disease [Li & Siegrist, 2012]). While children and youth often choose to participate in organized sport as a way of engaging in physical activity, evidence suggests that those with asthma may experience a range of physical and social barriers to physical activity compared with their non-asthmatic peers (Glazebrook et al., 2006; Williams et al., 2008). Ensuring asthma is well-managed in a supportive youth team sport environment (e.g., involving coaches, teammates, parents, and sport providers) can contribute to how youth athletes impacted by asthma and respiratory allergy participate in, enjoy, and maintain physical activity and sport participation into adulthood.

This research therefore used a mixed methods case study approach to increase understanding of how organized youth team sport stakeholders in Ontario (e.g., coaches, players, parents) understand and manage the links between allergic disease, the environment (broadly defined), and physical activity. Theoretically, the research was guided by social constructionism, which explores how experiences of health (e.g., asthma) are constructed through interactions

with others and the everyday world. In this way, how asthma is constructed and understood, and the knowledge, attitudes and management behaviours of coaches, affected youth athletes, and parents are considered just as important as those of health professionals or policy makers.

More specifically, this thesis aimed to address the following research objectives:

- 1) To explore the knowledge, attitudes, and practices of users and providers of child and youth team sport in Ontario with respect to the links between the environment, allergic disease and physical activity;
- 2) To investigate the impacts of a coach education module related to coach attitudes and behaviours regarding the links between the environment, allergic disease and physical activity; and,
- 3) To document the factors shaping the perception of asthma as an emerging environmental health risk in Ontario youth team sport.

This chapter summarizes the major findings of this research, highlights the primary contributions (theoretical, methodological and substantive), identifies limitations of the work, and offers directions for future research.

7.2 Summary of Key Findings

Chapter Four of this thesis reported results from semi-structured, in-depth interviews with youth sport athletes, parents and coaches. Theoretically, this research increased our understanding of the physical and sociocultural ‘risk-scapes’ that emerge in organized youth team sport, and more specifically how they impact a vulnerable population (youth athletes diagnosed with asthma). Substantively, results found that with respect to coach and player knowledge, participants often linked their asthma knowledge to their own personal experiences of asthma (e.g., shortness of breath was identified by all but one participant). Further, aspects of

the sociocultural environment emerged as particularly relevant when discussing attitudes toward asthma in sport, and with respect to asthma management and prevention behaviours. For example, some coaches articulated doubt related to athletes' asthma symptoms, and the possibility of stigmatization (e.g., asthma perceived as a 'weakness'), bullying, or minimizing of symptoms was described by coaches, players and parents. This is particularly important as it highlights the potential for stigmatization to act as a barrier to participation in organized youth team sport. While multiple management techniques were identified, both coaches and players call for increased awareness and education related to asthma acceptance and management in sport.

Chapter Five qualitatively investigated the impact of the Air Aware Coach Module, using focus groups and an in-depth interview to understand how coaches perceive and apply module content in their team and athlete management. Coach participants generally believed the module to be valuable, however some considered its relevance limited to certain contexts (e.g., less relevant in the indoor environment), or less valuable compared with other coach education (e.g., sport-specific tactical or technical skill development). Management behaviours were discussed, particularly with respect to the given scenarios, and while identified behaviours included communication with parents and players, ensuring inclusive environments, and completing medical forms, specific recommendations from the module were at times not identified without probing (e.g., use of the Air Quality Health Index). Barriers to module application described by coaches included the role of their sport organization, stigmatization of asthma/health management, and module cost and interest.

The sixth chapter presents results from two online risk perception surveys and a sports organization website policy and guideline content analysis that primarily explored team-

community-, and individual-level determinants of asthma risk perception. Harrington & Elliott's (2015) place-based framework was applied to facilitate investigation of the factors that shape asthma risk perception, and document asthma risk perception outcomes amongst youth team sport coaches and parents of allergic athletes. The community-level sports organization website policy and guideline content analysis found that while environment and health issues were identified on roughly half (n=97) of the sport organization websites, asthma and its management were not mentioned on any of the websites reviewed. Broad impacts on respiratory health (e.g., tobacco policy) were mentioned (n=25), however not in the context of asthma or allergic disease. Environment and health themes or guidelines that were identified most frequently include concussions (n=47), extreme weather (e.g., related to lightening [n=28]), and the use/value of a medical information form (n=27).

When using the survey data to investigate the factors that shape risk perception outcomes, amongst coaches, those directly affected by allergic disease were more likely to perceive asthma risk as high. Alternatively, male coaches, coaches of recreational sport, those with medical qualifications and higher education levels (postsecondary and above), and those with higher levels of trust and coping, were less likely to perceive asthma risk as high. Amongst parents, those who scored highly on the Asthma Trigger score and those whose child was diagnosed with fewer than 3 forms of allergic disease were less likely to perceive asthma risk as high. High Propensity for Risk was significantly associated with increased asthma risk perception amongst both coaches and parents, and while the Environmental Attitudes score was a significant predictor of asthma risk perception amongst both coaches and parents, the relationship was inverse amongst parents.

With respect to asthma risk perception outcomes, parents perceived asthma risk as higher than coaches. Amongst coaches and parents, asthma was ranked seventh out of a possible 17 Canadian health hazards. Both coach and parent results demonstrate that asthma falls below similar health hazards, including other respiratory allergy and food allergy. While previous work (Harrington & Elliott 2015; Krewski et al., 1995; 2006) reports how Canadians rank possible health hazards, this survey was the first to include asthma and respiratory allergy in the list of health risks to Canadians. Harrington & Elliott's (2015) framework offers an organizational model that builds upon existing theories of risk perception. While the framework facilitated research design, data organization, and reporting of results, challenges with respect to oversimplification and the consideration of scale are discussed.

7.3 Contributions

This thesis makes theoretical, methodological and substantive contributions to the literature related to asthma risk perception, physical activity, sport participation and health, and child and youth health. A major theoretical contribution of this work lies in the application of Harrington & Elliott's (2015) place-based conceptual framework for understanding public experience of risk. Harrington & Elliott's framework has been piloted in the context of food allergy and anaphylaxis risk; this research addresses calls for application of the framework in different contexts and using different hazards, populations, and methods to increase understanding of its use in understanding the social, physical and cultural places where environmental health risk is experienced and perceptions are formed. In this work, the framework was applied to both inform research design and organization of results, and recommendations with respect to the application of the framework are offered. Specifically, results emphasize the need for caution with respect to oversimplification of the framework;

isolating the different environmental categories is challenging in practice, as overlap and interaction between place and environmental health risk beyond the defined boundaries of the framework (e.g., between political, economic, and sociocultural contexts) exists. Further, the results, especially with respect to the community-level sport organization political environment, emphasize the need for consideration of scale; future application of the framework should consider the role of scale (e.g., micro and macro scale factors, as employed by the Swinburn et al.'s [1999] ANGELO framework), in order to provide a more comprehensive understanding of the environmental contexts that influence the public experience of risk. In the policy context, this is particularly relevant as risk messages that are effective at one scale (e.g., targeted toward community-level sport organizations), may not be relevant in different contexts or at different scales (e.g., targeted toward provincial or national sport bodies). Despite the identified recommendations for future use, this framework is robust and has distinct strengths (e.g., considering social, political and economic contextual influences that have been limited in previous risk perception paradigms) that make it valuable for use in environment and health risk perception research.

Methodologically, while Twitter, one of the most popular social media platforms, has received attention related to its applications for collecting data (Fisher & Clayton, 2012; Holt, 2011; Zhang et al., 2018), its use as a way to recruit participants is becoming increasingly relevant (Gelinas et al., 2017; Guillory et al., 2016). This research therefore adds to our understanding of the potential benefits (e.g., cost efficiency, speed of recruitment, ability for potential participants to contact the researcher with a Direct Message, ability of other local organizations to 'retweet' the message to their followers quickly and with ease), and some of the challenges (e.g., geographic distribution beyond sample region [survey responses from the

United States and across Canada emerged in the quantitative survey results]) associated with using Twitter as a participant recruitment tool in health geography research.

This research also benefited from the use of multiple methods (e.g., semi-structured in-depth interviews, focus groups, online surveys, policy and guideline content analysis). This methodological triangulation allowed for an enhanced understanding of the environmental factors that contribute to how asthma is experienced and managed in organized youth team sport, reduced bias (e.g., possible peer pressure in focus groups), and provided confirmation of findings (Bekhet & Zauszniewski, 2012), as major themes emerged in results using different methodological approaches (e.g., role of sociocultural environment, stigmatization).

This study also offers several substantive contributions. First, this research contributes to the Geographies of Asthma literature, specifically in the Ontario sport context; while previous studies investigate the quality of life of children with asthma (Gabe et al., 2002; Protudjer et al., 2008; Prout et al., 1999; Simon, 2013), this work significantly contributes to our understanding of how children and youth experience and manage asthma and relationships with other stakeholders (e.g., coaches, teammates) in organized youth team sport. Further, in addition to discussing the potential physical and social risk environments in organized sport, this research gives a voice to a potentially vulnerable group as it documents the experiences, risk perceptions, and coping strategies from child and youth perspectives.

A major contribution of this work lies in our increased understanding of the application of the Air Aware Coach Module. Chapter Five elaborates on how coaches understand, recall and apply module content. Although coaches generally believed the education module had value, other coach education (e.g., related to other health outcomes or skill development) was described as more relevant. While ensuring the concerns of a specific population are addressed is not a new

concept in effective risk communication (Frewer, 2004), these results emphasize the value of ‘speaking the language’ of the organized youth team sport coach. Ensuring the link between well-managed asthma and individual and team success and performance is well articulated in environment and health, and more specifically asthma, coach education should be a major component of future coach education and marketing. Similarly, although the module currently targets coaches from a range of sports (e.g., indoor and outdoor, recreational and competitive), results from Chapter Five indicate that coaches may prefer sport-specific module content.

Although the Coaching Association of Canada is not currently offering the Air Aware Coach Module, investigating ways to collaborate with Asthma Canada (or other asthma stakeholders in Ontario) in order to apply the results of this research and offer (a version of) the coach education module for future Ontario coaches will be prioritized moving forward. Additionally, results will be disseminated to participating sport organizations (and individual participants), in order to provide evidence-based recommendations for possible asthma in sport management guidelines, and support program and policy implementation that benefits athlete development and retention.

Considering geographical factors (e.g., local context, composition, collective [Macintyre et al., 2002]) may increase both module accessibility and relevance for coaches (e.g., offering the module in different languages, addressing local air quality concerns in different geographical regions), in order to achieve better outcomes for those with asthma in sport. Similarly, emphasizing place-based understanding of different local contextual, compositional and collective factors can also increase understanding of athlete vulnerability related to environment and health management in sport. For example, residents of communities with sport organizations that have fewer financial resources available for their programs (e.g., rural communities with a smaller pool of athletes to draw from, communities with lower socioeconomic status) are less

likely to offer financial support to subsidize coaches for coach education (e.g., Air Aware or other education opportunities), more likely to depend on volunteers who may not have time or financial resources to dedicate toward furthering their coach education, and may not have available resources to create, and monitor the application of environment and health policy.

Further, this research increased understanding of the role the political environment plays in asthma management in organized youth team sport. Uncertainty regarding the presence and implementation of environment and health, and asthma, policy at the community organization level (e.g., compared with the school environment) emerged in focus groups. In addition, the policy and guideline content analysis demonstrated that guidelines or policy related to environment and health risks more broadly, and asthma management more specifically, are not frequently identified on community-level sport organization websites in the Greater Golden Horseshoe region of Southern Ontario. This data not only contributes to our understanding of the structural factors that influence asthma management in sport, but has implications related to ensuring inclusive and well-managed physical and social spaces for vulnerable athletes; a lack of youth team sport organization policy or guidelines (or non-compliance when they do exist), influences coach management culture and practices, and can potentially increase the inequalities and inequities already experienced by children impacted by chronic illness in sport. Even if the module increases coach awareness and understanding of asthma and respiratory allergy, coach autonomy related to making fair and effective decisions may be limited if their organization's policies or guidelines (or lack thereof) are not consistent with Air Aware recommendations. Engagement at a range of scales (at the community, provincial and national levels) is therefore vital to ensuring the priorities of all stakeholders are met while balancing athlete development and health risk management in sport.

More broadly, this research enhanced understanding of the role of the sociocultural environment (and relationships between stakeholders therein) in shaping environment and health experiences and management in organized youth team sport. Themes related to the social spaces in which youth team sport occurs emerged in both the focus groups and semi-structured in-depth interviews, emphasizing the sociocultural determinants of how asthma is experienced, as well as related barriers to ensuring sustainable asthma management. For example, reports of coaches fearing parental judgment when adjusting training due to poor air quality, players minimizing symptoms for fear of stigmatization, and parents avoiding disclosure of asthma symptoms to coaches emerged. Increasing awareness at the grassroots level (amongst coaches, teammates, parents) is vital for addressing the necessary cultural change in community-level sport (particularly at the competitive level) related to the ‘tough it out’ attitudes and related behaviours that can increase athlete vulnerability. In the Canadian context, the recent paradigm shift emphasizing the process of athlete development, and away from the primary emphasis on winning, results not only in improvements in athlete development (tactical, technical, psychological and physical), but has broader benefits associated with athlete health and wellbeing, and long-term participation in sport (see Canadian Sport for Life; Long-Term Athlete Development [2014]).

In addition to the theoretical, methodological and substantive contributions, results of this research can inform change pathways that will support long-term sport participation for asthmatic children and youth. First, and as identified by interview and focus group participants (coaches, athletes and parents), there is a need for sport organization stakeholder education to ensure coaches and athletes understand and apply asthma management in sport best practices, and to create inclusive sociocultural environments that reduce stigmatization attitudes and

behaviours that can exacerbate asthma (e.g., hiding symptoms). Reducing barriers to asthma management and environment and health education and training (both formal [e.g., coach qualifications] and informal [e.g., information resources]) is one important pathway to support asthmatic athletes in organized youth team sport. As identified above, collaborating with Asthma Canada to create and disseminate an asthma information resource that addresses asthma in the organized youth sport context is one possible pathway to improve asthma management in Canadian youth sport.

Another pathway for sport stakeholder behaviour change exists in policy (e.g., return to play policy after illness or injury). The sport organization website analysis indicated that while sport organizations may have policy or guidelines to manage athlete safety and wellbeing (e.g., concussion protocol, see, for example: http://www.health.gov.on.ca/en/public/programs/concussions/docs/mtcs_concussion_guide_en.pdf), there is little, if any, policy related to asthma and allergic disease management in organized youth team sport. Similarly, some focus group coach participants articulated that they are uncertain if environment and health policy exists in their club (and if it does, it is not monitored), while others reported that certain environmental risks (e.g., air quality) may not be considered priorities by youth sport leaders compared with other factors (e.g., athlete technical development, team success). In organized youth sport, unique barriers to such policy design, implementation, compliance, and monitoring exist. First, the ‘tough it out’ attitude demonstrated in some competitive sport contexts (and as described in the coach interviews) could contribute to a sociocultural environment that deters coaches from prioritizing the need for athlete health and safety, and may negatively influence coach implementation of prevention or management practices or policy (e.g., for fear of parental stigmatization, being labeled as ‘soft’). Next, there

are financial and temporal barriers to participation in coaching. Many coaches are volunteers, and while subsidization may exist, it is often limited to competitive settings (Merkel, 2013; Wiersma & Sherman, 2005). Community-level sport organizations run by volunteers or a limited number of paid employees may therefore either not be aware of the importance of asthma management (and other environment and health issues) in sport, may not have the resources (time, financial) to design, implement, and monitor policy compliance, or may want to remove barriers to volunteer participation (e.g., paperwork) to ensure program existence and success. With the positive shift in sport culture in the Canadian context toward increased coach education and awareness related to athlete wellbeing and the social and psychological components of participation (Canadian Sport for Life, 2014), educating and retaining qualified coaches (both volunteers and subsidized) can be difficult (Burton, 2015; Vargas-Tonsing, 2007). With these possible barriers to policy development, implementation, compliance and monitoring, future research investigating how other sport organization stakeholders (e.g., full-time employees in charge of scheduling and program development) prioritize asthma management in sport is an important next step. In addition, collaboration with sport organization stakeholders will facilitate the design and implementation of environment and health policy that will be prioritized and valued by community organizations and other sport stakeholders. This will ultimately benefit athlete development and retention, and ensure safe and equitable sport environments appropriate for long-term athlete development.

While organized team sport is one possible way for children and youth to participate in physical activity, the results of this research (e.g., with respect to the role of the sociocultural environment) are also applicable in other forms of physical activity participation. For example, results should be considered by coaches of individual recreational or competitive sports (e.g.,

tennis), leaders in athletic camps who may interact with asthmatic youth, and parents of asthmatic youth who participate in less structured physical activity (e.g, with friends in their neighbourhood, at local playgrounds). Further, teachers or others in charge during physical activity participation in the school environment (e.g., in physical education class or during unstructured play at recess) should also be conscious of the possibility for youth with asthma to hide their diagnosis, symptoms or management protocol from friends or those in charge for fear of stigmatization or having to sit out.

Finally, results of this research are increasingly relevant in the face of global environmental change (e.g., climate change). Athletes (especially at the elite level) and people who exercise outdoors are particularly vulnerable to the impacts of air pollution (e.g., exacerbation of pre-existing respiratory illness, coughing, wheezing, and asthma) (Abelsohn, 2011; Elers et al., 2014; Rundell, 2012), and although our understanding is incomplete, climate change is anticipated to increase prevalence of allergy and asthma, and the physical burden on those already impacted (D'Amato et al., 2015; D'Amato et al., 2016; Paramesh, 2018). Increasing our understanding of how sports organizations and policy makers prioritize and manage environment and health issues can therefore help inform development of organizational policies that promote safe participation and equity in the face of environmental change, reduce possible barriers to participation related to the physical, political and social environment, and ensure future safe and enjoyable sport opportunities for Canadians.

7.4 Future Research Directions

Despite multiple contributions, numerous areas for future research exist. While this work aimed to investigate a range of possible individual perspectives and experiences of asthma in the coach and athlete/parent semi-structured interviews, the qualitative interviews did not investigate

differences related to variation between respondents, largely due to the small sample size (n=18 coaches, n=11 athletes). Further, while the quantitative survey results increased understanding of how different stakeholder groups may perceive asthma risk in Ontario youth sport, the samples were not representative of the Ontario population (e.g., the samples did not include representation from across the province), and increasing the sample size for further investigation of possible determinants of asthma risk perception outcomes could be an avenue for future research. Considering how factors such as asthma severity, sport environment (e.g., indoor versus outdoor), competition level (e.g., competitive versus recreational), sport participation (e.g., soccer, baseball, basketball, etc...), and socioeconomic and demographic status (e.g., age, gender, ethnic group, immigrant status) impact perceptions and behaviours, and how perceptions and behaviours vary geographically and in different populations (e.g., rural versus urban, in Mississauga versus Hamilton versus Waterloo) will be important to ensure place-specific asthma management interventions are targeted toward populations that will value and apply their use. This will help ensure stakeholder engagement and successful application and uptake (e.g., an intervention that is appropriate at the recreational level may not be successful in competitive sport).

A limitation of this work emerged with respect to the nature of qualitative research; participants in focus groups or interviews may provide what they perceive to be socially desirable responses, and understanding of how coaches or youth athletes behave in practice or with different contextual factors may therefore be skewed. For example, focus group coach participants may behave differently compared with how they responded in front of coach peers related to the scenarios presented. In addition, the presence of parents during youth athlete interviews may have influenced their children's responses, particularly with respect to how they

feel related to parental or familial pressure. Increasing our understanding of how athletes and coaches interact and behave in training and in competition (e.g., through further longitudinal work including participant [coach, youth athlete, sideline] observation) could be a fruitful avenue for further research.

Another area for future work involves further investigation of elements of Harrington & Elliott's (2015) framework, in order to more comprehensively understand how risk perceptions are formed and managed. For example, in Chapter Six, the economic environment was not included, and while an element of the political environment (at the community-level) was investigated, it was limited to community-level sport organization websites. Understanding different elements of the political context (e.g., provincial or national sport governing bodies) will therefore increase understanding of how asthma is framed and prioritized with another group of sport stakeholders. For example, while we know that coverage of environment and health risks is limited on community-level sport organization websites in Ontario, we do not know what environment and health policy exists through public health organizations or sport governing bodies at the provincial or national levels that often oversee community organizations. Engaging public health agencies at the national (e.g., Public Health Agency of Canada), and provincial level (e.g., Public Health Ontario), in addition to policy makers from provincial and national team sport governing bodies (e.g., Canada Basketball, Ontario Hockey Association), could also help extend our understanding of how decision makers prioritize and manage athlete risk, and the role of the political environment in enhancing or reducing athlete vulnerability.

Similarly, Chapter Five engaged a population that may not have formal coach training, and yet likely plays a significant role at the community sport organization level. Understanding how other organized team sport stakeholders (e.g., sport organization guideline or policy-makers,

full-time staff at sport organizations in charge of program implementation) prioritize or understand asthmatic athletes represents a significant gap in our understanding. This is particularly important, as focus group coach participants reported structural barriers to participation in the coach education module (e.g., cost), as well as application of module content. For example, coaches described how sport organizations are often in control of scheduling training times and locations; this is relevant, for example, as coaches do not have the authority or autonomy to change training location if they are scheduled to train in close proximity to a source of poor air quality (e.g., major transportation route), or at a time when air quality tends to be worse (e.g., Air Aware recommends coaches avoid training at times close to the afternoon commute in order to reduced athlete exposure). Reducing environmental barriers to athlete participation and ensuring sport organization stakeholders are informed and engaged in environment and health issues will not only establish sustainable management of risk and athlete safety in the context of environmental change, but promote long-term sport and physical activity participation amongst Canadian children and youth.

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Chapter 1

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**APPENDIX A: COACH AND PARENT DEMOGRAPHIC INFORMATION
QUESTIONNAIRES**

Coach Demographic Information Questionnaire

1. Are you a: Head Coach Assistant Coach Both

2. What sport(s) do you coach?

3. What age group(s) are the children you coach?

4. Do you coach: Recreational Competitive Both

5. Approximately how many years have you been coaching? _____

6. Do you have any coaching qualifications? Yes No
If yes, can you list what you consider relevant?

7. Do you have any medical qualifications (e.g. First Aid)? Yes No

8. Your Gender: Male Female

9. Year of Birth:

10. Marital Status (circle one):

Single Married Separated Divorced Widowed

11. In what municipality do you currently reside?

12. What is your country of birth?

13. What is the level of your highest education? (e.g., high school, college, etc...)

16. Have you filled out the online survey? Yes No

17. How did you hear about this research?

APPENDIX B: SEMI-STRUCTURED INTERVIEW SCHEDULES

Coach Interview Schedule

Theme: Introduction/Role of the coach

First, I would like us to talk a little bit about your experiences coaching.

1. Can you tell me a little bit about the sport(s) you coach and your coaching background?

Probes: Is your child on the team?

How long have you coached?

Do you coach mainly at the recreational or competitive level?

Is it played indoor or outdoor?

How often do you interact with your team? (once a week, twice, etc)

Do you have any coaching education or medical training completed?

2. Can you describe the characteristics of what you consider an ideal coach (for example, someone you would like to coach your child)?

Probes: What do you find challenging about fulfilling this role?

3. What kind of role do your assistant coaches play?

Probes: Are you aware of any medical or coaching training they have?

4. Can you think of any factors that you think may impact the performance of your players?

Probes: What benefits the players? What hinders their performance?

Are there any environmental factors that may affect their performance? (e.g., temperature, rain, etc)

5. Can you tell me a little bit about what you think may influence a young athlete's enjoyment of sport? (e.g., pre-existing health conditions, pressure from their parents, the environment, air pollution)

6. Could you tell me about any possible health risks to your team when participating in (sport)?

Probes: In what ways could these factors impact the players?

Have you had any direct experience with that (depending on what they respond)? How do you respond in these scenarios?

Is there anything else that you believe could pose a risk to your players while playing (sport)?

Theme: Environment and health

I would now like us to discuss the environment.

1. What does the word 'environment' mean to you?

2. Do you think the environment and health are linked in any way?

Probe: What role do you think it plays in making a person health or unhealthy?

3. How might the environment impact participants of sport?

Probes: What kind of role do you think the environment plays in providing a healthy sporting experience for your players?

Could it impact their performance? Their enjoyment?

4. Are there any characteristics of the environment in (place) that might affect your coaching decisions (e.g. air pollution, increased temperatures, smog)?

Probe: How do you think these factors might affect the health of your players?

5. [If they don't mention climate change] What does the term climate change mean to you?

Probe: How might climate change impact the sport experience of players on your team?

Theme: Allergy and Asthma

Moving on, I would like to specifically talk a little bit about asthma and allergies.

1. What does the term allergy mean to you?

Probes: What about asthma, respiratory allergy?

To your knowledge, are any of your athletes affected by any of these conditions? Could you elaborate? How many?

Do parents approach you to tell you about their children's health concerns?

2. Can you describe what you consider some of the possible triggers of asthma?

Probe: What are some of the symptoms you see in your players?

3. Have you ever been in a situation while coaching where an athlete has suffered from an asthma attack, serious allergies, or has been in distress because of their symptoms?

Probe: Can you describe how you reacted in this situation?

4. Could you identify some of the ways athletes on your team manage their asthma and allergies? (e.g. asthma action plan, medication, epi pen, puffer)

5. What are some of the ways you think (sport) coaches can help players that are affected by allergic disease? (e.g. be aware of symptoms, encourage athlete to get medical help if needed, inform team/parents of educational resources)

Probe: Have you ever had to make coaching decisions based on the respiratory health of your players? Can you elaborate?

(e.g. change their practice times, cut practices short on humid or high risk days, have more frequent water breaks, check the AQHI, understand their asthma management plans and their medication, etc.)

Conclusion

Thank you very much for taking the time to participate in my research today. It has helped me have a better understanding of how coaches perceive the environment, physical activity and allergic disease in recreational sports. Is there anything else you would like to add?

Demographic Information

Just to finish up, I have a short anonymous questionnaire for you to complete. This information will be used to make sure all of our participants are different from one another so we get answers that represent different groups of Ontarians. If there is any information you don't feel comfortable including in this survey you can skip any question without consequence. If you have any questions about the questionnaire or if anything is unclear, please don't hesitate to ask.

Other questions:

Do you know any other coaches in your club that might be interested in participating?

Athlete/Parent Interview Schedule

Theme: Introduction/Sports Participation

I'd really like this conversation to just be like a group chat, as informal as possible – so if you have any ideas or comments at any time throughout feel free to share them! Also remember that there are no right or wrong answers, I'm interested in your experiences and your opinions so just answer based on that - Anything that pops into your head.

First, I'd like us to talk a little bit about your experiences playing sports.

What sports do you play and can you tell me a little bit about these sports?

Age group? How long have you played? Are they most often played indoor or outdoor?

How often do you practice/play games? Do you play any other sports for fun?

Competitive/recreational – how long have you played competitively?

Why do you play these sports – reasons for joining this sport?

Can you tell me about some of the qualities that you think make a great coach – what are some of the things that you've liked in coaches you've had? In your opinion as a player, what are some of the responsibilities of your coach and the assistant coaches?

What are some of the reasons that make you enjoy playing (sport)? Are there any times you don't enjoy yourself? Why? (e.g. asthma, etc.)

Can you think of anything that could impact your performance in ____? For example, is there anything you think that makes you play well or have a bad game? What about anything that impacts how much fun you have?

Theme: Now I would like us to talk a little bit about the environment and health – the following questions can be answered by both the parent or the child, and please let me know if you have ideas to add.

If you hear the word “environment” what does that word mean to you?

Maybe what you learn in school, what you have heard talked about... Could be weather, the field, pollution, temperatures, smog, etc...

How might the environment impact your participation in (sport)? Do you think it (any of the factors they mention) could impact your ability to play, or how well you play (for example, some people love playing in rain, some hate it, could it affect your enjoyment or how you play)? Do you think any of these factors could impact your health when playing ____?

What does the term climate change mean to you? Do you think climate change could impact the sport experience of players on your /your child's team?

Theme: Allergy and Asthma

I would now like us to talk a little bit more about asthma and allergies.

When you think about your experiences with asthma, what does the word mean to you – what do you think of and how does it make you feel? What about allergy, respiratory allergy, food? Anaphylaxis?

In what ways does it affect you specifically – do you have any specific symptoms? Can you tell me a little bit about your experience of having asthma?

Symptoms include: coughing, chest tightness/pain, feeling weak, loss of colour, emotional stress, trouble speaking, sweating, unconsciousness, dizziness, wheezing, shortness of breath, out of shape, sensitivity to air

Can you describe some of the possible triggers, or things that cause, asthma and allergies? Are these the things that affect you?

Exercise, tobacco smoke, dust, fatigue, obesity, pet dander, mould, emotional stress, car and truck exhaust, cold air, low humidity, outdoor air pollution, indoor air pollution, grass/pollen/ragweed, industrial pollutants, cosmetic fumes

I'd like to talk a little bit more about how it affects you in sports – when does it bother you at ____ (sport)? Have you ever been affected seriously at sports, such as an asthma attack? How do you normally handle it?

What are some of the ways you control your asthma/allergies or prevent the symptoms? (i.e. asthma action plan, taking breaks during playing, medication, epi pen, puffer)

In general (at school, etc), in sport

Are any other players on your team affected by either asthma or allergy? I don't need to know their names, but do you know how many? Do they experience it in a similar way to you?

Do you think the players on your team that are not affected by asthma or allergies understand what you experience? Do you ever talk about it with them, or do they ever ask you questions?

Would you like them to behave differently?

Does your coach play a role in the way you handle your asthma/allergy – do you talk to them about it? What is their normal reaction?

To Parent: To your knowledge, do other parents of kids with health concerns approach your coach (or coaches you've had in the past)?

Can you explain if there is anything you or other players/parents would prefer the coach to say or do differently – are there any other ways you think they could support you?

Specifically related to asthma - (e.g. change their practice times, cut practices short on humid or high risk days, have more frequent water breaks, check the AQHI, be aware of symptoms, encourage athlete to get medical help if needed, inform team/parents of educational resources)

To parents – are you affected by asthma or allergies? In what way? Do you think this has influenced how you and ___ (child) understand or deal with asthma?

Conclusion

Thank you very much for taking the time to participate in my research today. It has helped me have a better understanding of the way young athletes understand the environment and health in sport.

Do you have any other comments, or is there anything else you would like to add?

If you know any other parents or young athletes that you think might be interested in participating in this research then please do not hesitate to pass on my email address.

Demographic Information

Just to finish up, I have a short one-page anonymous questionnaire for you to complete. This information will be used to make sure all of our participants are different from one another so we get answers that represent all different groups of Canadians. If there is any information you don't feel comfortable including in this survey you can skip any question without consequence. If you have any questions about the questionnaire or if anything is unclear, please don't hesitate to ask.

APPENDIX C: ONLINE ADVERTISEMENTS

Coach Advertisement



ARE YOU:

- **A recreational or competitive youth coach?**
 - **18 or over?**
- **Interested in furthering your coaching education?**

WHAT DO YOU THINK?

Researchers from the University of Waterloo are interested in hearing about YOUR opinions on coaching, physical activity, environment and health.

Please contact:

Francesca

fcardwel@uwaterloo.ca

519-888-4567 ext. 33682

Participation will consist of a 45-minute interview in your community, and participants will receive a gift card in appreciation of their time.

This project has received ethics clearance through a University of Waterloo Research Ethics Committee.

Athlete/Parent Advertisement



ARE YOU:

A parent of a child:

- Affected by allergies or asthma?
- That participates in a team sport?

WHAT DO YOU THINK?

Researchers from the University of Waterloo are interested in hearing about YOUR opinions on physical activity and health.

Please contact:

Francesca

fcardwel@uwaterloo.ca

519-888-4567 ext. 33682

Participation will consist of a 45-minute interview with you and your child, and participants will receive a gift card in appreciation of their time.

This project has received ethics clearance through a University of Waterloo Research Ethics Committee.

APPENDIX D: SPORTS ORGANIZATION SAMPLE FRAME

Final Sample (N=193):

Acton House League Hockey	Chedoke Minor Hockey
Halton Hills Minor Baseball Association (Formerly Acton/Georgetown Minor Ball)	Lorne Park Clarkson Minor Hockey
Acton Villa Soccer Club	Clarkson Sheridan Soccer Club
Alexander Park Minor Sports Association	Club Smash Volleyball
Ancaster Little League	Croatia Norval Soccer
Centre Wellington Minor Softball Association (Formerly Arthur Minor Ball)	Dixie SC
Arthur Minor Hockey	Don Rowing Club
Arthur Minor Lacrosse	Drayton Minor Hockey
Arthur Soccer Club	Drayton Minor Soccer
Ayr Minor Soccer Club	Dundas minor baseball
Ayr Ringette Association	East Hamilton Soccer
Cambridge Minor Lacrosse Association (Formerly Ayr Minor Lacrosse)	Eastmount Park Softball
Baden Minor Softball/Wilmot Baseball	Elora Fergus Ringette
Blessed Sacrament Basketball	Erin mills Soccer
Brookeville Minor Baseball	Erin-Hillsburgh hockey
Burlington Basketball	Erindale Little League
Burlington Blaze Volleyball	Etobicoke Baseball
Burlington Braves	Etobicoke Bulldogs
Burlington Centaurs	Etobicoke Eagles Football
Burlington Eagles	Etobicoke Ringette Association
Burlington Barracudas	Etobicoke Titans Volleyball
Burlington Lions Hockey	Etobicoke Youth Soccer
Burlington Minor Football	Fergus Elora Soccer Club
Burlington Organized Minor Baseball BOMBA	Flamborough Soccer Club
Burlington Youth Soccer Club	Forest Glen Basketball
Burloak Canoe Club	Georgetown Impact Volleyball
Cambridge Basketball Centaurs	Halton Hills Minor Hockey (replacing Georgetown Minor Hockey)
Cambridge Girls Softball Association	Georgetown Youth Soccer
Cambridge Minor Baseball	Georgetown Youth Girls Softball
Cambridge Minor Football	Ancaster Girls Hockey
Cambridge minor Hockey	Flamborough Girls Hockey
Cambridge Minor Softball	Stoney Creek Girls Hockey
Cambridge Ringette	Guelph CYO Knights Basketball
Cambridge Rowing	Guelph Girls Hockey
Cambridge Youth Soccer Club	Guelph Youth Volleyball Club
Centre Wellington Celtics Basketball	Guelph Minor Baseball
Centre Wellington Minor Lacrosse	Guelph Minor Football Association
Challenger Baseball Hamilton	Guelph Minor Hockey
	Guelph Regals Lacrosse
	Guelph Ringette Association
	Guelph Rowing Association

Guelph Rugby Football Club
 Guelph Soccer Club
 Guelph Water Polo Club
 Guelph Youth Basketball
 Halton Hills Girls fastpitch
 Halton Hills Minor Football Association
 Halton Hills Minor Lacrosse
 Halton Region Basketball Association
 Hamilton Basketball Association
 Hamilton Cardinals Baseball
 Hamilton Huskies Minor Hockey
 Hamilton Croatia
 Hamilton Sledge Hammer Hockey
 Hamilton Football Association
 Hamilton Hawks Girls Hockey Association
 Hamilton Hornets Rugby
 Hamilton Hurricanes
 Hamilton Lacrosse Association
 Hamilton Mountain Volleyball Club
 Hamilton Muslim Basketball Association
 Hamilton Sparta Soccer Club
 Hamilton United Elite Soccer Club
 Hamilton Water Polo
 Hamilton Wildcats
 Hamilton Transway Basketball
 Hespeler Minor Softball Association
 Hespeler Shamrocks
 Hilsburgh Erin District Soccer
 Hilsburgh Minor Softball
 Ice Warriors Hockey Association
 (Mississauga)
 International Soccer Club Mississauga
 Kitchener Minor Baseball
 Kitchener Minor Hockey
 Kitchener Ringette Association
 Kitchener Soccer Club
 Kitchener Waterloo Minor Boys Softball
 Kitchener Waterloo Minor Girls Softball
 Kitchener Waterloo Rowing Club
 KW Youth Basketball Data Extraction Tool
 KW Minor Lacrosse
 KW Lightning Girls Basketball
 KW Predators Volleyball
 KW Water Polo
 Lawfield Minor Hockey Association
 Leander Boat Club
 MAC Volleyball
 Mahoney Bears Baseball
 Malton Soccer Club
 Martingrove Baseball
 Meadowvale Minor Hockey
 Milton Girls softball Association
 Milton Minor Baseball
 Milton Minor Hockey
 Milton Stags Youth Basketball
 Milton Youth Soccer Club
 Mimico Mountaineers Lacrosse
 Mississauga Blues RFC
 Mississauga Central Soccer Club
 Mississauga Football Club
 Mississauga Hockey League
 Mississauga Knights Youth Basketball
 Mississauga Majors Baseball Association
 Mississauga Minor Basketball Association
 (Mississauga Monarchs)
 Mississauga North Baseball Association
 Mississauga North Girls Softball
 Mississauga Ramblers Cricket
 Mississauga Ringette Association
 Mississauga Southwest Baseball Association
 Mississauga Tomahawks
 Mississauga Pakmen Volleyball
 Mississauga Warriors Football
 Mississauga Wolverines
 Mount Forest Minor Ball
 Mount Hamilton Youth Soccer Club
 Mount Forest Minor Hockey
 New Dundee Minor softball
 North Halton Highlanders Rugby Club
 North Mississauga Soccer Club
 Oakville Angels Girls Softball
 Oakville Cricket Club
 Oakville Crusaders Rugby Club
 Oakville Eagles Volleyball Club
 Oakville Hornets Girls Hockey
 Oakville Minor Baseball
 Oakville Minor Football
 Oakville Minor Lacrosse
 Oakville Recreational Hockey League
 Oakville Soccer Club
 Oakville Thunder Volleyball Club
 Oakville Vytis

Rexdale Soccer Club
Ringette Association of Burlington
Saltfleet Stoney Creek Soccer
Scooby Soccer
Scorpions Youth Volleyball
Stoney Creek Optimist Little League
Stoney Creek Soccer Club
Streetsville Hockey League
Volleygirls
Waterloo County Rugby Club
Waterloo Minor Baseball
Water Minor Hockey

Waterloo Minor Soccer
Waterloo Ringette
Sunrise Cricket Club
Waterloo Tigers Volleyball
Waterloo Wildhawks Basketball
Wellesley Soccer Association
West Hamilton Youth Soccer Club
West Mountain Baseball Association
Wilmot District Soccer Club
Wilmot Rugby Club
Woolwich Wildcats
Woolwich Youth Soccer Club

Original Sample Also Included (N=219):

Due to the organization changes (e.g., closures, program changes, mergers), the following organizations were removed from the sample:

Burlington Bandits
Burlington Braves
Burlington Bulls Baseball
East Mountain Baseball
Elmira-Parkland Lacrosse
Georgetown Minor Baseball
Georgetown Minor Hockey
Georgetown Youth Girls Softball
Glen Allan Youth Athletic Association
Greater Hamilton Girls Hockey League
Guelph Hurricanes
Halton Hills Bulldogs

Hamilton District Baseball
Hamilton Lacrosse Jr B Bengals
KW Braves Lacrosse
Lil Strikers Soccer
Mimico Minor Lacrosse
Mississauga Soccer Club
Oakville Blades
Pakmen
Palmerston Soccer club
Stoney Creek Soccer
Transway Basketball
Volleygirls Milton

APPENDIX E: SEMI-STRUCTURED INTERVIEW LETTER OF INFORMATION

Coach Letter of Information

Dear Coach,

Researchers from the School of Public Health and Health Systems and the Department of Geography and Environmental Management at the University of Waterloo are conducting research related to the links between environment and health in the youth sport community in Ontario. We are writing to provide you with information about the study and to ask whether you are interested in participating to improve the experience of youth athletes in sport.

This study focuses on the experiences and opinions of coaches and participants of youth sport in Canada regarding physical activity, health and the environment. Francesca Cardwell, a PhD candidate from the University of Waterloo Department of Geography and Environmental Management, will be the main contact and oversee the research.

Participation in this research is voluntary, and if you choose to participate, you will be part of a sample of coaches from across Southern Ontario who will share experiences and opinions related to the environment, health and physical activity. This project will involve an interview of approximately 45 minutes (either in a spare room of your sports club, or in a mutually agreed upon location such as a public library) to discuss the study and explore your experiences of coaching, the environment and health. In addition, participants will be asked to complete a short online survey targeted towards both recreational and competitive coaches:

<http://fluidsurveys.com/surveys/uwhealth/coach-physical-activity-and-health/>

Following the interview, interested coaches may complete a coach education module, called the Air Aware Coach Training Module. This research is partnered with Clean Air Champions (http://www.cleanairchampions.ca/about_us.php). Clean Air Champions have designed the Air Aware Coach Training Module, which has been approved and will be streamed via the Coaching Association of Canada website (coach.ca). The module is being piloted in this research, and Clean Air Champions are working with the Coaching Association of Canada to integrate the training module into the National Coaching Certification Program (NCCP) so that it can be available to educate Canadian coaches. Finally, the researcher will get in touch approximately three months following the interview with details of a focus group with multiple coaches to discuss your season, the content of the coach education module, and factors that either played a role in its success or challenges. The focus group will be approximately 45-60 minutes in length.

If you are interested in participating, please contact Francesca Cardwell (details below). The research will also involve interviews with parents and youth participants (11-18) that play sport in Ontario. In appreciation of your time, you will receive a \$20 gift certificate. If at any point you wish to withdraw from the study, you may still receive the gift card.

You may decline to answer any of the interview questions or decline participation in the coach education module if you wish. Further, you may decide to withdraw from this study at any time

without any negative consequences by advising the researcher. All information provided will be kept completely confidential and anonymous, and identifiable personal information will not appear in any report resulting from this study.

WHAT IS INVOLVED FOR COACHES?

- Online 15-minute survey
- One (45 minute) individual interview to share experiences related to the links between the environment, physical activity, and health. At this time, participants will have the opportunity to ask questions they may have about the study
- Coaches will complete the Air Aware Coach Training Module online, either at a public computer with the researcher present if you wish to ask questions, or at home on a personal computer. Following completion they will forward the certification number to the researcher.
- Three months following the completion of the training module, you will be invited to take part in a focus group to discuss content of the coach education module, and factors that either played a role in its success or challenges.

WHAT ARE THE BENEFITS OF PARTICIPATION?

- You will have the opportunity to share your experiences as well as give feedback and suggestions for addressing the management of health risks in sport.
- You will have the opportunity to complete the Air Aware Coach Training Module in order to further your coaching education. You will be able to apply the content of the module to your seasonal plans and improve the experiences of young athletes. In addition, the cost of the Coach Training Module will be covered (it will cost \$15/coach for non-participants), and you will receive a certification number from the Coaching Association of Canada.

RENUMERATION

Each participant will receive a \$20 gift certificate in appreciation of your time. In addition, parking costs will be covered as appropriate. The amount received is taxable. It is the participant's responsibility to report the amount received for income tax purposes.

CONTACT INFORMATION

If you have any questions or are interested in your club being a part of this research, please get in touch with Francesca Cardwell for the next steps. This research has been granted ethics clearance through a University of Waterloo Research Ethics Committee. If you have any comments or concerns resulting from your participation in this project, please contact Dr. Maureen Nummelin, the Director, Office of Research Ethics, at 1-519-888-4567, Ext. 36005, or maureen.nummelin@uwaterloo.ca.

Sincerely,

*Susan J. Elliott, PhD
Dean of Applied Health Sciences,
School of Public Health and Health
Systems
519-888-4566, Ext. 31346
elliotts@uwaterloo.ca*

*Francesca Cardwell, MA
PhD Candidate
Department of Geography and
Environmental Management
519-888-4567, Ext. 33682
fcardwel@uwaterloo.ca*

Parent Letter of Information

Dear Parents,

Researchers from the School of Public Health and Health Systems and the Department of Geography and Environmental Management at the University of Waterloo are conducting research related to the links between environment and health in the youth sport community in Ontario. We are writing to provide you with information about the study and to ask whether you are interested in participating. We are looking for parents and youth sport participants in Southern Ontario that are affected by asthma and allergies.

This study focuses on the experiences and opinions of participants of youth sport in Canada regarding physical activity, allergic disease (i.e., asthma), and the environment. Francesca Cardwell, a PhD candidate from the University of Waterloo Department of Geography and Environmental Management, will be the main contact and oversee the research.

Participation in this research is voluntary, and if you choose to participate, you and your child will be part of a sample of parents/youth athletes (11-18 years old) from across Southern Ontario will share experiences and opinions related to physical activity, health, and allergic disease. This project will involve an interview of approximately 30-45 minutes (either in a spare room of your sports club, or a mutually agreed upon location such as a public library) to discuss the study and explore youth athlete experiences of physical activity and allergic disease in the sport environment. In appreciation of your/your child's time, you/your child will receive a \$20 gift card. If at any point you wish to withdraw from the study, you may still receive the gift card.

In addition, parents of youth participants (under age 18) are asked to complete a short online survey targeted towards parents of allergic or asthmatic athletes:

<http://fluidsurveys.com/surveys/uwhealth/parent-physical-activity-and-health/>

You may decline to answer any of the interview or survey questions. Further, you may decide to withdraw from this study at any time without any negative consequences by advising the researcher. All information provided will be kept completely confidential, and identifiable personal information will not appear in any report resulting from this study. The only people that will have access to the collected data will be the Principal Research Investigator and the Student Researcher. There are no known or anticipated risks to your club or participants of this study.

WHAT IS INVOLVED FOR PARENTS/YOUTH ATHLETES?

- One (30-45 minute) interview to share experiences related to allergic disease in the sport environment. Parents of the athletes will provide consent for their child to participate, and will fill out a short demographic information questionnaire. They will have the opportunity to ask any questions they may have about the study.
- Online 10-15 minute survey (for parents)

WHAT ARE THE BENEFITS OF PARTICIPATION?

- You will have the opportunity to share your experiences as well as give feedback and suggestions for addressing the management of health risks in the sporting environment. Your responses will help improve the youth sport experience in Ontario for both players and coaches.

REMUNERATION

Each participant will receive a \$20 gift certificate in appreciation of your time. In addition, parking costs will be covered as appropriate. The amount received is taxable. It is the participant's responsibility to report the amount received for income tax purposes.

CONTACT INFORMATION

If you have any questions or are interested in your club being a part of this research, please get in touch with Francesca Cardwell for the next steps. This research has been granted ethics clearance through a University of Waterloo Research Ethics Committee. If you have any comments or concerns resulting from your participation in this project, please contact Dr. Maureen Nummelin, the Director, Office of Research Ethics, at 1-519-888-4567, Ext. 36005, or maureen.nummelin@uwaterloo.ca.

Sincerely,

*Susan J. Elliott, PhD
Dean of Applied Health Sciences,
School of Public Health and Health
Systems
519-888-4566, Ext. 31346
elliotts@uwaterloo.ca*

*Francesca Cardwell, MA
PhD Candidate
Department of Geography and
Environmental Management
519-888-4567, Ext. 33682
fcardwel@uwaterloo.ca*

APPENDIX F: SEMI-STRUCTURED INTERVIEW CONSENT FORMS

Coach Consent Form

By signing this consent form, you are not waiving your legal rights or releasing the investigator(s) or involved institution(s) from their legal and professional responsibilities.

I have read the information presented in the information letter about a study being conducted by Francesca Cardwell and Dr. Susan J. Elliott of the School of Public Health and Health Systems at the University of Waterloo. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions, and any additional details I wanted.

I am aware that I have the option of allowing the interview to be audio recorded to ensure an accurate recording of my responses. Upon completion of the study, the audio recordings and data collected for the research will be deleted or shredded. I am also aware that excerpts from the interview may be included in the thesis and/or publications to come from this research, with the understanding that the quotations will be anonymous. I was informed that I may withdraw my consent at any time without penalty by advising the researcher.

This project was reviewed by, and received clearance through, the Office of Research Ethics and the University of Waterloo. I was informed that if I have any comments or concerns resulting from your participation in this project, please contact Dr. Maureen Nummelin, the Director, Office of Research Ethics, at 1-519-888-4567, Ext. 36005, or maureen.nummelin@uwaterloo.ca.

With full knowledge of all foregoing, I agree, of my own free will, to participate in this study

YES NO

I agree to have the interview audio recorded.

YES NO

I agree to the use of anonymous quotations in any thesis or publication that comes of this research.

YES NO

I agree that I may be contacted at a later date regarding the research (e.g., coach education module, focus group)

YES NO

Participant Name: _____ (Please print)

Participant Signature: _____

Participant Email Address (in order to receive the Coach Education Module):

_____ (Please print)

Witness Name: _____ (Please print)

Witness Signature: _____

Date: _____

Athlete and Parent Consent Form

By signing this consent form, you are not waiving your legal rights or releasing the investigator(s) or involved institution(s) from their legal and professional responsibilities.

I have read the information presented in the information letter about a study being conducted by Francesca Cardwell and Dr. Susan J. Elliott of the School of Public Health and Health Systems at the University of Waterloo. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions, and any additional details I wanted.

I am aware that I have the option of allowing the interview to be audio recorded to ensure an accurate recording of my responses. Upon completion of the study, the audio recordings and data collected for the research will be deleted or shredded. I am also aware that excerpts from the interview may be included in the thesis and/or publications to come from this research, with the understanding that the quotations will be anonymous. I was informed that I may withdraw my consent at any time without penalty by advising the researcher.

This project was reviewed by, and received clearance through, the Office of Research Ethics and the University of Waterloo. I was informed that if I have any comments or concerns resulting from your participation in this project, please contact Dr. Maureen Nummelin, the Director, Office of Research Ethics, at 1-519-888-4567, Ext. 36005, or maureen.nummelin@uwaterloo.ca.

With full knowledge of all foregoing, I consent my child _____ to participate in this study.

YES NO

I consent to have my child's interview audio recorded.

YES NO

I agree to the use of anonymous quotations in any thesis or publication that comes of this research.

YES NO

Parent/Legal Guardian Name: _____ (Please print)

Parent/Legal Guardian Signature: _____

On behalf of: _____ (Please print)

I (name of participant), _____ (Please print),
assent to participate in the research.

Witness Name: _____ (Please print)

Witness Signature: _____

Date: _____

APPENDIX G: SEMI-STRUCTURED INTERVIEW CODEBOOKS

Coach Codebook

1. Coaching Experience
 - a. Primary Sport
 - i. Soccer
 - ii. Hockey
 - iii. Basketball
 - iv. Baseball
 - v. Volleyball
 - vi. Football
 - vii. Rugby
 - viii. Lacrosse
 - ix. Cycling
 - b. Other Sport Coaching
 - i. Soccer
 - ii. Hockey
 - iii. Basketball
 - iv. Baseball
 - v. Volleyball
 - vi. Football
 - vii. Rugby
 - viii. Lacrosse
 - ix. Cycling
 - x. Swim
 - xi. Other
 - c. Level
 - i. Recreational
 - ii. Competitive
 - d. Role
 - i. Head Coach
 - ii. Assistant Coach
 - iii. Both
 - e. Age Group
 - f. Parent Coach
 - i. Yes
 - ii. No
 - g. Gender
 - i. Males
 - ii. Females
 - h. Experience
 - i. Years
 - ii. Qualifications
 1. Coach Education
 2. Medical/First Aid

- 3. University/College Education in Coaching/Sport
- i. Environment
 - i. Indoor
 - 1. Gymnasium
 - 2. Arena
 - 3. Dome
 - ii. Outdoor
 - 1. Field/Park
 - a. Grass
 - b. Sand
 - c. Turf
 - iii. Both
- j. Frequency of Participation
 - i. 1-2 times/week
 - ii. 3-5 times/week
 - iii. More than 5 times/week
 - iv. Varies seasonally
- k. Other Staff
 - i. Assistant Coaches
 - 1. Coaching Education
 - 2. Role
 - ii. Manager
 - iii. Trainer
 - iv. Do not work with other coaches
- l. Personal Sport Participation
- m. Characteristics of Ideal Coach
 - i. Knowledge/Understanding of Game
 - ii. Fair
 - iii. Organization
 - iv. Clear Expectations
 - v. Ability to Teach/Develop Players
 - vi. Communication
 - vii. Players Enjoy the Sport
 - viii. Demeanor (e.g., friendliness, caring)
 - ix. Respect of Players
 - x. Understands Players
 - xi. Leadership
 - xii. Other
- n. Factors Influencing Performance
 - i. Physical Environment
 - 1. Weather
 - a. Temperature
 - i. Heat Stress
 - ii. Cold
 - b. Air Quality
 - c. Precipitation

- i. Rain
 - ii. Snow
 - d. Lightning
 - e. Wind
 - ii. Team Social Environment
 - 1. Stress/Anxiety
 - 2. Team Dynamics
 - iii. Personal Factors
 - 1. Focus/Concentration
 - 2. Prepared
 - 3. Confidence
 - 4. Understanding of Sport
 - 5. Passion for Game/Excitement
 - iv. Health Impacts
 - 1. Injury
 - 2. Illness
 - 3. Asthma/Allergies
 - v. Quality of Opponent
 - vi. Events from Outside Sport
 - 1. School
 - 2. Family
 - 3. Friends
 - 4. Other
- o. Factors Influencing Enjoyment
 - i. Performance
 - 1. Winning
 - 2. Contribution to Team
 - a. Scoring Goals
 - 3. Playing Time
 - ii. Coach Interactions
 - iii. Learning
 - iv. Good Competition/Exciting Game
 - v. Physical Environment
 - 1. Weather
 - a. Temperature
 - i. Heat Stress
 - ii. Cold
 - b. Air Quality
 - c. Precipitation
 - i. Rain
 - ii. Snow
 - d. Lightning
 - vi. Social Environment
 - 1. Stress/Anxiety
 - 2. Team Dynamics
 - vii. Health Impacts

- 1. Injury
 - 2. Illness
 - 3. Asthma/Allergy
 - viii. Events from Outside Sport
 - 1. School
 - 2. Family
 - 3. Friends
 - 4. Other
 - p. General Health Risks in Sport
 - i. Asthma
 - ii. Allergies
 - iii. Physical Injury
 - 1. Concussion
 - 2. Joint Injury
 - 3. Muscular
 - iv. Mental Health
 - 1. Stress/Anxiety
 - v. Dehydration
 - vi. Other
2. Environment and Health
 - a. Physical
 - i. Pollution
 - 1. Air Quality
 - a. Smog
 - 2. Water
 - ii. Precipitation
 - 1. Rain
 - 2. Snow
 - iii. Temperature
 - 1. Heat
 - 2. Cold
 - iv. Extreme Weather
 - v. “Clean” Environment
 - vi. Chemicals/Fertilizers
 - vii. Current Weather Conditions
 - viii. Climate Change
 - ix. Natural
 - 1. Grass
 - 2. Trees
 - 3. “Green” Space
 - 4. Water
 - x. Other
 - b. Social
 - i. Friends
 - ii. Family

- iii. Mental Health
- iv. Other
- c. Environment and Sport Impacts
 - i. Performance
 - ii. Enjoyment
 - iii. Health of Players
 - 1. Air Quality
 - 2. Temperature
 - 3. Humidity
 - 4. Storms
 - 5. Lightning
 - 6. Coaching Behaviour Change
 - iv. Physical Environment
 - 1. Pollution
 - a. Air Quality
 - i. Smog
 - b. Precipitation
 - i. Rain
 - ii. Snow
 - c. Temperature
 - i. Heat
 - ii. Cold
 - d. Extreme Weather
 - e. “Clean” Environment
 - f. Natural
 - i. Grass
 - ii. Trees
 - iii. “Green” Space
 - iv. Water
 - v. Social Environment
 - 1. Coach Environment
 - 2. Teammates
 - 3. Friends
 - 4. Family
 - 5. Mental Health
 - a. Stress
 - b. Anxiety
 - 6. Other
 - vi. Health Impacts
 - 1. Asthma/Allergies
 - a. Air Quality
 - i. Indoor
 - ii. Outdoor
 - b. Temperature
 - c. Management/Prevention Behaviours
 - 2. Injuries

- a. Physical
 - i. Concussion
 - ii. Joint
 - iii. Muscular
 - 3. Dehydration
 - 4. Mental Health
 - a. Stress/Anxiety
 - vii. Facility Impacts
 - 1. Closures
 - 2. Disruptions
 - 3. Damage
 - 4. Transportation
 - viii. None
 - d. Climate Change
 - i. Global Warming
 - ii. Natural Disasters
 - iii. Greenhouse Gas Emissions
 - iv. Pollution
 - v. Wildlife
 - vi. Glaciers/Ice Melting
 - vii. Extreme Weather
 - 1. Temperatures
 - 2. Precipitation/Storms
 - viii. Sea-Level Rise
 - ix. Health Impacts
 - x. Denial
 - xi. In Sport
 - 1. Performance
 - 2. Enjoyment
 - 3. Health of Players
 - 4. No Impacts
3. Allergic Disease, Environment and Sport
 - a. Knowledge
 - i. Allergy
 - 1. Food
 - a. Anaphylaxis
 - 2. Seasonal
 - 3. Respiratory
 - ii. Asthma
 - 1. Symptoms
 - a. Coughing
 - b. Chest tightness/pain
 - c. Shortness of Breath
 - d. Feeling Weak/Tired
 - e. Loss of Colour

- f. Stomach Ache
- g. Emotional Stress
- h. Trouble Speaking
- i. Sweating
- j. Unconsciousness
- k. Dizziness
- l. Wheezing
- m. Feelings of Being Out of Shape/Winded
- n. Headache
- o. Sensitivity to Air Temperature
- 2. Triggers
 - a. Exercise
 - b. Tobacco Smoke
 - c. Dust
 - d. Physical Fitness (Lack of)
 - e. Pet Dander
 - f. Mould
 - g. Emotional Stress
 - h. Outdoor Air Quality
 - i. Vehicle Exhaust
 - j. Industrial Pollutants
 - k. Grass/Pollen/Ragweed
 - l. Indoor Air Quality
 - m. Temperature
 - n. Humidity (low)
 - o. Seasons
 - p. Time of Day
- 3. Athletes Affected
 - a. Asthma
 - b. Allergies
 - c. Other
 - d. Parent Communication
 - e. Performance
 - f. Enjoyment
- b. Attitudes – Allergies/Asthma
 - i. Frustration
 - ii. Understanding
 - iii. Ask Players/Parents Best Approach
 - iv. Social Stigma
 - 1. Bullying
 - v. Doubt their Symptoms
 - vi. Inability to Compete
 - vii. Cynical/Skeptical
 - viii. Uncertain How to Proceed/Manage
 - ix. Unaware of Allergic Athletes
- c. Practices

- i. Asthma Attack
 - 1. Never Occurred
 - 2. Trainer/Assistant Coach Responsibility
 - 3. Player Behaviours
- ii. Asthmatic Players
 - 1. Management
 - a. Asthma Action Plan
 - b. Medication
 - i. Emergency
 - ii. Maintenance
 - iii. Epi Pen
 - iv. Other
 - c. Communication with Coach
 - d. Resources
 - i. AQHI
 - ii. Other
 - e. Decide Not to Participate
 - f. Breaks/Water
 - 2. Prevention
 - a. Training Time
 - b. Training Location
 - c. Reduce Training Length
 - d. Breaks/Water
 - e. Increase Awareness of Symptoms
 - f. Encourage Players to Seek Medical Help
 - g. Inform Team/Parents of Resources
 - h. Use of Resources
 - i. AQHI
 - i. Decide Not to Participate
 - j. Weather
 - k. Seasons
 - 3. Barriers to Behaviours
 - a. Cost
 - b. Time
 - c. Club Policy
 - d. Players/Parents Do Not Explain
 - e. Other
 - 4. Other Allergy Experiences
- d. Personally Affected by Asthma/Allergies?
 - i. Yes
 - 1. Asthma
 - 2. Allergies
 - ii. No
 - iii. Influence Understanding/Behaviours

Athlete and Parent Codebook

1. Team Sport Participation
 - a. Primary Sport
 - i. Soccer
 - ii. Hockey
 - iii. Basketball
 - iv. Baseball
 - v. Volleyball
 - vi. Football
 - vii. Rugby
 - viii. Lacrosse
 - ix. Cycling
 - b. Other Sport Participation
 - i. Soccer
 - ii. Hockey
 - iii. Basketball
 - iv. Baseball
 - v. Volleyball
 - vi. Football
 - vii. Rugby
 - viii. Lacrosse
 - ix. Cycling
 - x. Swim
 - xi. Other
 - c. Level
 - i. Recreational
 - ii. Competitive
 - d. Age Group
 - e. Frequency of Participation
 - i. 1-2 times/week
 - ii. 3-5 times/week
 - iii. More than 5 times/week
 - iv. Varies seasonally
 - f. Environment
 - i. Indoor
 1. Gymnasium
 2. Arena
 3. Dome
 - ii. Outdoor
 1. Field/Park
 - a. Grass
 - b. Turf
 - c. Other
 - iii. Both
 - g. Reasons for Participation in their Sport

- i. Enjoyment
 - ii. Friends/Social Benefits
 - iii. Performance/Skill Set
 - iv. Fitness/Exercise
 - v. Other
- h. Characteristics of Ideal Coach
 - i. Knowledge/Understanding of Game
 - ii. Fair
 - iii. Organization
 - iv. Clear Expectations
 - v. Ability to Teach/Develop Players
 - vi. Communication
 - vii. Players Enjoy the Sport
 - viii. Demeanor (e.g., friendliness, caring)
 - ix. Respect of Players
 - x. Understands Players
 - xi. Leadership
 - xii. Other
- i. Factors Influencing Enjoyment
 - i. Performance
 - 1. Winning
 - 2. Contributing to Team
 - a. Scoring Goals
 - 3. Playing Time
 - ii. Coach Interactions
 - iii. Learning
 - iv. Good Competition/Exciting Game
 - v. Physical Environment
 - 1. Weather
 - a. Temperature
 - i. Heat Stress
 - ii. Cold
 - b. Air Quality
 - c. Precipitation
 - i. Rain
 - ii. Snow
 - d. Lightning
 - vi. Social Environment
 - 1. Stress/Anxiety
 - 2. Team Dynamics
 - vii. Health Impacts
 - 1. Injury
 - 2. Illness
 - 3. Asthma/Allergy
 - viii. Events from Outside Sport
 - ix. School

- x. Family
- xi. Friends
- xii. Other
- j. Factors Influencing Performance
 - i. Physical Environment
 - 1. Weather
 - a. Temperature
 - i. Heat Stress
 - ii. Cold
 - b. Air Quality
 - c. Precipitation
 - i. Rain
 - ii. Snow
 - d. Lightning
 - e. Wind
 - ii. Team Social Environment
 - 1. Stress/Anxiety
 - 2. Team Dynamics
 - iii. Personal Factors
 - 1. Focused/Concentration
 - 2. Prepared
 - 3. Excited
 - 4. Confidence
 - 5. Understanding of Sport
 - 6. Passion for Game/Excitement
 - iv. Health Impacts
 - 1. Injury
 - 2. Illness
 - 3. Asthma/Allergies
 - v. Quality of Opponent
 - vi. Events from Outside Sport
 - 1. School
 - 2. Family
 - 3. Friends
 - 4. Other
- 2. Environment and Health
 - a. Environment Meaning
 - i. Physical
 - 1. Pollution
 - a. Air Quality
 - i. Smog
 - b. Water
 - 2. Precipitation
 - a. Rain
 - b. Snow

3. Temperature
 - a. Heat
 - b. Cold
4. Extreme Weather
5. “Clean” Environment
6. Current Weather Conditions
7. Natural
 - a. Grass
 - b. Trees
 - c. “Green” Space
 - d. Water
8. Other
- ii. Social
 1. Friends
 2. Family
 3. Mental Health
 4. Other
- b. Environment and Sport Impacts
 - i. Performance
 - ii. Enjoyment
 - iii. Health of Players
 1. Air Quality
 2. Temperature
 3. Humidity
 4. Storms
 5. Lightning
 6. Behaviour Change
 - iv. Physical Environment
 1. Pollution
 - a. Air Quality
 - i. Smog
 - b. Precipitation
 - i. Rain
 - ii. Snow
 - c. Temperature
 - i. Heat
 - ii. Cold
 - d. Extreme Weather
 - e. “Clean” Environment
 - f. Natural
 - i. Grass
 - ii. Trees
 - iii. “Green” Space
 - iv. Water
 - v. Social Environment
 1. Coach Environment

- 2. Teammates
- 3. Friends
- 4. Family
- 5. Mental Health
 - a. Stress
 - b. Anxiety
- 6. Other
- vi. Health Impacts
 - 1. Asthma/Allergies
 - a. Air Quality
 - i. Indoor
 - ii. Outdoor
 - b. Temperature
 - c. Management/Prevention Behaviours
 - 2. Injuries
 - a. Physical
 - i. Concussion
 - ii. Joint
 - iii. Muscular
 - 3. Dehydration
 - 4. Mental Health
 - a. Stress/Anxiety
- vii. Facility Impacts
 - 1. Closures
 - 2. Disruptions
 - 3. Damage
 - 4. Transportation
- viii. None
- c. Climate Change
 - i. Global Warming
 - ii. Natural Disasters
 - iii. Greenhouse Gas Emissions
 - iv. Pollution
 - v. Wildlife
 - vi. Glaciers/Ice Melting
 - vii. Extreme Weather
 - 1. Temperatures
 - 2. Precipitation/Storms
 - viii. Sea-Level Rise
 - ix. Health Impacts
 - x. Denial
 - xi. In Sport
 - 1. Performance
 - 2. Enjoyment
 - 3. Health of Players
 - 4. No Impacts

3. Allergic Disease, Environment and Sport
 - a. Knowledge
 - i. Allergy
 1. Food
 - a. Anaphylaxis
 2. Seasonal
 3. Respiratory
 - ii. Asthma
 1. Symptoms
 - a. Coughing
 - b. Chest tightness/pain
 - c. Shortness of Breath
 - d. Feeling Weak/Tired
 - e. Loss of Colour
 - f. Stomach Ache
 - g. Emotional Stress
 - h. Trouble Speaking
 - i. Sweating
 - j. Unconsciousness
 - k. Dizziness
 - l. Wheezing
 - m. Feelings of Being Out of Shape/Winded
 - n. Headache
 - o. Sensitivity to Air Temperature
 2. Triggers
 - a. Exercise
 - b. Tobacco Smoke
 - c. Dust
 - d. Physical Fitness (Lack of)
 - e. Pet Dander
 - f. Mould
 - g. Emotional Stress
 - h. Outdoor Air Quality
 - i. Vehicle Exhaust
 - j. Industrial Pollutants
 - k. Grass/Pollen/Ragweed
 - l. Indoor Air Quality
 - m. Temperature
 - n. Humidity (low)
 - o. Seasons
 - p. Time of Day
 - b. Attitudes
 - i. Frustration
 - ii. Optimistic
 - iii. Barrier to Sport Participation

- iv. Teammate Communication
 - v. Social Stigma
 - 1. Bullying
 - vi. Hide Symptoms
 - 1. From Teammates
 - 2. From Coach
 - c. Practices
 - i. Asthma Attack
 - 1. Never Occurred
 - 2. Role of Coach
 - 3. Personal Behaviours
 - ii. Asthma Control
 - 1. Management
 - a. Asthma Action Plan
 - b. Medication
 - i. Emergency
 - ii. Maintenance
 - iii. Epi Pen
 - iv. Other
 - c. Communication with Coach
 - d. Resources
 - i. AQHI
 - ii. Other
 - e. Decide Not to Participate
 - f. More Breaks
 - 2. Prevention
 - a. Training Time
 - b. Training Location
 - c. Reduce Training Length
 - d. Breaks/Water
 - e. Increase Awareness of Symptoms
 - f. Seek Medical Help
 - g. Inform Team/Parents of Resources
 - h. Use of Resources
 - i. AQHI
 - i. Decide Not to Participate
 - j. Weather
 - k. Seasons
- d. Teammates with Asthma/Allergies
 - i. Yes
 - 1. Share Techniques
 - 2. Do Not Discuss
 - 3. Stigma
 - ii. No
 - 1. Communication with Teammates
 - 2. Stigma

- 3. Teammate Behaviour Change
- e. Role of Coach
 - i. Communication
 - ii. Understanding
 - iii. Doubt Symptoms
 - iv. Explain to Teammates
 - v. Player Support
 - 1. Increase Awareness
 - 2. Change Practice Time
 - 3. Change Practice Location
 - 4. Use of Resources
 - 5. Increase Breaks
 - 6. Communication
 - vi. Other Coach Behaviours
- 4. Parent Allergy/Asthma
 - a. Yes
 - i. Asthma
 - ii. Allergies
 - b. No
 - c. Influence Understanding/Behaviours

APPENDIX H: AIR AWARE FOCUS GROUP LETTER OF INFORMATION

Title of Project: Exploring allergic disease in the youth sport community in Ontario

Thank you for your continued interest in this research. As you are aware, researchers from the Department of Geography & Environmental Management at the University of Waterloo are conducting research related to the links between environment and health in the youth sport community in Ontario. Francesca Cardwell, a PhD Candidate from the University of Waterloo Department of Geography & Environmental Management, will be the main contact and will facilitate the focus group.

Participation in this session is voluntary, and if you choose to participate you will be part of a sample of coaches from across Southern Ontario who will discuss the content and provide feedback related to the Air Aware Online Coach Education Tool. The focus group will last approximately one hour. Following the focus group, you will be asked to fill out an optional demographic information questionnaire.

There are no known or anticipated risks to your participation in this session. You may decline answering any of the focus group or demographic information questions if you wish. All information you provide will be considered confidential and grouped with responses from other participants. Further, you will not be identified by name in any report that the facilitator produces from this focus group. The information collected from this session (audio recordings and transcripts) will be kept for a period of two years in a locked cabinet in the Student Researcher's office. The only people that will have access to the collected data will be the Principal Research Investigator and the Student Researcher.

The session will be audio recorded to ensure an accurate recording of responses, and anonymous excerpts from the focus group may be included in the thesis and/or publications to come from this research. Further, you may withdraw from this study at any time without any negative consequences by advising the researcher. In appreciation of your time, you will receive a \$20 gift certificate. The amount received is taxable. It is your responsibility to report this amount for income tax purposes. In addition, parking costs will be covered as appropriate.

This focus group will use GoToMeeting.com, which is a United States of America company. Consequently, USA authorities under provisions of the Patriot Act may access data or meta-data related to these communications. If you prefer not to participate via GoToMeeting.com please contact the researcher so you can participate using an alternative method or attend the in-person focus group.

Given the group format of this session we ask that you keep in confidence information that identifies or could potentially identify a participant and/or his/her comments. If you have any questions about participation in this session, please feel free to discuss these with the facilitator, or later, by contacting professor Susan Elliott at 519-888-4567, Ext. 31107. If you are interested in receiving a copy of a summary of the session outcomes, please contact Francesca Cardwell at fcardwel@uwaterloo.ca.

I would like to assure you that this research has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee. However, the final decision about participation is yours. Should you have comments or concerns resulting from your participation in this study, please contact Dr. Maureen Nummelin in the Office of Research Ethics at 1-519-888-4567, ext. 36005 or maureen.nummelin@uwaterloo.ca.

Sincerely,

*Susan J. Elliott, PhD
Professor
Department of Geography and
Environmental Management
519-888-4566, Ext. 31107
elliotts@uwaterloo.ca*

*Francesca Cardwell, MA
PhD Candidate
Department of Geography and
Environmental Management
519-888-4567, Ext. 33682
fcardwel@uwaterloo.ca*

APPENDIX I: AIR AWARE COACH EDUCATION MODULE COMPLETION PROCEDURE

1. Click the following
link: <https://thelocker.coach.ca/Account/Login?ReturnUrl=%2faccess%2faccount%2fonlinelearning>
2. If you already have an account with the National Coaching Certification Program (NCCP) on the coach.ca website, you can log in on this page. If you have never registered with the coach.ca website, you may create an account on this page. This is so you will receive the correct certification following completion of the module.
3. After logging in, the Air Aware page will appear. If it does not automatically appear, scroll down and it will be an 'Available' option in the left hand column. Click on the module. In order to complete this module, you will have to pay the \$15.00 fee. As soon as you complete the module, you will be reimbursed by the researcher either in cash or with a \$15 gift card of your choice.
4. Click "Begin" and wait for the pop-up window to load. It is up to you whether you complete the pre- and post-module surveys as prompted by the module (this research is separate).
5. You can leave the module at any point and return to it at a later time to complete it (but do not delete your browser's cookies, otherwise you will have to start at the beginning of the module).
6. When you have completed the module, please confirm with Francesca at fcardwel@uwaterloo.ca. If you would like to receive the reimbursement in cash, please forward the researcher the receipt for the completed module (you will receive it by email). If you would prefer a gift card you do not need to forward the receipt.

APPENDIX J: AIR AWARE FOCUS GROUP CONSENT FORM

By signing this consent form, you are not waiving your legal rights or releasing the investigator(s) or involved institution(s) from their legal and professional responsibilities.

I have read the information presented in the information letter about the session being facilitated by Francesca Cardwell from the Department of Geography and Environmental Management at the University of Waterloo. I have had the opportunity to ask the facilitator any questions, and any details I wanted. I am aware that I may withdraw from the session without penalty at any time by advising the facilitator of this decision. In appreciation of my time given to this session I am aware that I will receive a \$20 gift certificate.

This project has been reviewed by, and received ethics clearance through a University of Waterloo Research Ethics Committee. I understand that if I have any comments or concerns resulting from my participation in this study, I may contact the Director, Office of Research Ethics at 1-519-888-4567, Ext. 36005 or Maureen.nummelin@uwaterloo.ca.

With full knowledge of all foregoing, I agree, of my own free will, to participate in this session and to keep in confidence information that could identify specific participants and/or the information they provided.

Yes No

I understand that the focus group will be audio recorded.

Yes No

I agree to the use of anonymous quotations in any thesis or publication that comes of this research.

Yes No

Print Name: _____

Signature: _____

Date: _____

Witness: _____

APPENDIX K: AIR AWARE FOCUS GROUP INTERVIEW SCHEDULE

Good evening and welcome to the focus group session. Thank you for completing the Air Aware online coaching module, and for coming today. As you know, I am Francesca Cardwell from the University of Waterloo. During the next hour, we will discuss the content of the module, and I would like to hear about whether you think the content of the module is useful and if you have or would use it during your team's season. We will also go over a couple of different scenarios as I am interested to know what information you would use from the module in different situations while you are coaching or organizing your team. The results will be used to help contribute to future coach education in Ontario and Canada related to management of asthma and allergies and other emerging health risks, and you were selected because of your involvement in youth team sport in Southern Ontario.

First, I'd like us to review the Information Letter, and go through the Consent Form. Does anyone have any questions before we begin?

I just want to confirm with everyone that this session is being audio recorded, so if we can try and ensure only one person is speaking at a time that would be great. I am recording the session because I don't want to miss any of the comments that emerge that I may not be able to write down in time. You may be on a first name basis here, but I won't use names in any report that comes from this session, there will be complete confidentiality. There are no right or wrong answers, and I am interested in your experience with the Air Aware Coach Module, what you liked and didn't like, and how it might be improved. Please share your point of view even if it differs from what others have said. My role as a moderator is to guide the discussion but you should feel free to talk to each other and build off of each other as we go.

1) Opening/Introductory Questions:

To start, I would like to discuss whether you found the Air Aware Coach Module useful for your coaching education. Before we get into questions specifically about the coach module, if we could go around the circle and introduce ourselves, identify the sport you coach, whether it is competitive or recreational, and the age and gender of the children you coach?

Have you ever played the sport you coach? Are you still a player?

Do you or have you ever had asthma or respiratory allergy? What about food allergy?

Could you describe how you think the content of the module is relevant to the sport you coach?

Would you recommend the module for other coaches in your club?

To your knowledge, does your club provide environment and/or health information to volunteer or paid coaches? What about related to asthma/allergies?

If you paid out of pocket for this module (\$15), would you find it worthwhile?

In what way could the module be more effective for some coaches than others? Does the module exclude any possible groups?

Is there anything you would change related to the completion of the module? (e.g., time it takes, money it costs, online completion)

2) Scenario Questions

Next, I'd like us to go through the following scenarios, as I am interested to hear what parts of the online module you would use in different situations. I will first read the scenario and distribute a handout of each scenario for you to refer back to, and then we can have a group discussion.

Scenario 1

Part A:

You have been coaching a group of teenagers, aged 14-15, in a competitive hockey league. You notice that Simon, a talented fourteen year-old with asthma who played really well last season, hasn't been using his reliever medication before or during practice, seems more tired than usual and covers less ground during practices and games. Last season, Simon was capable of outperforming many of his competitors when he had his asthma under control, and he was even noticed by scouts for the provincial development team. Being a high-level player whose competitive nature also transfers to school and his other extra-curricular activities, Simon was excited at the prospect of joining the development team at the age of 15 and expressed a strong desire to continue working toward this goal.

Simon is complaining of fatigue and is sitting out of more games and practices, claiming he doesn't think he is fit enough to keep up. Simon has also been acting more withdrawn than usual, and he isn't communicating with his teammates as much compared to last year. You also notice that he's not using his rescue/reliever medication before practice or games. At the same time, he's not showing any obvious signs of common asthma symptoms like coughing, wheezing, chest pain/tightness or shortness of breath.

Probing Questions:

Why do you think Simon may not be using his reliever medication?

As the coach, what are some next steps you may consider? What are some of the key pieces of information from the scenario that make you think _____ ?

Part B:

Simon is the only player on your team who is diagnosed with asthma, and the only player who uses an inhaler. Your team is playing at a tournament out of town, and between games you notice that while all of the members of the team are socializing, one of the louder boys makes a condescending comment in Simon's direction that indicates social stigma around his inhaler use.

Simon ignores the comment and continues chatting with another teammate. After observing this interaction, you suspect Simon may be uncomfortable using his inhaler in front of his teammates, and this could be affecting his interactions with his teammates as well as his asthma management and performance.

Probing Questions:

Why do you think this happened?

Whose responsibility do you think it is to address this situation?

What role could you (the coach) play in this situation? How could you help Simon?

Scenario 2

Part A:

It is an unusually hot, muggy day in early May, and the beginning of the season for your soccer team; you are in charge of coaching a group of 8-10 year olds. There are a few new players in the group that you did not coach last year. Just before your practice starts at noon, 9-year-old Sammy, a new player, gets dropped off by her mother. Sammy immediately runs out onto the field with her ball, and is excited to be playing on the team. You have never met her mother before, but she comes over to you and despite being in a rush mentions that Sammy has had hay fever all her life and that lately she has noticed wheezing when she exerts herself, but doesn't think it's a problem. She casually suggests that Sammy has been playing more video games lately with her older brother and isn't in as good shape as she was a couple of years ago, since she hasn't participated in organized sport in the last 12 months. She also mentions that Sammy is just getting over a lingering cold but should be fine to practice. Sammy's mom gives Sammy a hug and tells you that she will be back to pick her up at the end of practice.

Probing Questions:

Has anything like this ever happened to you? How did you deal with it?

What is your (the coach's) role in this situation? What should you consider in determining your actions?

Identify a few things you think the coach should do to help Sammy or other similar athletes? Before/during/after practice?

How could the practice environment affect the players you are coaching?

Part B:

On Wednesday the following week, you check the forecast and find that Saturday is forecast to be another unusually hot and muggy day. In anticipation of a hot day ahead, on the morning of

your practice you check the Air Quality Health Index (AQHI) for your community, and it provides a reading of 7. You are aware that four of the players on your team are affected by respiratory allergy, and an additional two are diagnosed with asthma. All six of these players are attending practice today, which starts at noon.

Probing Questions:

What does the Air Quality Health Index, or AQHI, mean to you?

What does it measure and what do the numbers mean?

Based on the AQHI reading of 7, what are possible steps you (the coach) could take?

Are there any barriers to these actions?

In addition to checking the AQHI, what do you think the coach could do to help the players with asthma or respiratory allergies? Are there any barriers to these actions?

3) Ending Questions

To finish up, I have a couple of more general questions.

[Depending on the scenario discussion]

When you mentioned _____, can you explain to me what you meant? Why do you feel that way? Can you elaborate on _____?

Could you describe how the module was sufficient/insufficient training in allergic disease, the environment and physical activity?

Overall, were you satisfied with the information included in the module? Is there anything you can think of that would be useful to other coaches and could be added?

Throughout the module, there were a range of additional resources, such as the Asthma Society of Canada website. Have you accessed these resources? Is there anything specific you were looking for?

Do you have any other comments? Is there anything else anyone would like to add?

That is all the questions I have for today. Thank you for coming to discuss the content of the Air Aware Coach Module and for your interest in the research.

APPENDIX L: AIR AWARE FOCUS GROUP CODEBOOK

1. Coaching Background
 - a. Primary Sport Coached
 - i. Basketball
 - ii. Soccer
 - iii. Baseball
 - iv. Curling
 - v. Multiple Sports Coached
 - b. Level
 - i. Competitive
 - ii. Recreational
 - c. Age of Children
 - d. Gender
 - i. Male
 - ii. Female
 - e. Role
 - i. Head Coach
 - ii. Assistant Coach
 - f. Other Comments
2. Coach Module
 - a. Relevance
 - i. Never discussed/came up in coaching experience
 - ii. Not important compared with other issues
 - iii. Kids with asthma/allergy
 - iv. Valuable
 - v. More relevant in other environments
 - vi. Change Behaviour as Coach
 1. Cancel Practice/Game
 2. Air Quality
 3. Heat
 4. Health Impacts
 5. Physical Fitness
 6. Medication
 7. Water, Breaks
 8. Positive Environment
 - vii. Increased knowledge
 - viii. Learned in other courses
 - ix. Don't adhere to content
 - x. Misdiagnosis
 - xi. Coach Misunderstanding
 - xii. Need for athlete safety
 - xiii. Asthma dangers
 - xiv. Should be mandatory
 - xv. Social Dynamics
 1. Playing Time

- 2. Stigma from Coaches/Teammates
 - 3. Perceived Weakness
 - 4. Peer Pressure
 - xvi. Use as crutch
 - b. Recommend to Others
 - i. Yes
 - 1. Rationale
 - ii. No
 - 1. Rationale
 - iii.
 - c. Barriers to Module Participation/Applicability
 - i. Money
 - 1. Would pay out of pocket
 - 2. Would not pay out of pocket
 - 3. Clubs should make mandatory
 - ii. Lack of Information
 - iii. Technology
 - iv. Interest
 - v. Not Important Issue
 - vi. Time
 - vii. Excludes Certain Populations
 - viii. Don't want to pursue coaching/coach recreational
 - d. Club Already Provides Environment and Health Information to Coaches
 - i. Yes
 - ii. No
 - 1. Dangers
 - iii. Asthma/Allergy
 - iv. School Board
 - e. Sufficient Training
 - i. Yes
 - ii. No
 - iii. Changes to the Module
 - 1. Time
 - 2. Money
 - 3. Online Completion
 - 4. Other
 - f. Resources Accessed
 - i. Yes
 - 1. Useful
 - ii. No
 - 1. Barriers
 - iii. More Required
3. Scenario 1
 - a. Part A
 - i. Use of Reliever Medication
 - 1. Fear of Stigma

- a. Playing Time
 - b. Unfit
 - c. Difference
 - i. Hide from teammates
 - ii. Hinder chances of being elite athlete
 - d. Other
 - 2. Ineffective/Mistreatment (i.e., behaviour not asthma related)
 - 3. Annoying to take it
 - 4. Time to get prescription
 - 5. Financial constraints
 - 6. Last medication use
 - 7. Annoying
 - 8. Other
 - ii. Coach Behaviour to Help
 - 1. Communication with, observe Player
 - a. Home life
 - b. Nutrition, fatigue, hydration
 - c. Friends and relationships
 - d. School
 - e. Injuries or other health issues
 - f. Love of sport
 - g. Encourage
 - 2. Communication with parents
 - a. Home life
 - b. Nutrition, fatigue, hydration
 - c. Friends and relationships
 - d. School
 - e. Injuries or other health issues
 - f. Love of sport
 - 3. Observe situation
 - 4. Check medical forms
 - a. Asthma Action Plan
 - 5. Wouldn't consider asthma
- b. Part B
 - i. Reasons for Simon's Behaviour
 - 1. Stigma
 - 2. Bullying
 - 3. Competition for role on team
 - 4. Team Environment
 - 5. Coach behaviours
 - 6. Used inhaler already multiple times
 - 7. Other
 - ii. Coach Behaviour
 - 1. Change environment
 - a. Respect
 - b. Positivity/Inclusivity

- c. Increase awareness of symptoms
 - d. Communicate with team
 - e. Address bullying
 - f. Support athlete/asthma management
 - 2. Communication
 - a. With player
 - i. Asthma management
 - ii. Suggest player visit doctor/specialist
 - iii. Asthma Action Plan
 - iv. Clinical Testing
 - b. With parents
 - i. Speak to player first
 - ii. Asthma Action Plan
 - 3. Change nothing
 - 4. Increase personal awareness
 - 5. Observe and see if other possible scenarios occurring
 - 6. Other
- 4. Scenario 2
 - a. Part A
 - i. Coach Factors to Consider
 - 1. Weather
 - a. Heat
 - b. Time of Day
 - 2. Air Quality
 - 3. Fitness Level of Players
 - 4. Ask Parent for More Information
 - a. Medical History of Players
 - i. Asthma
 - 1. Symptoms
 - 2. Triggers
 - ii. Exercise-Induced Asthma
 - iii. Undiagnosed
 - iv. Allergy
 - 1. Symptoms
 - 2. Triggers
 - v. Suggest Asthma Screening
 - b. Other Information on Player
 - 5. Age of players
 - 6. Parent/guardian leaving
 - ii. Coach Behaviours
 - 1. Before
 - a. Check AQHI
 - b. Check Other Resources (e.g., Weather Network)
 - c. Medical Forms
 - d. Modify Training Time
 - i. Morning has best air quality

- ii. After afternoon commute
 - e. Modify Training Location
 - f. Modify Training Plan
 - g. Awareness of hot/humid day
 - 2. During
 - a. Observe Training Physical Environment
 - b. Observe Training Social Environment
 - c. Modify Team Training
 - i. Reduce intensity
 - ii. Reduce duration
 - iii. Increase number of Breaks/Water
 - d. Monitor Player
 - i. Stop Activity with symptoms
 - ii. Return to training following symptom relief
 - e. Ensure sufficient warm up and warm down
 - f. Play player in minimal exertion position
 - g. Create 'buddy' system where 'buddy' reports breathing difficulties
 - h. Don't let player participate
 - 3. After
 - a. Ensure medical form completed as soon as possible
 - b. Monitor player for asthma symptoms over season
 - c. Notify parent if observe symptoms
 - d. Provide parent with resources
 - e. Asthma Action Plan
 - iii. Player Impacts
 - 1. Heat
 - 2. Air Quality
 - 3. New Season
 - 4. Age of Players
 - 5. Social Environment
- b. Part B
 - i. Air Quality Health Index (AQHI)
 - 1. Knowledge
 - a. Online resource
 - i. Phone Ap
 - b. Provides air quality and health ratings for communities in Canada
 - c. Scale
 - i. Meaning of 7
 - 1. High Risk
 - d. Don't Know
 - e. Uses of AQHI
 - 2. Attitudes
 - a. Confusion
 - b. Valuable

- c. Too much effort
 - d. Not relevant
- 3. Practices
 - a. Monitor athletes with asthma/respiratory allergy
 - b. Decrease training intensity
 - c. Focus on tactics/skills development
 - d. Require participants to have medication ready
 - e. Change training location
 - i. Away from heavy traffic/industry
 - ii. Indoor Training
 - f. Change training time
 - g. Cancel training
 - h. More breaks/water
 - i. Players with symptoms can sit out without consequence
 - j. 1-2-3 rule for asthmatic/allergic athletes
 - k. Other
 - l. Never used AQHI
 - m. Barriers
 - i. Cost
 - ii. Facility availability
 - iii. Lack of knowledge
 - iv. Time
 - v. Organizations oversee scheduling
 - vi. Other
- 5. Module Quality
 - a. Sufficient Training
 - i. Easy to Understand
 - ii. Good quality information
 - iii. Will apply in training
 - iv. Relevant for my sport
 - v. Would pay
 - vi. Other
 - b. Insufficient Training
 - i. Missing Information
 - ii. Difficult to understand
 - iii. Not relevant for my sport
 - iv. Would not pay
 - v. Other
 - c. Technological Difficulties
 - d. Resource Access
 - i. Yes
 - 1. Missing Information
 - ii. No
 - 1. No further information needed
 - 2. Not interested
 - e. Future Recommendations

- i. Framing
 - ii. Add to other courses
- f. Other

APPENDIX M: COACH AND PARENT ONLINE SURVEYS

Coach Survey

Youth Sport and Health: What do YOU think?

Part A:

First, we would like to learn a little bit about you and your experiences as a coach. Please do not include your experiences coaching school sports in your responses.

1. Have you coached an organized team sport (competitive or recreational), targeted at children/youth under 18 years of age in the last 12 months?

Yes
No

2. Are you a head or assistant coach?

If you coach multiple sports and hold different roles then please choose "Both".

Head Coach
Assistant Coach
Both
Other (e.g., Goalkeeper Coach)

3.a) For each sport that you have coached within the past 12 months, please identify whether it is at the recreational or competitive level (or both if applicable).

Baseball
Canoe/Kayak/Rowing
Cricket
Football
Rugby
Soccer
Softball
T-Ball
Lacrosse
Ringette

Field Hockey
Roller Hockey
Ice Hockey
Basketball
Volleyball
Water Polo
Ultimate Frisbee
Other (please identify)

3.b) For each sport that you have coached within the past 12 months, please identify whether it is in the indoor or outdoor environment (or both if applicable).

- | | |
|--------------------|-------------------------|
| Baseball | Field Hockey |
| Canoe/Kayak/Rowing | Roller Hockey |
| Cricket | Ice Hockey |
| Football | Basketball |
| Rugby | Volleyball |
| Soccer | Water Polo |
| Softball | Ultimate Frisbee |
| T-Ball | Other (please identify) |
| Lacrosse | |
| Ringette | |

4. In what seasons do you coach?

Check all that apply.

- Fall
- Winter
- Spring
- Summer

5. What age group(s) are the children/youth you coach?

If you coach multiple age groups, please list them all.

6. Approximately how many years have you been coaching?

- Less than 3
- 3-5
- 6-10
- 10-15
- 15-20
- 20+

7. Do you have any coaching qualifications?

If yes, please list anything you consider relevant.

- Yes
- No

8. Do you have any medical qualifications (e.g. First Aid)?

If yes, can you provide additional details?

Yes

No

9. Can you describe the physical environment in which your games or practices take place?
(e.g. outdoor grass field, indoor turf, indoor ice rink, outdoor pavement, indoor sand,
etc...)

If you coach multiple teams/sports, please choose the team/sport with which you spend the most time.

10. On average, what time of day do your practices take place?

If you coach multiple sports, please choose the team/sport with which you spend the most time.

6-9am

9am-12pm

12pm-4pm

4-6pm

6-8pm

8-10pm

10pm-12am

11. On average, what time of day do your games take place?

If you coach multiple sports, please choose the team/sport with which you spend the most time.

6-9am

9am-12pm

12-4pm

4-6pm

6-9pm

9pm-12am

12. Your Gender:

Male

Female

13. Year of Birth: _____

14. In what municipality do you currently reside?

15. What is your country of birth?

16. What is the level of your highest education?

High school diploma or equivalent

Apprenticeship or trades certificate or diploma

College or other non-university certificate or diploma

University certificate or diploma below bachelor level

Bachelor's degree

University certificate, diploma or degree above bachelor level

No certificate, diploma or degree

Other, please specify...

17. What is your current employment status?

Employed Full-time

Employed Part-time

Student

Retired

Unemployed

Other, please specify:

18. Marital Status:

Single

Married

Separated

Divorced

Widowed

Other, please specify:

19.a) Are you a parent?

Yes

No

19.b) If yes, how many children do you have?

Part B:

Next, we would like to learn more about your experiences coaching organized sport.

1.a) Please choose the option that best represents your opinion on the statement provided.
(Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, Don't Know)

If you coach multiple teams/sports please choose the team with which you spend the most time.

If I am unable to attend/coach a practice/game, another parent or assistant coach will run the practice/game in my place

If I am unable to attend/coach a practice, I will reschedule

I have an assistant coach or parent volunteers that help out during practices and games

If a player on my team does not have a ride to a practice or game, myself or another parent usually drives them

Contact information for team members and their families is available for them to keep in touch

1.b) If you coach multiple teams/sports, with what sport do you spend the most time?

Please identify the team sport that you had in mind when answering 1.a).

2. As a coach, do parents typically speak to you about their children's health concerns? If yes, how do you handle such concerns?

Yes
No

3. Please answer the following question with respect to the team sport you identified in 1.b) above. Does your child play on the team you coach?

Yes
No

Part C:

Next, we would like to learn about what you consider important health concerns in Canada.

1. What do you think are the greatest health concerns facing the Canadian population today? Please identify your level of concern (e.g., Low, Moderate, High, Unknown) related to the following health hazards:

- | | |
|---------------------|-------------------------|
| Vaccines | Asthma |
| Climate Change | Obesity |
| Blood Transfusions | Food Allergy |
| Crime and Violence | Overhead Power Lines |
| Nuclear Waste | Smog and Air Quality |
| Respiratory Allergy | Flu Epidemics |
| Stress | Motor Vehicle Accidents |
| Cigarettes | Mould |
| Pesticides | |

2. Please choose the option that best represents your opinion on the statement provided (Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, Don't Know)

The environment is a major concern for Canadians

The environment poses a significant health concern for Canadians

I am concerned about the effects of the environment on the health of my friends and family

Climate change is a major concern for Canadians

Climate change is a major health concern for my family and friends

Part D:

Evidence suggests that allergic disease, such as asthma, might be on the rise in Canada. Please provide your opinion on the following questions related to allergic disease.

1. Approximately what proportion of players on your team are affected by asthma or respiratory allergies?

0-15%	61-75%
16-30%	76-90%
31-45%	91%+
46-60%	Don't Know

2. Which of the following, in your opinion, are symptoms of asthma?

Please check all that apply.

Coughing
 Chest tightness/pain
 Feeling weak or tired when exercising
 Loss of colour/pale
 Diarrhea
 Stomach ache
 Emotional stress
 Trouble speaking/finishing a sentence
 Sweating
 Unconsciousness
 Tinnitus
 Dizziness
 Wheezing
 Feeling grouchy
 Shortness of breath
 Feelings of being out of shape/winded
 Headache
 Trouble sleeping
 Sensitivity to cold air

3. Which of the following, in your opinion, are possible triggers of asthma?

Please check all that apply.

Exercise
 Tobacco smoke
 Dust
 Fatigue
 Obesity
 Pet dander
 Mould
 Emotional Stress

Increased caffeine intake
Car and truck exhaust
Cold air
Low humidity
Outdoor air pollution
Exercising immediately following food intake
Indoor air pollution
High humidity
Grass, pollen, ragweed
Industrial pollutants (such as nitrogen dioxide)
Cosmetic fumes
Exercising in the rain

4. Are you affected by allergic disease?

If yes, can you provide additional details?

Yes
No

5. Is your child or another family member diagnosed with allergic disease?

If yes, can you provide additional details?

Yes
No

6. How did you hear about this survey?

7. Do you have any additional comments?

Thank you very much for completing this survey, your opinions and responses are extremely valuable!

Please feel free to pass on the link to this survey to anyone you think might be interested.

Parent Online Survey

Allergy and Physical Activity: What do YOU think?

Part A:

First, we would like to learn a little bit about asthma/allergy and sport participation in your family.

1. Over the past 12 months, has your allergic/asthmatic child participated in organized recreational or competitive team sport?

Please do not include sports that your children are involved in at school.

Yes

No

2. Is your allergic/asthmatic child under 18 years old?

Yes

No

3. What is the year of birth of your allergic/asthmatic child?

If you have multiple children that play organized team sports and are affected by asthma/allergies, please choose the one that you believe spends the most time involved in sport. For the remainder of the survey, this child will be referred to as "Child 1".

4. Allergic/Asthmatic Child's Gender:

If you have multiple children that play organized team sports and are affected by asthma/allergies, please choose the one that you believe spends the most time involved in sport. This child will be referred to as "Child 1".

Male

Female

5a. How many children do you have?

5b. For each of your children affected by allergies/asthma, please identify what they are allergic to (or if they have asthma) in the space provided.

Example:

Child 1: peanuts, pollen, asthma

6. For each organized team sport that your allergic/asthmatic child ("Child 1") has been involved with in the past 12 months, please identify whether they participate at the recreational or competitive level.

- | | |
|--------------------|------------------|
| Baseball | Field Hockey |
| Canoe/Kayak/Rowing | Roller Hockey |
| Cricket | Ice Hockey |
| Football | Basketball |
| Rugby | Volleyball |
| Soccer | Water Polo |
| Softball | Ultimate Frisbee |
| T-Ball | Other |
| Lacrosse | |
| Ringette | |

7. For each sport that your child has been involved with in the past 12 months, please identify whether they participate in the indoor or outdoor environment (or both if applicable).

- | | |
|--------------------|------------------|
| Baseball | Field Hockey |
| Canoe/Kayak/Rowing | Roller Hockey |
| Cricket | Ice Hockey |
| Football | Basketball |
| Rugby | Volleyball |
| Soccer | Water Polo |
| Softball | Ultimate Frisbee |
| T-Ball | Other |
| Lacrosse | |
| Ringette | |

8. Your Gender:

- Male
- Female

9. Your Year of Birth:

10. In what municipality do you currently reside?

11. What is your country of birth?

12. What is the level of your highest education?

- High school diploma or equivalent
- Apprenticeship or trades certificate or diploma
- College or other non-university certificate or diploma
- University certificate or diploma below bachelor level
- Bachelor's degree
- University certificate, diploma or degree above bachelor level
- No certificate, diploma or degree
- Other, please specify...

13. What is your current employment status?

- Employed Full-time
- Employed Part-time
- Student
- Retired
- Unemployed
- Other, please specify...

14. Marital Status:

- Single
- Married
- Separated
- Divorced
- Widowed
- Other, please specify

Part B:

Next, we would like to hear about your child's experiences in organized sport.

1. Please choose the option that best represents your opinion on the statement provided.
(Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, Don't Know)

If your allergic/asthmatic child ("Child 1") plays multiple sports, please choose the team/sport with which they spend the most time.

Contact information for team members
and their families is easily available for
them to keep in touch

In my view, my child's coach is

approachable for discussion of any team related issues

Carpooling options are easily available for my child's team

If I am unable to attend a practice or game, my child will usually not attend either

If my child suffers an injury during the game and I am not present, I trust that other parents or a coach will choose the appropriate course of action

2. If your child plays multiple team sports, which sport do they play the most?
This should be the team sport that you had in mind when answering the above question.

Part C:

Next, we would like to learn about what you consider important health concerns in Canada.

1. What do you think are the greatest health concerns facing the Canadian population today?
Please identify your level of concern related to the following health hazards:

Vaccines
Climate Change
Blood Transfusions
Crime and Violence
Nuclear Waste
Respiratory Allergy
Stress
Cigarettes
Pesticides
Asthma
Obesity
Food Allergy
Overhead Power Lines
Smog and Air Quality
Flu Epidemics
Motor Vehicle Accidents
Mould

2. Please choose the option that best represents your opinion on the statement provided (Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree, Don't Know)

The environment is a major concern for Canadians

The environment poses a significant health concern for Canadians

I am concerned about the effects of the environment on the health of my friends and family

Climate change is a major concern for Canadians

Climate change is a major health concern for my family and friends

Part D:

Evidence suggests that allergic disease, such as asthma, might be on the rise in Canada. Please answer the following questions related to allergic disease and asthma.

1. Approximately what proportion of players on your child's team are affected by asthma or respiratory allergies?

- 0-15%
- 16-30%
- 31-45%
- 46-60%
- 61-75%
- 76-90%
- 91%+
- Don't Know

2. Which of the following, in your opinion, are symptoms of asthma?

Please check all that apply

- Coughing
- Chest tightness/pain
- Feeling weak or tired when exercising
- Loss of colour/pale

Diarrhea
Stomach ache
Emotional stress
Trouble speaking/finishing a sentence
Sweating
Unconsciousness
Tinnitus
Dizziness
Wheezing
Feeling grouchy
Shortness of breath
Feelings of being out of shape/winded
Headache
Trouble sleeping
Sensitivity to cold air

3. Which of the following, in your opinion, are possible triggers of asthma?

Exercise
Tobacco smoke
Dust
Fatigue
Obesity
Pet dander
Mould
Emotional stress
Increased caffeine intake
Car and truck exhaust
Cold air
Low humidity
Outdoor air pollution
Exercising immediately following food intake
Indoor air pollution
High humidity
Grass, pollen, ragweed
Industrial pollutants (such as nitrogen dioxide)
Cosmetic fumes
Exercising in the rain

4. Are you affected by allergic disease?

If yes, can you provide additional details?

Yes
No

5.a) I have discussed the symptoms of my child's asthma/allergies with the coach.

Yes
No

5.b) If yes, were they receptive?

Yes
No

6.a) I have discussed the appropriate steps to manage my child's asthma/allergies with the coach.

Yes
No

6.b) If yes, were they receptive?

Yes
No

6.c) If yes, did they follow through?
If yes, can you identify how?

Yes
No

7. How did you hear about this survey?

8. Are there any other comments you would like to make?

APPENDIX N: POLITICAL ENVIRONMENT DATA EXTRACTION TOOL

Instructions: Indicate selection by placing an X in the relevant box. Include additional information in point form where there are blank boxes, or indicate N/A if appropriate.		
Date of Review:		
Section A)		
Name of Sports Organization Website:		
Relevant Sport:		
Geographical Region (e.g., Waterloo, Hamilton, Waterdown):		
Sport Environment:	Indoor	
	Outdoor	
	Both	
	Other (please specify)	
Are sport, environment and health issues mentioned on the website? If no, there are no longer any relevant questions in Section A). If yes, please proceed to Section B).	Yes	
	No	
If yes, please specify the title(s) of the relevant Document(s)/Website(s), and include the link(s). If there are more than 1 relevant guidelines on the website, please separate Titles and Links by a (;):	Title(s):	
	Link(s):	
Year(s) Guidelines Updated:		
Section B)		
Environment of Policy Guidelines/Relevance:	Indoor	
	Outdoor	
	Both	
	N/A	
	Other (please specify)	
Setting:	School Gymnasium	
	Arena	
	Community Centre	
	Sports Field	
	Public Park	

	Other Public Space (please specify)		
Target Group (choose all that apply):	Coaches		
	Parents		
	Sport Organization		
	Children/Youth		
	Other (please specify)		
Policy/Guideline Relevance (choose all that apply, and please provide point form relevant details in the box beside your choice):	Climate Change		
	Extreme Weather (e.g. heat stress, air quality)		
	Food Allergy Management		
	Asthma Management		
	Other Respiratory Health Management (e.g. tobacco)		
	Air Quality Health Index (AQHI)		
	Broad Youth Team Sport Participation		
	Other Sport and Environment and Health risk (e.g., concussion, acute physical injury)		
	Other (please specify)		
Does the document direct users to any other guidelines/information?	Yes (please specify)		
	No		
Any other relevant information:			