Fairness Under Fire: Environmental Justice, Mental Health, and Natural Disasters

by

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Abstract

Natural disasters are increasing due to climate change, bringing with them substantial increases in disaster-associated mental illnesses, such as depression, PTSD, and anxiety. Previous evidence has shown that after a natural disaster, these mental heath outcomes are not distributed equally throughout the population, but tend to affect certain groups of people more than others. Yet, inequality does not necessarily constitute an inequity. Currently, there is no established way of determining the fairness of mental health outcomes post-disaster, which is a necessary component of determining whether policies or guidelines ought to change in order to remedy an injustice. In this project, I use an environmental justice framework to assess the justness of mental health outcomes after natural disasters, using the Fort McMurray fire of 2016, known as The Beast, as a case study. Environmental justice theories have not previously been used to determine justness of mental health outcomes after natural disasters, therefore I begin by determining whether this the correct type of theory to use for this endeavour by examining certain critical components of the theory against what would be required for its application in this particular context. I end this ethical analysis by suggesting particular elements for inclusion in an environmental justice theory, to accommodate its usage for mental health outcomes post-natural disaster. The Beast caused the largest mandatory evacuation and was the costliest disaster in Canadian history. It therefore serves as a highly relevant case study to examine the question of equity in mental health outcomes in a Canadian context. Using aggregated data from Alberta Health, academic articles, newspaper articles, and published reports, I attempt to determine what the mental health outcomes of the Beast were, and if they affected the members of the population equally. In my final chapter, I applied the findings from my ethical analysis to the case study. This iterative process highlighted gaps and strengths in the approach. I conclude this thesis by reflecting on the learnings from this application process and offer thoughts on how we can move forward.

Keywords: Environmental justice; Mental health; Mental illness; Natural disasters; Wildfires; The Beast

This work is dedicated to God. He's a good father, and he came up with the idea of justice in the first place.

Researching and writing this thesis has shown me, even more than before, that when Jesus teaches about 'justice', it means the same thing as when I say it: a compassionate desire and fierce longing for what is wrong to be set right again.

Not only does he love people, but he really likes them too.

~

Learn to do right; seek justice. Defend the oppressed. Take up the cause of the orphan. Fight for the rights of widows.
Isaiah 1:17

The Lord loves righteousness and justice; the earth is full of his unfailing love.
Psalm 33:5

But let justice roll on like a river, righteousness like a never-failing stream!
Amos 5:24

Yet the Lord longs to be gracious to you; therefore he will rise up to show you compassion. For the Lord is a God of justice. Blessed are all who wait for him! People of Zion, who live in Jerusalem, you will weep no more. How gracious he will be when you cry for help! As soon as he hears, he will answer you.
Isaiah 30:18-19

Acknowledgements

It seems unfair that the acknowledgements for a novel get to take up many pages, whereas for a thesis I am restricted to one – simply because, over these past few years, I have received so much help and guidance that I am sure I could fill many pages with gratitude. Know, then, that the names of those to whom I am indebted are too many for these few lines of text; but your input, support, encouragement, guidance, food, time, kindness, and love have been the fuel that's kept me going. Thank you.

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Chapter 1.

Introduction

“Take off your hat," the King said to the Hatter.
"It isn't mine," said the Hatter.
"Stolen!" the King exclaimed, turning to the jury, who instantly made a memorandum of the fact.
"I keep them to sell," the Hatter added as an explanation; "I've none of my own. I'm a hatter.”

Lewis Carroll, *Alice’s Adventures in Wonderland*

The way we interpret an issue depends upon the hat we are wearing – that is, the role, position, or perspective we inhabit - and, indeed, an issue can always be interpreted through the wearing of multiple hats. The beautiful fact of the matter is that we, like the hatter, are not constrained to simply wearing a single hat. Instead of being forced to pursue only a single perspective, we can gain the technical abilities to weave together different perspectives and examine multiple angles of an issue, so that our own skills of hat-making grow to accommodate new seasons and circumstances.

Climate change is an issue which requires many hats to be worn. There must be the person wearing the hat of a climatologist, a geologist, engineers, environmental scientists, and the list goes on. Required perspectives are not limited to job titles though. To fully understand the impact of these complex issues, or wicked problems, we must also hear from those who can bring the perspective of a mother, a child; an immigrant, an indigenous person; a field worker, and a university professor. The reason being, these wicked problems do not exist in silos. Climate change, for instance, is a multifactorial problem: it has many causes, and many consequences. One of the consequences of climate change is an increase in certain types of natural disasters. This, too, occurs through an intricate web of causal chains. Because these complex issues are not siloed, our proposed solutions cannot be siloed either.

This project is about the ethics of mental health outcomes after natural disasters, including the kinds of natural disasters that are heavily influenced by climate change. The perspective, or to continue the metaphor, the hat, that I want to wear in this discussion is that of environmental justice. I have chosen to adopt and learn from this perspective because it purposefully centers the experience of those who are vulnerable, as a result of harms accrued from our collective use of environmental resources. Using an environmental justice perspective, I have tried to understand what it means to have "fair" mental health outcomes, since the data has shown that some populations tend to experience worse mental health outcomes after natural disasters than others. I then applied these findings to a case study – the Fort McMurray fires of 2016, known colloquially as the Beast. Drawing from this application, I was able to make some suggestions regarding how an environmental justice perspective could enrich our understandings of fairness, ultimately leading to better health outcomes for those most vulnerable.

While I used a wildfire as a case study, I want to take a moment to invite you to also put on an environmental justice hat, so that we can together see some of the ways this perspective can shed light on today's most pressing issues.

I am writing these words in June of 2020. The past six months, news feeds, social media outlets, and words on lips have been almost exclusively focussed on a single topic: the novel coronavirus, SARS-CoV-2. It became known that, particularly in the United States, the coronavirus was disproportionately affecting African-American people: African-Americans in the United States were over three times more likely to die from the coronavirus than their white counterparts (Webb Hooper et al., 2020). Soon after this was discovered, the urgency surrounding the coronavirus began to wane. Restrictions began to be lifted, and "normal life" started to resume.

That is, until the death of George Floyd.

Swiftly, news of the coronavirus was overshadowed with news of protests and, sometimes, riots. Cries of justice rang through our collective ears. Racial justice, criminal justice, "no justice, no peace": in short order, 'justice' has become a rallying cry for the multitudes. Echoes of justice rang out, against a background of recently-discovered racial disparities in coronavirus mortalities.

It is not my intention to provide an in-depth analysis surrounding the current events, through which I am now living. Indeed, at this juncture I could not. Rather, I share this abridged history with you to highlight the societal cornerstone that is justice. Justice, a notion often taken for granted; a notion that, as I type, is being hotly debated, pushed to the fore, and defended.

The ideas of environmental justice were born from a similar battle: African-Americans, people of colour, and minorities were having to suffer the consequences from environmental decision-making, while white people benefitted (Taylor, 2000). Those battles are just as relevant today as they were then. This environmental justice paradigm has since shifted, grown, morphed, and changed, but its roots of equality still hold this ideology solidly in the soil of justice.

As we turn our attention to natural disasters, let us not forget the centrality of equality. These increasing phenomena are having devastating effects in communities worldwide. Yet, these effects are not experienced equally. Certain groups of people are suffering more than others. Sometimes these groups are defined by race, sometimes by gender, sometimes by age, and other times by physical ability. Many factors influence which group is the worst-off in any particular instance, and yet, it is rarely, if ever, the case that a disaster affects everyone equally. This is true both in terms of death and physical morbidities, as well as mental health outcomes.

In developing my analysis of natural disasters, I wanted to know what the role of justice was, in the midst of these inequalities. As I will discuss, an inequality is not necessarily unjust; therefore, before we are able to address these inequalities in terms of justice, it must first be determined when an inequality is, in fact, unjust. In short, this was my goal. After analysing both quantitative and qualitative data for the mental health outcomes of the Fort McMurray fire, I was then well-positioned to explore the query of: what does it mean to have just mental health outcomes after a natural disaster?

This thesis is separated into three body chapters: an ethical analysis, a case study, and a discussion. The primary focus of this project was understanding the equitability of mental health outcomes after natural disasters. In the ethical analysis, my aim was to analyse the concept of environmental justice, in order to determine if it was suitable to extend this theory of justice to encompass post-disaster mental health

outcomes. After this analysis, I move on to quantitatively and qualitatively describing the mental health outcomes of a particular natural disaster: a wildfire in Fort McMurray, Alberta, Canada, which began in May of 2016, known as the Beast. In my discussion chapter, I aim to apply the findings from my philosophical analysis to the case study, and offer some concluding thoughts on the use of this theory in regards to mental illness outcomes.

1.1. Ethical Analysis

'Environmental justice' is a term that is fairly familiar, but fraught with varied meanings. To begin my analysis, I set the groundwork by examining some of the history and meanings of 'environmental justice'. This historical account helps to shed light on current usage of this theory. It also acts as an introduction to some of the concepts that will be expanded upon later in the thesis.

Environmental health justice has, as per its name, had health concerns as a central feature; yet, including "health" as the outcome of equality for which distributive schemes may aim is problematic for many reasons. In my section discussing environmental justice and health, I examine some of the key concerns with using "health" as a metric of equality (or of equity, depending on the theory) in a theory of environmental justice. Equality and equity are central tenets of environmental justice theories – however, as I describe, the implications of the theory vary greatly depending on whether equality or equity is being used as a benchmark of justice. Particularly as regards health-states, while equity is a laudable goal, aiming for equality in health-states is likely theoretically impossible, and may in fact be practically unethical.

After discussing how health ought to be viewed in a theory of environmental justice (namely, through a lens of equity), I turn my attention to consider salient features of natural disasters, in order to determine if a theory of environmental justice can be applied in this context. The first feature of natural disasters that I consider is the fact that there are mental health outcomes post-disaster, and that burden of these outcomes are unequal in the population. Although this inequality may be a red flag, note that it does not necessarily constitute an inequity – which is precisely why a theory of justice is necessary in this context.

A necessary component of justice is that the outcome under examination was not inevitable: in short, this describes the difference between an injustice and what is simply a misfortune[1]. Therefore, in order for the outcomes of natural disasters to be open to inclusion in a theory of justice, it must be the case that the outcomes were, in some way, evitable. This is the case when it comes to natural disasters. Firstly, the outcomes of natural disasters are in many ways determined by the social and political structures in place. Secondly, due to anthropogenic climate change, the very occurrence and severity of natural disasters is now also being impacted by humans. Further, the impact of humans on natural disasters has long been recognized as a matter of justice.

Given that natural disasters meet this basic requirement for inclusion in a theory of justice, I then turn my attention to determining what further features would be required in order to determine justness of post-disaster mental health outcomes. These features are:

1. A theory of environmental justice ought to be rooted in a broader theory of justice

2. A theory of environmental justice must account for the prevention of unjust harms.

3. "Vulnerability" must be defined in such a way that populations which are most susceptible to harms from natural disasters can be afforded protection. The idea of resilience ought not supplant the centrality of vulnerability in these discussions, as resilience tends to point towards individual- or community-based strengths, whereas vulnerability highlights system-level weaknesses or faults.

4. A theory of environmental justice must be able to accommodate for multiple sources of information and knowledge in order to allow for a participatory approach.

5. Theories of environmental justice must be situated at the appropriate scale.

I conclude this section by arguing that remediation of harms is insufficient, if prevention of harms is possible.

[1] For more on this, see Shklar (1990).

1.2. Case Study

In this case study, I examine the 2016 wildfire called The Beast, which occurred in Fort McMurray, Alberta. The format of this case study is describing the type of natural disaster being analysed, providing context for the location where it occurred, and then examining the outcomes of the disaster.

I begin this case study by providing relevant background surrounding the occurrence and harms that arise due to wildfires. Firstly, I examine the role of climate change in wildfires, specifically in Alberta, Canada. This is done to determine the extent to which humans may be responsible for the occurrence of wildfires. I then explain the harms that are likely to arise from wildfires, along with preventative measures that certain communities have undertaken. Turning towards the mental health outcomes, I explore which types of mental illnesses are most prevalent after wildfire, then I examine the literature to determine if certain groups of individuals are more likely to experience those harms than others.

Data was obtained from Alberta Health regarding the mental health outcomes of the fire that occurred in Fort McMurray. Data was aggregated by age-sex, and also by income quintile. These data were analysed and presented using graphs. A lack of individual-level data prevented more in-depth statistical analyses, as described in the Methods chapter. The context of the fire was described, including the natural ecosystem of Fort McMurray and likelihood of fires. The demographics of Fort McMurray were also taken into consideration, as it is known that certain demographic features such as age and sex influence the likelihood of developing a mental illness after the occurrence of a natural disaster.

Results were presented for the following illnesses for which data was requested: post-traumatic stress disorder, anxiety, depression, and substance use. The findings from this research were that, unsurprisingly, mental illnesses did increase after the fire. When this data was aggregated by age-sex, and by income quintile, there was no clear pattern found for a particular group which seemed to be particularly disadvantaged. These findings were considered in light of findings from other studies, especially results that had been published regarding mental health outcomes of the Fort McMurray fire.

Information from newspapers and other reports were also considered to help provide a qualitative lens to make sense of the findings from the quantitative data.

1.3. Discussion and Conclusion

The purpose of this chapter was to apply the findings from the ethical analysis to the case study chapter. After positioning the discussion of environmental justice and mental health outcomes within the current literature, I examine the justice considerations that ought to be named in determining the justness of outcomes of The Beast. Fort McMurray is found in the middle of the Athabasca Oil Sands, and revenue from the oil sands is a strong financial incentive to live in Fort McMurray. The fact that the oil sands act as an economic driver is an important justice consideration, as it influences the number of individuals who live in the midst of the boreal forest – an ecosystem which naturally regenerates through wildfire. I examine other aspects of justice associated with Fort McMurray's economy, and the role that the oil sands play in it.

I look at the oil sands through the perspective of risk. I categorize three different types of risk which I believe are helpful in ascertaining the risk of harm that the oil sands may pose to the health of those in Fort McMurray, particularly in regards to employment. I call these three categories direct risk, proximal risk, and indirect risk. I describe direct risk as risk arising from work itself; proximal risk as risk arising from working in proximity to a risky environment, and indirect risk, as the risk that arises through living in proximity to hazards which result from particular workplaces. Notably, it is often this third category of risk which is of interest to environmental justice scholars: for example, it may be an environmental justice concern that those living in close proximity to landfills are exposed to pollutants and have an increased risk of various diseases, but may not be the ones who either chose to have the landfill in that location, or who will benefit from its being there.

After this discussion of the role of risk in the context of justice, I look at what needs to be added to a theory of environmental justice in order to make it useful for determining the justness of mental health outcomes of natural disasters. I deliberate on the reasons that an environmental justice lens is the correct lens to use to determine injustices, even though modifications to the theory are needed. I conclude this chapter by reflecting on the learnings that I have had through the iterative process of applying a

theory to a case – both in terms of what it meant for my understanding of the theory, and in reflecting on areas where data was unavailable and therefore it was impossible for me to speak conclusively. While this approach was applied to a specific case study, I believe that an environmental justice perspective can help us not only ascertain when an injustice has occurred, but ultimately, can help us work towards preventing injustices from occurring in the first place.

The goals of this thesis are to:

- Assess if a theory of environmental justice can be used to determine inequities in mental health outcomes after natural disasters, and if so, what components may need to be added
- Use quantitative and qualitative methods to (a) determine the mental health outcomes in Fort McMurray after 'The Beast', and (b) assess contextual features which may have related to those outcomes
- Iteratively apply the theory of environmental justice from the first section to the understanding of mental health outcomes from the second section to (a) determine if the mental health outcomes of the Fort McMurray fire were just, and (b) make recommendations for how we ought to understand mental health outcomes of natural disasters more broadly.

1.4. Works Cited

Shklar, J. N. (1990). The Faces of Injustice. Yale University Press.

Taylor, D. (2000). The Rise of the Environmental Justice Paradigm: Injustice Framing and the Social Construction of Environmental Discourses. American Behavioural Scientist, 43(4), 508–580.

Webb Hooper, M., Nápoles, A. M., & Pérez-Stable, E. J. (2020). COVID-19 and Racial/Ethnic Disparities. JAMA, 323(24), 2466–2467. https://doi.org/10.1001/jama.2020.8598

Chapter 2.

Methods and Methodology

2.1. Research paradigm

A pragmatic approach was adopted for this research study. This approach emphasizes the research problem over the research methods, thereby allowing the researcher to make use of the most relevant data, whether it is qualitative or quantitative (Rossman & Wilson, 1985). As this research is cross-disciplinary, a pragmatic approach which allowed the use of multiple sources of data was a strong paradigm as it allowed access to the most relevant information needed to develop a thorough answer to the research questions. Further, this method emphasizes practical application of solutions to problems (Patton, 1990), which was especially important as one of the aims of this research is to apply findings from a theoretical analysis to a real-world example.

2.2. Research methods

An embedded mixed methods approach was used in this study. This approach puts an emphasis on qualitative methods and data, while incorporating quantitative data to support and provide context for qualitative findings (Creswell, 2014). The ethical analysis is primarily a theoretical analysis, which is supported by relevant empirical data (whether qualitative or quantitative). The result of the analysis provided a theoretical framework within which data from the case study was explored.

2.3. Ethical Analysis

The purpose of the ethical analysis was to investigate how principles of environmental justice should be understood in the context of, and applied to, mental health issues caused by natural disasters. ‘Philosophy’ as a method of analysis or inquiry is notoriously difficult to define, but in practice has been defined as “the intellectual activity that works with distinctions, […] showing how and why the things that it has distinguished must be distinguished one from the other” (Sokolowski, 1998, p. 516), by utilizing a method of conceptual analysis (Grice, 1989). Ethics, on the other

hand, has been defined as, “The study of the concepts involved in practical reasoning: good, right, duty, obligation, virtue, freedom, rationality, choice” (Blackburn, 2016) . Given that the focus of this project was to determine justness of mental health outcomes, this study represented an ethical analysis. To note, the terms ‘ethical analysis’ and ‘philosophical analysis’ are used interchangeably throughout this thesis.

A conceptual and textual analysis of philosophical literature was undertaken. Due to the multisectoral nature of the problem, literature was sought from multiple different disciplines (Figure 2.1). I primarily focussed on literature that occurred at the intersections of this diagram: between health and the environment; the environment and ethics/justice; and ethics/justice and health literatures.

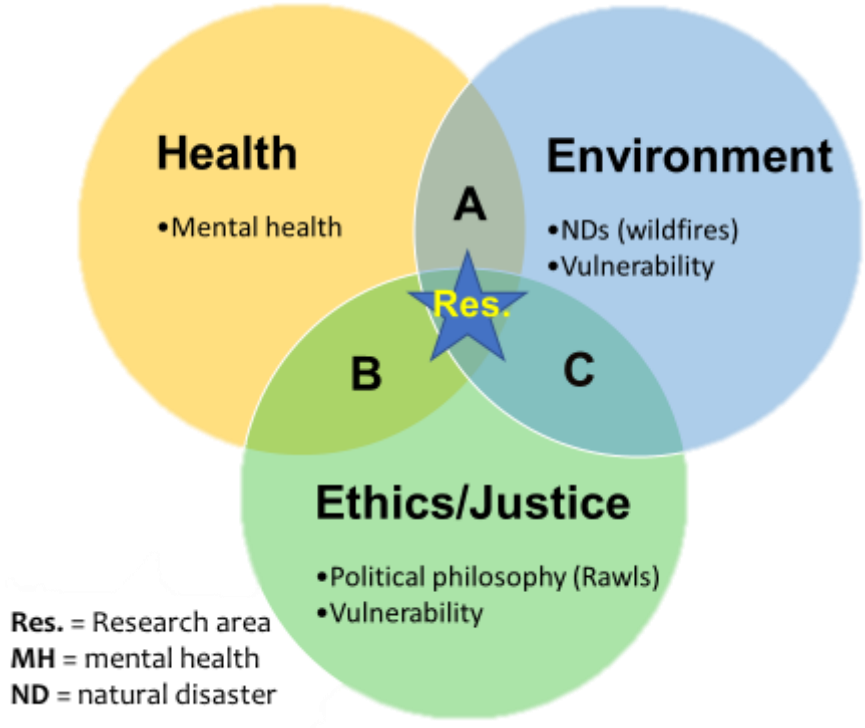

Figure 2.1. Diagram of research areas indicating the area where literature was sought.

Table 2.1 lists the types of disciplines and associated examples of search concepts which were researched.

Table 2.1. Example search terms in intersecting disciplines relevant to this research.

	Health & Environment	Ethics/Justice & Health	Environment & Ethics/Justice
Example disciplines	• Disaster management *(from government and academic sources*)	• Biomedical ethics • Medical ethics • Health ethics	• Environmental ethics • OneHealth • Planetary Health
Example search concepts	• Wildfires and impact on human health • Impact of natural disasters on mental health • Impact of wildfires of mental health	• Distributive justice in health • Health equity • Mental health and equity	• Equity and natural disasters • Environmental burdens and equity • Environmental burdens and natural disasters • Mental health and environmental justice • Health and environmental justice

Searches were also performed for the intersection of health, environment, and justice. The search concepts that were used for these searches were things like:

- Mental health equity and natural disasters
- Environmental justice and mental health after natural disasters
- Environmental justice and health outcomes after natural disasters

Searches were conducted through numerous databases, depending upon the discipline being researched.

The philosophical analysis was grounded in a theoretical framework of environmental justice and both quantitative and qualitive empirical data was gathered to supplement the theoretical discussions. Snowballing search strategies were also used to find relevant sources which may not have come up in the database searches. These presented an important aspect of the search strategy, since data had been collected from many different fields.

2.4. Chapter 2: Case Study

Robert K. Yin is a foremost scholar in the area of qualitative research, having written multiple influential books on the subject over the past few decades. His work is

pedagogical in nature and incorporates a thorough discussion of how to effectively carry out qualitative research, specifically in the context of case study analysis. For these reasons, the methods for this case study analysis were largely structured on the format described in Yin (2018).

2.4.1. Research question and rationale

This case study was primarily focussed on discovering what the outcomes of the Horse River fire of 2016 were; an in-depth analysis on the equity implications of these outcomes was saved for Chapter 5: Discussion and Conclusion. Therefore, the research question for this chapter was: What were the mental health outcomes of the Horse River fire of 2016, and who in the population was experiencing this mental health outcomes?

A case study approach was chosen to investigate this question because case studies can be particularly useful tools for research when (1) the context and dynamics of a situation are important to fully understand it, and (2) for areas where research and theory are not well-developed (Darke et al., 1998). Given that the focus of this research is on further developing understanding around the application of principles of justice in a particular situation, the purposes of this study align perfectly with a case study research approach.

2.4.2. Research design

The specific case to be studied is the Horse River Fire which began in May 2016 and burned for approximately 13 weeks. The population that I am studying for this case study was bounded based off of geographical location to encompass those who were, at the time of the wildfire, living in Fort McMurray. Mental health effects can commence immediately after a trauma, such as wildfire, and/or they may become apparent some time in the future (Galea, 2007). Data was requested from approximately one year prior to the fire to establish a baseline, the year of the fire, and the year following the fire (April 2015 to April 2017). Data collection procedures are specified below.

2.4.3. Data collection

The sub-questions that were addressed in order to answer the broader research question for this chapter are:

1. What were the mental health outcomes of the Fort McMurray fire?

2. Who was most affected by these mental health outcomes?

Qualitative data collection

As per Yin (2018), data was collected from the following sources:

- Newspapers and news articles
- Articles from other media sources
- Formal studies and evaluations relevant to the case
- Academic articles and research relevant to the case
- Data from organizations assisting in mental health response to the Fort McMurray fire
- Policies relevant to the Fort McMurray fire
- Government statements/announcements about the case

The use of multiple sources of data – both within the case study analysis and within the philosophical analysis – allowed for data triangulation. Corroborating findings through the utilization of multiple sources of evidence strengthened the overall theory that was developed (Yin, 2018). News and media articles provided important context in the analysis. They additionally helped to represent the opinions and experiences of those who had been affected by the fire, since an interview component was not included in this study.

Quantitative Data Collection

Administrative data were obtained from Alberta Health (AH). Alberta Health Services is the only health authority in Alberta and serves more than 4.3 million Albertans (Ernst & Young LLP, 2019). Previous research had identified the following

information as important in determining vulnerability[2]: socioeconomic status; gender; length of time spent living in an area; language skills; chronic illness; being elderly; being a child (Amin et al., 2011). However, Alberta Health does not collect data on many of these characteristics. Additionally, as I did not have Research Ethics Board approval through an Alberta institution, AH was unable to provide me with individual-level data; thus, all requested data was aggregated by both age and sex, and income quintiles. Data was suppressed for any cell for which the count was below five individuals.

Age and sex aggregations

Male and female are used as sex aggregations. No other category was included based on data availability. Age groupings which were used were under 24, 25 to 54, and over 55. It was found that having age groupings of below 18 and above 65 would lead to larger amounts of data suppression due to cell count, so the final ages were chosen to minimize this data suppression.

Income data

Income data was determined based on the median total household income of the entire population of a dissemination area, as drawn from census data. Individuals were assigned to a dissemination area by their postal code at the time of the fire. The median total household income was then assigned to each member of the DA. Data on total household income was obtained by Alberta Health from Census data. These individuals were then assigned to income quintiles.

Mental illness diagnoses

Practitioner claims can be used to determine what types of services doctors are billing for (Moore et al., 2006) and thus were used to determine rates of mental illness. These categories were determined based on World Health Organization International Classification of Diseases (ICD) codes (Table 2). The specific types of codes used in Alberta are ICD-9 and ICD-10. Mental illnesses were grouped into four primary categories, by practitioner claim codes: affective disorder (excluding depression), anxiety/neurosis/stress/adjustment (ANSA), depressive disorders, and substance use. Initially, more specific codes were sought to distinguish between post-traumatic stress

[2] Roughly speaking, “vulnerability” is defined as an increased likelihood of harm. A more thorough conceptual analysis of the term is carried out as part of the ethical analysis in Chapter 3.

disorder (PTSD) and anxiety, and to specify the severity of illness, but it was discovered that the ICD codes are rarely, if ever, recorded to such a degree of specificity, and so a broader categorization was used. Individuals were tracked based on their personal health care number by employees at AH, who then presented me with aggregated results. In order to be characterized as a diagnosis of a mental illness, the same diagnosis had to be given twice to the same individual. While this method excludes those who have only had one interaction with the healthcare system in relation to a mental illness, it has been shown to be the most effective method of determining true instances of mental illness diagnoses in administrative data as it substantially decreases the chances of including a mislabelled diagnosis or an encounter where a diagnosis was not confirmed (Frayne et al., 2010).

ICD-9 codes used for diagnosis of mental illness were taken from Frayne et al. (2010) (Table 2.2). ICD-9 codes were converted to ICD-10 codes (Convert ICD-9-CM to ICD-10-CM, n.d.) then converted back to ICD-9 to check for accuracy.

Table 2.2. ICD-9 and ICD-10 codes used for mental illnesses.

	ICD-9	ICD-10
Affective disorders (excluding depression)	296, 296.x excl 296.2 & 296.3, 301.1	F30, F31, F34.0, F34.8, F34.9, F38, F39
Anxiety-Neurosis-Stress-Adjustment	300, 300.x excl. 300.4, 308, 309	F40-F48
Depressive disorders	296.2, 296.3, 300.4, 311	F32-F33, F34.1
Substance use	291, 292, 303, 304, 305	F10-F19

Data sources

Three different data sources were used: practitioner claims, ambulatory, and inpatient (definitions provided in Table 2.3 as provided by AH). While there is overlap between these sources, and AH representative stated that they can be imperfectly used as a proxy for severity of an illness; practitioner claims tend to represent the least serious instance of an illness, with ambulatory representing more severe cases, and inpatient representing the most severe cases.

Table 2.3. Definitions and ICD codes associated with practitioner claims, ambulatory, and inpatient data sets.

	Alberta Health definitions	ICD codes used
Practitioner Claims	Processed claims for eligible patients to pay medical doctors and other allied practitioners.	ICD-9
Ambulatory	Facility-based outpatient medical and/or surgical care that is provided in publicly-funded clinic, day surgery, and emergency department settings.	ICD-10
Inpatient	Treatment, examination and observation for patients occupying a hospital inpatient bed.	ICD-10

Years of data collection

Diagnoses were obtained for three consecutive years from 2015-16, 2016-17, and 2017-18, with each yearly cycle beginning on March 31, which corresponds to the end of the fiscal year at AHS and was therefore the best date from which to obtain annual data to expedite its procurement. As the Fort McMurray fire began on May 1, 2016, the first data set represents comparison data for before the fire, and the subsequent two years were used to determine the influence of the fire after one year and to years, respectively.

Population

The same population was represented in all three samples. On March 31, 2016 there were 90,661 registrants (those registered with Alberta Health) who were active in the Municipality of Fort McMurray. Of those, there were 83,086 who had also been active one year prior. This was the population for which data was obtained. Because AH is a unified provincial health system, the personal health numbers of these individuals were able to be tracked anywhere in Alberta, regardless of if the individuals returned to Fort McMurray after the fire. Loss of population occurred each year, either representing individuals moving out of province or death.

Income data

Income data were based on the average income of a dissemination area. That average income was then applied to all members of the dissemination area. Income was based off of after-taxes average household earnings.

2.4.4. Data Analysis

Qualitative data analysis

Document analysis was conducted as per Bowen (2009). This method was chosen given Bowen's expertise in the field and that the analytic techniques presented were geared towards practical use for novice researchers and students. This analysis provided background and context for the research question (Bowen, 2009) and helped determine relevant factors that may have contributed to inequalities in health status outcomes after the Horse River fire. In brief, this technique consists of: skimming (superficial examination); reading (thorough examination); and interpretation.

Relevant policies and reports were analyzed to supplement the qualitative portion of this research. Policy analysis was conducted using a framework analysis technique, as described in Ritchie & Spencer (1994). Framework analysis is a "systematic process of sifting, charting and sorting material according to key issues and themes" (Ritchie & Spencer, 1994, p. 177). Briefly, framework analysis consists of the following steps:

1. Familiarization (immersion in the data)
2. Identifying a thematic framework (identifying key issues, concepts, and themes)
3. Indexing (data read and annotated according to thematic framework)
4. Charting (data rearranged from original context according to thematic framework)
5. Mapping and interpretation (pull out key characteristics and map data as a whole)

The framework analysis technique is well-suited for applied policy analysis and has been used frequently in the health care field. It is a dynamic technique which is appropriate for within-case analysis, as it allows for systematic and comprehensive evaluation of multiple sources of information (Srivastava & Thomson, 2009). The policy analysis portion of this study was conducted concurrently with the document analysis. It provided clarification on mitigating and aggravating circumstances affecting the distribution of environmental burdens in the context of the Fort McMurray fire.

Quantitative data analysis

Raw numbers were converted into rates, which were then graphed. To find the rates of service utilization for each category, the number of people who utilized a service in a particular group was divided by the total population of that group, then converted to a percentage. Since data was aggregated by both age and sex, in order to obtain information only on age groups, or only by sex groups, data was combined as necessary in order to obtain the correct groupings. Rates of service usage were found to be less informative than rates per individuals, as there were cases where few individuals would utilize a service multiple times, which was not informative in this study as I was looking for number of individuals affected, therefore service utilization rates were not included in the final analysis. For example, instances were found where it appeared as though one or two individuals would utilize a service many times, thereby increasing the rates of service utilization in a way that did not reflect an increase in population usage of a service. If individual-level data had been obtained, there may have been ways to account for this (for example, by examining possible reasons for the increased usage by that individual, or by eliminating the individual from the analysis to determine the effect on overall trends if necessary). However, since only aggregated data was available, such analysis was not possible. Similarly, the category for “Affective Disorders” showed no clear trends in physician claims, ambulatory services, or inpatient services. This lack of clarity in trends was also influenced by the number of cells which were affected by data suppression in this particular category. It was determined that the grouping of disorders was too broad to show any trends that may have arisen as a result of the fire; again, as only aggregate data was available, it was not possible to further investigate the reasons behind this, or determine whether there were any other possible confounding factors in the data. Therefore, this group was also excluded in the final analysis.

2.5. Chapter 3: Discussion

Results of the case study were incorporated into the findings from the philosophical analysis in the final discussion chapter. The research question which guided the incorporation of the philosophical analysis with the case study was: How should principles of environmental justice (as stipulated in the philosophical analysis) be applied to understand the distribution of mental health outcomes of the Horse River

Wildfire of 2016, and what are the implications of that distribution for health equity? Two sub-questions which were examined in order to answer this question are:

- What structural features may have influenced the distribution of mental health outcomes within the population?
- Do these distributions of mental health outcomes reflect principles of justice, as explored in the ethical analysis?

The pragmatist approach of this mixed methodologies study (as described earlier) allows for the use of multiple methods in order to answer a single research question. Utilizing both a theoretical and empirical framework to answer the research questions allowed for a balanced and reflexive approach, that is informed by both relevant political philosophy and environmental justice theories as well as insights gained through qualitative analysis. This integration helped to determine what would be required in applying an environmental justice approach to a real-world situation, and was therefore an iterative process. Methods used in this chapter were as above for the philosophical analysis.

2.6. Research Ethics

Research Ethics Board (REB) approval was obtained from Simon Fraser University. As mentioned above, Alberta Health required REB approval from an Alberta Institution in order to release individual-level data, and therefore REB approval was not actually required for this study.

2.7. Works Cited

Amin, M., MacLachlan, M., Mannan, H., El Tayeb, S., El Khatim, A., Swartz, L., Munthali, A., Van Rooy, G., McVeigh, J., Eide, A., & Schneider, M. (2011). EquiFrame: A framework for analysis of the inclusion of human rights and vulnerable groups in health policies. Health and Human Rights, 13(2), 20.

Blackburn, S. (2016). The Oxford Dictionary of Philosophy (2 rev. ed.). Oxford University Press.

Bowen, G. A. (2009). Document Analysis as a Qualitative Research Method. Qualitative Research Journal, 9(2), 27–40. https://doi.org/10.3316/QRJ0902027

Convert ICD-9-CM to ICD-10-CM. (n.d.). ICD.Codes. Retrieved July 27, 2020, from https://icd.codes/convert/icd10-to-icd9-cm

Creswell, J. W. (2014). Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (4th ed.). SAGE Publications, Inc.

Darke, P., Shanks, G., & Broadbent, M. (1998). Successfully completing case study research: Combining rigour, relevance and pragmatism. Information Systems Journal, 8, 273–289.

Ernst & Young LLP. (2019). Alberta Health Services Performance Review: Summary Report (pp. 1–101). Alberta Health. https://open.alberta.ca/dataset/c0724ccd-832e-41bc-90d6-a0cd16bc6954/resource/1e03ea8a-7948-48c4-bca4-109c20ce0f02/download/health-ahs-review-summary-report.pdf

Frayne, S. M., Miller, D. R., Sharkansky, E. J., Jackson, V. W., Wang, F., Halanych, J. H., Berlowitz, D. R., Kader, B., Rosen, C. S., & Keane, T. M. (2010). Using Administrative Data to Identify Mental Illness: What Approach Is Best? American Journal of Medical Quality, 25(1), 42–50. https://doi.org/10.1177/1062860609346347

Galea, S. (2007). The long-term health consequences of disasters and mass traumas. CMAJ, 176(9), 1293–1294. https://doi.org/10.1503/cmaj.070368

Grice, P. (1989). Studies in the way of words. Harvard University Press.

Moore, D., Copes, R., Fisk, R., Joy, R., Chan, K., & Brauer, M. (2006). Population Health Effects of Air Quality Changes Due to Forest Fires in British Columbia in 2003: Estimates from Physician-visit Billing Data. Canadian Journal of Public Health, 97(2), 105–108.

Patton, M. Q. (1990). Qualitative evaluation and research methods (2nd ed.). Sage.

Ritchie, J., & Spencer, L. (1994). Qualitative data analysis for applied policy research. In B. Bryman & B. Burgess (Eds.), Analyzing Qualitative Data (1st ed., pp. 173–194). Routledge. http://ebookcentral.proquest.com/lib/sfu-ebooks/detail.action?docID=170016

Rossman, G. B., & Wilson, B. L. (1985). Numbers and Words: Combining Quantitative and Qualitative Methods in a Single Large-Scale Evaluation Study. Evaluation Review, 9(5), 627–643.

Sokolowski, R. (1998). The Method of Philosophy: Making Distinctions. The Review of Metaphysics, 51(3), 515–532.

Srivastava, A., & Thomson, S. B. (2009). Framework Analysis: A Qualitative Methodology for Applied Policy Research. JOAAG, 4(2).

Yin, R. K. (2018). Case Study Research and Applications: Design and Methods (6th ed.). SAGE Publications, Inc.

Chapter 3.

Philosophical Analysis

3.1. Introduction

The impacts of the global burden of mental illness are tremendous. A 2016 study estimates that this burden accounts for almost a third (32.4%) of all years lived with a disability (Vigo et al., 2016). Recognition of the substantial impact of mental illness on sustainability and development has led to its inclusion in the 2015 United Nation's Sustainable Development Goals (Mills, 2018). In addition to the severe impact that mental illness can have on quality of life, psychological distress and major depressive disorder also create significant direct healthcare costs in Canada (Chiu et al., 2017). A recent report by the Lancet Commission on global mental health and sustainable development emphasized the growing importance of mental disorders in the public health community. In describing a "foundational pillar", the report states that: "mental health is a fundamental human right for all people that requires *a rights-based approach* to protect the welfare of people with mental disorders and those at risk of poor mental health, and to enable an environment that promotes mental health for all" (Patel et al., 2018, p. 1553, italics added). A rights-based approach to mental health will require an understanding of what constitutes mental health-related rights, particularly in environments that pose substantial threats to mental health. One such environment is after the occurrence of a natural disaster.

Large increases in the rates of mental illness are frequently observed after natural disasters amongst affected communities. Because of increasing human population, more people are being threatened and harmed by the occurrence of natural disasters. To worsen matters, due to climate change, the number of natural disasters is increasing globally. While these disasters result in negative mental health outcomes for all affected groups, there is evidence that not all groups are affected equally: very often, susceptible populations are the most negatively affected by mental illness following natural disasters (J. E. Bell et al., 2016; Tierney, 2000). "Susceptible population" is defined, in broad strokes, as a group of people, for example, women, younger people, older people, those who are not fluent in the dominant language, etc., who are more

likely to experience harm from a particular occurrence; this is further discussed in this chapter, in the sections “Health Outcomes of Natural Disasters” and “Defining Vulnerability”, as well as in the following two chapters.

While it is known that inequalities exist in health outcomes after natural disasters, what remains unclear is whether these inequalities constitute inequities. Though unequal outcomes (“inequalities”) can be empirically assessed, the terms “rights-based approach” and “inequities” have moral connotations, often deriving their definitions from within the realms of political philosophy and theories of justice. Many rights-based approaches exist, along with numerous theories of inequity. When promoting fair health outcomes after natural disasters, it is paramount to have conceptual clarity regarding which rights-based approach is being followed, or which ideal of equity is being pursued, lest scarce resources be spent on ineffective or ambiguous health promotion policies (Braveman et al., 2011; Braveman & Gruskin, 2003); however, there is not currently a standard of justice by which mental health inequalities arising after natural disasters can be judged. One type of justice theory which may be well-suited to fill this gap is a theory of environmental justice, as these types of theories often consider distributions of environmental burdens, impacts on vulnerable populations, and incorporation of participatory approaches.

In this paper, I aim to show that a theory of environmental justice may be an appropriate type of justice theory to determine the justness of mental health distributions after natural disasters, because prominent features of environmental justice theories overlap with the types of justice questions which arise when considering health outcomes from natural disasters. I will then argue that current theories of environmental justice are insufficient for understanding the justness of mental health outcomes after natural disasters. One of the reasons for this is that theories of environmental justice have traditionally been concerned with “manmade” injustices, such as the siting of toxic waste facilities. Outcomes from “natural”, or unplanned, events have been excluded. It has long been known that there is a distinction between a natural hazard (i.e. a flood) and a natural disaster (the disastrous consequences of a flood) (Cannon, 1994) (this distinction will be discussed more throughout the chapter.) I intend to show that outcomes from natural disasters are influenced enough by human decisions that their outcomes can also be considered within an environmental justice framework. I then focus on three areas where current theories of environmental justice are lacking. These

areas of insufficiency are: 1) environmental justice theories are mostly appealed to retrospectively, and therefore do not incorporate the notion of prevention of harms in the best way to accommodate outcomes of natural disasters; 2) the concept of "vulnerability" used in environmental justice theories is often insufficient: "the vulnerable" may not be explicitly defined; the scope of the definition of "vulnerable" may not extend beyond the specific case being discussed; or, the definition of "vulnerable" employed may not indicate the people most likely to be harmed from a natural disaster; and, 3) environmental justice theories are not poised to navigate and adjudicate between knowledge arising from multiple sources, which is often required when discussing prevention of mental illness. Lastly, I discuss the scale at which such a theory ought to be situated. I argue that, since many features influencing mental illness outcomes operate at a socio-political level, an appropriate theory of justice will also need to operate at that level; which, in many cases, is actually the case with theories of environmental justice. The goal of this paper is not to provide solutions, but rather to suggest areas for further work on this important and increasingly pressing issue.

3.2. What is Environmental Justice?

In Flint, Michigan in the year 2011, a failure on the part of the municipal government to adequately treat its water system led to dangerous levels of lead in drinking water, having the greatest impact on children (Campbell et al., 2016). In the Bangladesh cyclone of 1991, forty-two percent more females than males died (Fothergill, 1996; Juran & Trivedi, 2015). Infamously, in the case of Hurricane Katrina, pre-existing racial discrimination was a prominent factor in post-disaster health and economic outcomes (Chia-Chen Chen et al., 2007). Like these examples, many instances of environmental injustices are readily apparent. Other instances of environmental injustice occur when an environmental hazard puts additional stress on a nexus of pre-existing injustices: "For example, in cases of pesticide exposure that cause birth defects or women of color being subject to involuntary sterilization, the environmental injustices arise from the inseparable and interlocking nature of race, class, and gender oppression" (Taylor, 2000, p. 523). While all being instances of environmental injustices, these particular cases mostly do not share the same causes, geographies, physical impacts, or affected populations, highlighting the diversity of situations which can become a part of the environmental justice movement.

Taylor, a leading scholar on environment justice, describes the environmental justice movement as examining “how discrimination results in humans harming each other, how racial minorities bear the brunt of discrimination, and how discriminatory practices hasten the degradation of environments” (Taylor, 2000, p. 523). The history of environmental justice is relatively new. While conservationists like John Muir were writing on what may now be classified as issues relating to mainstream environmentalism in the first half of the 20th century, and Rachel Carson published the seminal work “Silent Springs” in 1964, it was not until the 1978 court battles of Warren County that environmental justice was largely recognized as a movement.

The United States was the birthplace of the environmental justice movement (EJM), which has since spread internationally (Agyeman et al., 2003). The EJM started not from within the walls of a university, but from grassroots coalitions of people who sought to oppose practices and decisions leading to increased economic strain, ill-health, and environmental degradation in their communities. In 1978, citizens of Warren County, North Carolina, fought against the U.S. Environmental Protection Agency (EPA) and the state of North Carolina after it was announced that a disposal site for hazardous waste would be built in their county (McGurty, 1997). The need for this waste site stemmed from the unlawful discharge of polychlorinated biphenyl (PCB)-contaminated liquid, at night, along the shoulders of roads throughout counties in North Carolina. This resulted in 240 miles (386km) of contaminated road shoulder. The liquid came from the Ward Transformer Company, in Raleigh.

At first, the citizens of Warren County were primarily concerned with their health – that PCBs would leech into the groundwater, contaminating their drinking water. As the building project continued and their protests were unheeded, the citizens of Warren county changed their strategy, as well as their reasoning. “While threats to groundwater and the local economy were still worries for the citizens, the disruptive action focused on environmental racism. Protesters argued that Warren County was chosen, in part, because the residents were primarily poor and African-American” (McGurty, 1997, p. 302). Thus, the EJM arose from activist groups, recognizing unfair placement of toxic facilities which fell along racial lines (Taylor, 2000). The demands of the environmental justice movement began as purely distributive (Ikeme, 2003), but have since expanded to include procedural and participatory notions (Schlosberg, 2007),

reflecting the ever-changing nature of both the terminology used and the subject matter reflected in its use.

Although most consider this particular episode in Warren County to be the genesis of the EJM, communities of colour have been engaging in environmental activism since the 1800s (McGurty, 1997; Taylor, 2000). The following excerpt clearly differentiates the history of the EJM, which was historically a discourse of people of colour, from other topics such as conservationism, a line of thought developed primarily by free white males.

> "One of the enduring struggles of people of color is that of self-determination – the struggle to define who they are and how they interact with the land. It is also a quest to discover how much of their traditional skills and cultural practices can be recaptured and reinstated. Efforts to attain autonomy are closely aligned to the struggle for land and upholding treaty rights (i.e., the struggle to reclaim appropriated territories, fishing and water rights, etc.). The third prong of their activism revolves around the struggle for civil and human rights – the desire to be treated fairly and with human dignity. It is not surprising, therefore, that the environmental discourses of people of color are framed around concepts like autonomy, self-determination, access to resources, fairness and justice, and civil and human rights. These concepts are not found in mainstream environmental discourses. This is the case because mainstream environmental discourse was developed primarily by free, White males who were either wealthy or had access to wealthy people. These men, free to develop capitalist enterprises, roamed the outdoors at will, recreated when or where they pleased, and constructed environmental discourses that reflected their cultural backgrounds, lifestyles, experiences, and thinking. From their vantage point (social location), issues of autonomy and freedom had little or no resonance or salience. These were not issues that concerned them enough to warrant including them in the environmental discourses they were developing. They did not see how such issues were connected to environmental activism. Indeed, freedom and autonomy were privileges they had and took for granted. Thus, they developed discourses around resource depletion, degradation, and resource management and control." (Taylor, 2000, p. 534)

In other words, while concerns of conservation have (often) been intertwined with pleasure and privilege, the discourse of the EJM is intimately connected with the ability of a person or community to live safely and self-determinedly, and notably, to live in connection with the land. The precise ways in which this is expressed has differed widely, depending on individual circumstances. Thus, the bounds of "environmental justice" have been ever changing, expanding and retracting to encapsulate issues that concern the interaction between humans and the environment – a reality which is ever-

changing in itself. This flexibility has a cost, though. As Ikeme (2003) points out, “[i]n the literature on sustainable development, it will be difficult to find a concept that is as misused and misinterpreted as that of equity and environmental justice.” (p. 195). This conceptual unclarity poses problems for deciding on cases of potential injustice where our intuitions may be at odds with each other.

Due to its roots in activism, environmental justice theories tend to be largely pragmatic (action-oriented), and also strongly political (Bullard & Johnson, 2000; Cutter, 1995). In light of people succumbing to very real harms in their communities – which were largely African-American, minority, and/or low-income – one of the cries behind which these communities rallied was that of justice. This cry for justice extended to multiple areas: “[m]ore often than not, issues of environmental justice comprise a complex web of public health, environmental, economic, and social concerns. Given the multiple stressors that impact low-income, people of color, and tribal communities, such groups do not have the luxury of addressing one issue at a time” (Lee, 2002, p. 141). The injustices being fought against were not defined by a pre-existing theory of justice, be it distributive, participatory, or other; rather, they were empirically justifiable realities wherein certain communities were being excessively burdened by environmental risks and hazards.

3.3. Environmental Justice and Health

Although the range of conceptions of environmental justice movements is large and varied, one of the frequently sought-after qualities is that of equality – environmental equity, in particular, calls for an equal distribution of burdens and benefits (Ikeme, 2003). At times, equality and equity are taken to be synonymous (Been, 1993). Leaving the question aside of whether equality ought to be the project of environmental justice, an equal distribution of environmental burdens and benefits, or compensation for inequalities, is in theory an attainable goal, given that the focus of environmental justice is on projects of human origin: exporting of garbage, placement of toxic facilities, or production of harmful chemicals. From a distributive lens, that could mean placing landfills such that the burdens are not borne (entirely) by minority communities; a participatory approach may aim to achieve this equality by ensuring that voices from all affected communities are equally represented and considered during the decision-making. Importantly, the focus of environmental justice is often towards particular

projects, due to their effects (health, economic, social) on people. Contrast that with the concept of environmental health justice. When the focus of justice is on the health-state of people, it becomes apparent that equality may not (necessarily) be the appropriate measure of justice. In the case of health, what is considered fair or acceptable outcomes can be quite contested. While the cry of environmental justice movements is often for equality (Ikeme, 2003; Taylor, 2000), equality in outcomes is often not an ideal that can, or arguably, should, be attained when it comes to health. This is because, as opposed to the location of physical structures, ensuring equal health states for all individuals (supposing the presence of environmental homogeneity) seems theoretically improbable, due to differences in genetics and personal choices. Such a theoretical improbability likely translates into a practical impossibility. As Daniels (2008) has argued, in regards to health, not all inequalities are unfair – yet, as the vast majority philosophers studying health justice would agree, some inequalities in health are unfair.

The concept of environmental health justice has arisen in this landscape of bourgeoning definitions and concepts, to focus specifically on the impacts of environmental inequalities on health. “While much of the early focus of environmental justice research was on the distributional *outcomes* of hazardous facility siting in minority and low-income communities, the focus has also broadened to include a deeper and multi-level structural analysis of the social, economic and political *processes* involved in the production of environmental health injustices, both in relation to hazards exposure and to limitations on access to environmental opportunities” (Masuda et al., 2010, p. 456). There is an increasing focus on the conditions which may lead to health disparities, and a distinct move away from a narrow focus on the inequalities themselves at the exclusion of a broader consideration of the reason for their genesis. Since the environmental justice movement is not linked to any particular theory of justice, in the context of health, there is not an adequate metric for determining when health inequalities are unfair, given that (health) equality in itself is often not an attainable goal, particularly in the context of natural disasters.

3.3.1. Health Outcomes of Natural Disasters

Natural disasters have short- and long-term effects. This is especially true when looking at mental health outcomes. Post-traumatic stress disorder (PTSD), anxiety, and depression can affect individuals both immediately after a trauma, like a natural disaster,

and in the long-term (Galea, 2007). Further, these negative health outcomes are not experienced by all populations equally. This holds true at multiple scales. Between countries, the extent of human deaths and economic losses caused by natural disasters decreases in countries with more developed and open economies, higher educational attainment, more robust financial systems and smaller governments (Toya & Skidmore, 2007). People of lower socioeconomic status, particularly in developing countries, bear a disproportionate share of deaths from natural hazards such as earthquakes, floods, cyclones, hurricanes, and extreme temperature events (Kahn, 2005). Within a given population, on average, natural disasters negatively affect women more than men in terms of life expectancy: in a study of over 140 countries, it was found that life expectancy for women is lowered more in comparison with their male counterparts after a natural disaster, creating a gender gap in life expectancy which increases with the strength of the natural disaster and can be attributed largely to the decreased socioeconomic status of women (Neumayer & Plümper, 2007). The difference in experience of harm from natural disasters is also seen at a community level. Community social cohesion describes the attachment between individuals and their communities, and may be expressed in feelings like belonging and willingness to cooperate. In cases of forced displacement due to natural disasters, rates of depression are significantly higher in communities with low community social cohesion (Lê et al., 2013).

Theories of environmental justice have not typically dealt with the justness of outcomes relating to natural disasters, because historically they were not considered to be of human origin in the same was as landfill placements, or the production of harmful chemicals. As Čapek (1993) said, “Unlike natural disasters, chemicals are manufactured and distributed by human beings who (theoretically) can be identified and whose responsibility can be established” (p. 8). The influence of the activist roots of the EJM can again be seen in this context, where perhaps inclusion criteria for an environmental justice theory is the ability to act (politically), which in the above quote is reflected in the requirement of establishing responsibility. Even if the occurrence of natural disasters (as opposed to the manufacturing of chemicals) is unaffected, or not sufficiently affected, by human beings, it does not necessarily follow that responsibility for the impacts of a natural disaster could not be established, if it is the case that the outcomes are such that)an) identifiable individual(s) ought to be held responsible. Thus, the (in)ability to

establish responsibility would not prima facie prohibit the extension of a theory of environmental justice into the realm of natural disasters.

This type of theoretical extension is supported by other successful expansions of the domain of environmental justice. The new environmental justice paradigm (Taylor, 2000) subsumed the previous categorization of environmental racism (Cutter, 1995), and acts as a broader categorization than the term environmental equity. In another example, in the early 2000s, a Just Sustainabilities approach was developed as a way to combine the rhetoric and goals of environmental justice with those of sustainability (Agyeman, 2014; Agyeman et al., 2003; Agyeman & Evans, 2004, 2003). While a traditional environmental justice approach would challenge the placement of landfills (for example), a Just Sustainabilities approach may primarily seek to reduce the number of landfills *in toto* (Agyeman et al., 2003). A Just Sustainabilities approach may also address the challenges of distributive frameworks by shifting the focus from distribution to overall diminution of negative health outcomes. Even with a focus on sustainability, though, having a clear idea of what constitutes fair outcomes is important in an account of justice. The existence of a Just Sustainabilities framework, and the previous expansions of environmental racism to the new environmental justice paradigm, are evidence that it is possible to combine an environmental justice framework with a sustainability framework; therefore, it may also be possible to integrate the concerns arising from natural disasters into an environmental justice framework.

On the Inclusion of Outcomes from Natural Disasters in an Environmental Justice Theory

In the past, the occurrence of natural hazards occurred largely independently of human interference, but two observations will suffice to show that this is no longer the case. Firstly, natural disasters have been increasing worldwide as a result of climate change, driven by anthropogenic greenhouse gas emissions (Ostry et al., 2008; Thomas & López, 2015; Van Aalst, 2006). The damage caused by natural disasters can be extensive, disrupting social and political systems (Kreimer, 2001) and causing physical and mental injuries to those affected (Rataj et al., 2016). Secondly, in many locations, direct human interference with natural systems influences the occurrence of physical events such as wildfires. For example, suppression of natural fire cycles throughout National Parks over the past hundred years has altered the ecosystem such that any resulting fire which cannot be suppressed has the potential to be much more dangerous

than it would otherwise have been due to the availability of dead undergrowth as fuel (North et al., 2015; Rogeau et al., 2016).

The impact of human decisions on outcomes from natural disasters has long been recognized to be a justice issue – this is even reflected in how we define or conceptualize what constitutes a disaster. A special report published from the Intergovernmental Panel on Climate Change defines a disaster as, "severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic, or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery" (Lavell et al., 2012, p. 31). This is in line with a tradition of distinguishing between a particular event and the consequences (on humans) of that event (hazard/disaster) (Cannon, 1994). As another author states, "Indeed, disasters would not be disastrous if it were not for their effect on the human population" (Kizer, 2000). Although the terminology differs, many scholars have highlighted the importance of social, economic, health, and other factors in increasing either vulnerability or resilience to the eventuality or occurrence of a physical event, such as a wildfire, tsunami, or flood (Cannon, 1994; Lavell et al., 2012; Tierney, 2000; Wisner, 2016; Wisner et al., 2004). The argument for this distinction is that "hazards[3] are natural, but that in general disasters are not, and should not be seen as the inevitable outcome of a hazard's impact. The stress here is on the condition of the people which makes it possible for a hazard to become a disaster" (Cannon, 1994, p. 13, italics original). Framing the issue in this way allows for an evaluation of both the vulnerability of an individual or population to a natural hazard and the role that society could play in preparing for and mitigating against the effects of potentially dangerous situations (Cannon, 1994; Yoon, 2012).

Another reason for the inclusion of natural disasters in an environmental justice framework is that outcomes from natural disasters tend to be unevenly distributed along similar lines to those of conventional environmental justice cases: often, it is communities who are socioeconomically disadvantaged, marginalized, or otherwise disempowered who suffer the greatest burden of ill-health. Notably, the populations which contribute the least to greenhouse gas emissions will suffer the most climate-

[3] Indicating a naturally arising physical event, such as a wildfire, tsunami, or flood.

related negative health effects (Van Aalst, 2006). Although outcomes from natural disasters are not distributed with the same intentionality as coal plants or landfills, in describing environmental racism, Taylor demonstrates that intentionality is not a precondition for being considered an environmental injustice (Taylor, 2000, p. 536).

Cannon (1994) has argued that the policies and technical interventions aimed at mitigating the harms caused by natural disasters are not socially neutral but will impact subpopulations in various ways and therefore cannot be properly understood apart from an analysis of the factors that have created vulnerability within a society. He goes on to argue that "there are no really generalized opportunities and risks in nature, but instead there are sets of unequal access to opportunities and unequal exposures to risk which are a consequence of the socio-economic system" (Cannon, 1994, p. 14, italics original). It is known that certain groups tend to benefit more from health promotion activities than others (Jackson & Huston, 2016). Shklar (1990) similarly argues that what is considered to be simply a misfortune and what is an injustice turns on the fact that there are human and political factors which influence the harm caused by various natural hazards, such as floods. Preparation for a disaster, response during the disaster, and recovery phases of natural disasters are all mediated by humans, which affects the outcomes of communities and individuals. At all of these points in time, responsibility can (in theory) be established. "The disaster itself occurs within society and not within nature." (Weichselgartner, 2001, p. 86). Therefore, the outcomes from natural disasters retain the same pragmatic and political components as other cases considered through the lens of environmental justice theories.

In this section, I have argued that the occurrence and distribution of health outcomes from natural disasters, specifically mental health, may constitute an injustice. I have argued that such injustices should be included in the purview of a theory of environmental justice. What remains unclear, though, is when the establishing of responsibility would be required: at what point can we determine that outcomes from natural disasters, even in the presence of inequality, are unfair?

3.4. Requirements for a Theory of Environmental Justice

In the following section, I aim to outline certain features that would be required in a theory of environmental justice that is equipped to determine the justness of mental

health outcomes following natural disasters. In these various areas, my goal is to identify an area of lack and to demonstrate why or how that area is of importance to a theory of environmental justice in the context of natural disasters. I do not seek to provide definite answers, but rather to showcase certain features which would benefit from further theorizing.

3.4.1. Being Rooted in a Broader Theory of Justice

Accounts of justice need to be intersubjectively accessible in order to be politically or socially practicable. If not, they fall prey to the same criticisms levelled against intuitionist accounts. Justice, as a moral/ethical construct, is prescriptive, speaking in the language of "oughts". Therefore, it cannot be determined solely on the basis of empirical data – the language of "is" –, but necessitates the incorporation of value statements to our understanding of what constitutes reality. Theories from environmental justice have an inherent theoretical flexibility, given their umbilical connection to real-world problems, where principles can be borrowed from broader justice theories and applied in a justificatory manner. Case study approaches to environmental justice in the literature will often invoke ethical or moral principles (such as fairness, equity, autonomy, justice) to justify why, or to demonstrate how, a particular event is unjust, *ex post facto*. These environmental justice theories developed in academia are used as a way of spotlighting particularly salient features of cases of injustice, after (or in some instances, during) their occurrence. However, as environmental justice is concerned with justice, there needs to be a clear understanding of what justice entails. In the absence of such clarity, the use of terms can become vapid and meaningless – for example, while two people may call for 'distributive justice', the content of their cry belies very different understandings of what distributive justice entails, and perhaps neither of those understandings is theoretically sound, or its consequences palatable.

Environmental justice and environmental racism movements began on the ground, and were retrofitted with theory. While the EJM progressed into the enacting of laws and regulations governing environmental ills, the question remained open as to how much as this new governance was due to a recognition of injustice, or how much was the result of political lobbying and pressure from activists (Cutter, 1995). In the case of many accounts of environmental justice, there lacks a theoretical linkage between a

moral or political theory of justice, and why it is appropriate to employ that theory of justice in the case of an environmental injustice. This theoretical linkage to a broader theory of justice serves a practical purpose, as it provides important clarification surrounding some of the concepts often used in environmental justice. Take the example of the concept of autonomy. Different conceptions of autonomy are theoretically rooted in various different moral or ethical theories. Each of these theories may use the concept in a different way; or, the way in which autonomy plays out in diverse theories may have certain implications. For instance, while two theorists may both be discussing autonomy, one may justify its importance in society only insofar as it benefits the common good, whereas another may offer no restrictions on autonomy as such, so long as one person's autonomy does not infringe on another person's autonomy. While the concept of autonomy can sensibly be used in a cry for environmental justice, its separation from theoretical underpinnings around the meaning and appropriate use of autonomy also separate it from the meaning imbued by these theories. Yet, the implications of these two theories on how autonomy is construed in the context of environmental justice would differ greatly. Locating the discourse around environmental justice within a particular justice framework is instrumental in providing the necessary theoretical justification for use of its principles.

Theories of environmental justice have had political components from their inception. Theories of political philosophy, particularly distributive and participatory approaches, have oftentimes been called on as a means of expressing these political leanings. Shrader-Frechette (2002) describes this in the following way: "To correct problems of environmental justice, it will be necessary to improve the principles and practices of distributive justice—equal apportionment of *social benefits and burdens*, such as toxic waste dumps. It also will be necessary to reform the principles and practices of participative justice—equal *rights to self-determination in societal decision-making*" (p. 24, italics added). Notably, both theories of distributive and participatory justice contend with how the structures of society influence the functionings of society, including as it relates to the distribution of goods. For examples, Rawlsian Justice as Fairness (1971), which incorporates both aspects of distributive and participatory justice, is a theory the principles of which are intended to guide the establishment of fair social structures; Segall's account of Luck Egalitarianism (2010) presents an argument intended to be used to determine when the distribution of health inequalities are unjust,

and when compensation for differences in health states may be required. In this way, the formal incorporation of aspects of distributive and participatory justice into a theory of environmental justice are strategic in advancing its political aims. Theories of distributive and/or participatory justice from political philosophy represent strong contenders for the type of justice theory to which a theory of environmental justice could be rooted.

3.4.2. Prevention of Uncertain Unjust Harms

There are generally considered to be four operational stages of disasters: mitigation, preparedness, response and recovery (Altay & Green III, 2006). Although there are exceptions, discussions of distributive justice in natural disasters tend to be concerned with resource allocation decisions made after the fact (e.g. Greenacre & Fleshner, 2017; Leider, DeBruin, Reynolds, Koch, & Seaberg, 2017). Resultingly, concerns relating to distributive justice becomes restricted to the response and recovery stages. Yet, the distribution of goods prior to natural disasters affects the ability of populations to recover from these disasters. As has been argued in the legal literature, "vulnerable populations will enjoy meaningful protection only if emergency plans and preparedness initiatives anticipate and address their needs. Without appropriate planning, response efforts are unlikely to be adequate for at-risk communities" (Hoffman, 2009, p. 1547).

As I showed in section 3.3.1, "Health Outcomes of Natural Disasters", there are predictably worse mental health outcomes in vulnerable populations as compared to non-vulnerable populations after natural disasters. There currently are tools in place to help assuage these outcomes. Psychological first aid is one means through which public health practitioners have attempted to lessen the burden of mental illness after natural disasters, particularly in vulnerable populations. While psychological health first aid is often used as a disaster intervention tool, there is a lack of evidence currently available to support its effectiveness, although experts widely believe it to be helpful (Dieltjens et al., 2014; Fox et al., 2012). However, as an intervention which takes place only after a disaster has occurred, psychological first aid, even if shown to be impactful, is still insufficient as a means of promoting environmental justice. It is imperative to consider the needs of disadvantaged groups not only after the occurrence of natural disasters (for example, in triage situations, or as a means of fairly distributing goods), but importantly, the needs of disadvantaged groups also must be given fair consideration prior to the

occurrence of a natural disaster. This consideration must then be followed by appropriate planning and implementation measures, during the mitigation and preparedness stages.

In considering how disaster victims are often typified, Zack (2010) states the following:

> The average disaster survivor is often imagined to be an able-bodied, young or middle-aged, white male. He is the likely hero, the norm for a traditional majority of the American population, and he is in fact the norm from the perspective of emergency workers and the military, even though both institutions are becoming increasingly diverse in race and gender. In civilian disasters, women, children, the elderly, the poor, recent immigrants, the disabled, and racial minorities have prior disadvantages compared to this norm, some self-evident in terms of physical capabilities and stamina, some subtler in terms of social bias. The ideal of egalitarian disaster assistance would be for those assisting to have enough supplies and personnel available to be speedily dispatched so as to dispense goods and services fairly in order to meet everyone's needs. (p. 108)

Contrary to how a disaster survivor may be imagined, many of those who are most impacted by disasters are individuals from vulnerable communities. These vulnerabilities are often the result of pre-existing social conditions, which have then been exacerbated by the disaster itself (Wisner, 2016). Nevertheless, mental health disaster planning is done infrequently, and oftentimes without any focus on vulnerable communities (Roudini et al., 2017). Due to a lack of a vulnerability perspective in Canadian disaster policy (Stacey, 2018), vulnerable subpopulations tend not to be adequately considered in harm mitigation policies. This lack of consideration may be a factor contributing to worse health outcomes in vulnerable populations.

It may be the case that vulnerable populations are currently not being adequately considered in natural disaster preparation policies and actions due to the uncertainties associated with natural disasters. These uncertainties may relate to if or when a disaster will occur, or the magnitude of the damages that it will cause. Yet, many facts regarding the occurrence of natural disasters are known. To start, certain areas are more susceptible to particular types of disasters. For example, it is known that the city of Vancouver is at risk for an earthquake; therefore, certain preparations are underway to mitigate the harms an earthquake could cause (e.g., Vancouver's Earthquake Preparedness Strategy (City of Vancouver, n.d.)). In addition to the susceptibility of

particular locations, there is research to show that certain individuals or populations are more vulnerable to negative mental health outcomes than others (see previous section). Lastly, we know that the distribution of goods in society influences the occurrence of mental health outcomes. Even in ordinary (non-disaster) circumstances, economic gradients affect mental health, with the poorest individuals having the highest risk of having poor mental health outcomes (Allen et al., 2014). Given that it tends to be those same individuals who have the highest risk of negative mental health outcomes after natural disasters, in the case of a natural disaster, they may face an exponentially greater risk of mental illness. It is tempting to claim that all such resulting inequalities are unjust – yet, as I have indicated in the previous section, many agree that not all instances of inequalities in health outcomes are unjust. Without analysing a specific case through the lens of a particular theory of justice – even prior to the occurrence of a disaster – it may not be possible to intuitively determine the presence of injustices. This emphasizes the importance of connecting a theory of environmental justice to a broader theory of justice. Justice is not only meant to correct for injustices, but also to prevent their occurrence altogether. It is not sufficient for just actions to be only responsive to unjust situations, but inasmuch as it is possible, just actions are those which prevent injustices from ever occurring. Pre-emptively enacting principles of justice would be the most effective way of mitigating harms associated with natural disasters, particularly in the case of vulnerable populations who oftentimes have no other means of otherwise buffering negative outcomes.

The distributive components of a theory of environmental justice cannot be overlooked. While equality is the measure of justice in traditional theories of environmental justice, such a standard cannot be applied straightforwardly to distributions of mental health outcomes. It is possible that outcomes from a natural disaster will be evenly distributed amongst a population by sheer luck, with no preparation having taken place. It is also possible that, even will adequate preparation (however that is measured), mental health outcomes will be unequal. On a luck egalitarian account (for example, Segall, 2010), the first case would be considered just, whereas the second would be unjust. However, others may argue (Hoffman, 2009; Keim, 2011; Stacey, 2018) that the second outcome is more just than the first, as preparation is a more important consideration for justice than luck, regardless of the outcomes. Given that environmental injustices are of concern largely because of the

outcomes that they produce – although this need not be the case, depending upon which theory of justice is being invoked – a theory of environmental justice which adequately assesses the justness of mental health outcomes must account for these distributional concerns, and the interaction between the justness of preparations and the justness of outcomes.

Certain principles have already been constructed to reflect ways in which this could practically be done – in the case of an influenza pandemic, a group of experts (known as the Bellagio group) devised a “Checklist for Pandemic Influenza Preparedness and Response Plan” which explicitly addresses ways of intentionally considering vulnerable populations (The Bellagio Meeting on Social Justice and Influenza, 2012). A theory of environmental justice which is well-suited to address injustices in mental illness resulting from natural disasters would have to be equipped to provide guidance on what are appropriate measures that ought to be taken to prevent predictably unequal mental health outcomes. Given that mental health outcomes are influenced by such a wide variety of factors, it may be the case that prevention efforts fall outside of the scope of what is generally considered as either typical disaster preparation measures, or typical public health interventions. Regardless, a theory of environmental justice ought to give serious consideration as to what measures are just, feasible, and effective in pre-emptively addressing the inequalities in mental illness which arise following a natural disaster. If a theory of environmental justice is only concerned with distributive justice after a disaster, then an injustice has already been allowed to occur.

3.4.3. Defining Vulnerability

In order to be able to prevent excessive, or unjust harms, from befalling a particular population (the vulnerable) after a natural disaster, it is necessary to be able to identify that population with enough fidelity to ensure, with reasonable confidence, that any policies or governance structures put in place with the goal of preventing harms are, in fact, specifying and protecting the intended group. Efforts to protect the vulnerable from unjust harms will have limited success if it is not prospectively possible to identify the particular referent of the term “vulnerable”. Reference to those individuals at risk of being harmed, or actually harmed, is made through the use of many terms, such as: disadvantaged (e.g., Berke, Cooper, Salvesen, Spurlock, & Rausch, 2010), susceptible

(e.g., Resnik, MacDougall, & Smith, 2018), vulnerable (e.g., Hoffman, 2009), or infrequently, least well-off (e.g., Seekins, 2009, p. 729). Two problems arise from this multiplicity of terms: firstly, it is not clear that these various terms refer to the same group of people. To illustrate, while the concept of vulnerability has been used extensively in many literatures and contexts, including disaster management (Wisner et al., 2004) and health research ethics (Hurst, 2008), the way in which the term is used differs. Simply specifying a desire to help the "vulnerable" without fully understanding who or what is vulnerable can obscure where we ought to spend already limited funds (Carter-Pokras & Baquet, 2002). Secondly, it is not clear the ways in which people are made to be disadvantaged/susceptible/vulnerable/least well-off, which results in unclarity regarding the appropriate locus of action for the reduction of said vulnerability.

To further complicate matters, these same terms apply not only to individuals, but also to communities, the natural environment, the built environment, systems, and more. While there is a general understanding of what "vulnerability" means in these various contexts, the fluidity with which this term is used obscures its ability to pick out any particular state of affairs: for instance, while it may be sensible to say that there exist vulnerable people (or communities, cities, landscapes, etc.), in so saying we have no more concrete idea regarding exactly who (or what) is vulnerable. This problem is of particular salience for vulnerability in natural disasters, as the concept of a natural disaster incorporates not only the effects of a physical event on humans, but also the vulnerability of the land to particular outcomes. Because of this, a theory of environmental justice must be explicit in clarifying the referent(s) of "vulnerability", both in relation to a people (that is, from a bioethical, health sciences, or related perspective) and to the environment (that is, from a disaster management, ecological, or related perspective).

In the field of health ethics, many authors and researchers agree that "vulnerability" identifies individuals or populations who are likely to incur additional or greater wrong and thus are deserving of special protection (Forster et al., 2001; Hurst, 2008; Martin et al., 2014; Schroeder & Gefenas, 2009; Tavaglione et al., 2015). Although vulnerability is often defined in terms of groups of people (Amin et al., 2011)), this approach has been criticized as being potentially stereotyping (Hurst, 2008) and too all-encompassing (Forster et al., 2001; Schroeder & Gefenas, 2009). Thus, other researchers have defined it based on characteristics perceived to be contained within

the concept of “vulnerability”, as opposed to identifying vulnerable groups as such. One suggestion is that the threat or harm which renders someone vulnerable must be identifiable (Martin et al., 2014). While it is recognized that all humans have some amount of generalized vulnerability by virtue of being alive and are therefore susceptible to being harmed (Tavaglione et al., 2015; Wisner, 2016), in order to retain the notion of vulnerability as a right to special protection, it is required that the threat or harm which creates vulnerability be identifiable. Secondly, the notion of vulnerability indicates that there is a high exposure or risk of this harm, coupled with an inability to protect oneself (Zarowsky et al., 2013). This component highlights how an individual’s ability to defend themselves (or be resilient towards) a risk or harm affects their level of vulnerability. A third way of understanding vulnerability is as an increased likelihood of additional or greater wrong (Hurst, 2008). While we often focus on the magnitude of a particular harm for an individual or group in assessing vulnerability, the number of harms to which someone is exposed will also affect their vulnerability status.

The involvement of health sciences in the field natural disaster research has been relatively recent (Shoaf & Rottman, 2000). In the disaster management literature, or other literatures focussing specifically on natural disasters, conceptualisations of vulnerability are quite advanced. They frequently rely on quantitative methods and modelling (Wisner, 2016). One useful framework is framing vulnerability as four distinct domains: physical, environmental, social, and economic (United Nations Office for Disaster Risk Reduction, 2015); however, other frameworks have been proposed, some of which include more controversial components (for example, the idea of ‘delinquent vulnerability’, caused by negligence or corruption (Alexander, 2013)). Given that the scope of vulnerability tends to be much larger in the disaster management literature, one particular difficulty is in avoiding highly generalized and undifferentiated results. In the creation of a vulnerability measure entitled Disaster Risk Hotspots, vulnerability to a hazard was assessed using mortality within a 5km x 5km quadrant following a hazard, coupled with economic losses (Dilley et al., 2005). Determining vulnerability in this way overlooks the aspects of an individual which may have contributed to their increased vulnerability.

In summarising components of vulnerability often included in the disaster management literature, Wisner (2016, p. 21) notes the following to be of particular salience: that there be susceptibility or sensitivity to harm or loss; consideration of the

degree of personal or social protection enjoyed; and analysis of the capacity to cope or adapt to the impact of the hazard. According to Wisner, a matter of some debate is whether or not there needs to be exposure to a hazard in a model of vulnerability: if so, it is only possible to say that a person, community, or place is vulnerable after an event has occurred. This concern ties in with the previous discussion regarding the need for definitional clarity in order to properly allocate scarce resources: if something or someone is only vulnerable after it has been harmed, it is difficult to use the notion of vulnerability preventatively. Concepts of community vulnerability (Morrow, 1999) and social vulnerability (Cannon, 1994; Yoon, 2012) may also provide helpful guidance on how the term ought to be conceptualized. Nevertheless, it is clear that there is not currently an agreed-upon definition of "vulnerability"; intra- and inter-disciplinary debates are on-going.

While the definition of vulnerability for a theory of environmental health justice needs to be expansive enough to make sense of the myriad concepts found in these literatures, the need for expansiveness must be balanced with the need to maintain a narrow enough scope of the definition so that it is implementable. As the focus of vulnerability in this context ought to be to determine who is being burdened most by negative mental health outcomes after natural disasters, the concept of vulnerability must not be used to represent a slur on the victims (Hurst, 2008) but instead be used to highlight the roles of social structures and policies that may have contributed to these outcomes in the first place (Cannon, 1994). A valuable contribution that a theory of environmental justice could make would be to advance a conceptualization of vulnerability, building off of the work that has been done in the natural disasters literature, while addressing some of the critiques of the concept of vulnerability as discussed in the health ethics literature.

A Note on Resilience

The notion of resilience is popular in discussions of both health ethics and natural hazards, notably as they relate to policy. It is seldom found in the literature on justice, for reasons I will outline below. Resilience is defined as "the ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a potentially hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and

functions" (Lavell et al., 2012, p. 32). The idea behind this concept is to adopt a strength-based approach in recognizing and legitimizing the assets found in an individual or community to overcome adversity. Models of resilience tend to highlight participatory approaches, focussing on community engagement strategies to elicit and build upon pre-existing assets. While this is laudable, I maintain along with Stacey (2018), that being solely resilience-focussed is insufficient in addressing the harms of natural disasters. Although participatory and community-based approaches to disaster management do seem to meet many of the requirements of an environmental justice theory, I would argue that *solely* utilizing a resilience frame shifts the burden of protection from the state to the people. Retaining a vulnerability perspective recognizes that unjust harms can arise from natural disasters, and that unjust harms ought to be remedied and/or prevented, *independent of a community's ability to withstand or overcome them*. The responsibility for preventative or remedial action should not exclusively fall onto the individual or the community at risk of being harmed. A vulnerability perspective correctly emphasizes the social and political features which create an increased risk of, or susceptibility to, harm, absolving the community proper from an added burden of responsibility to mitigate, manage, or otherwise avoid these harms.

3.4.4. Sources of Information/Knowledge

Nature of the disaster, sources of acute and chronic stress, pre-existing features of resiliency and vulnerability, number of individuals affected, political processes, social structures: all of these features and more affect the way that an individual and/or a community will be impacted by a natural hazard. Therefore, a holistic perspective on mental health outcomes from natural disasters is required (Tierney, 2000). Environmental justice theories are broad-reaching, adding to and drawing from the literatures on equity (Prescott & Logan, 2016), intergenerational justice (Hiskes, 2006), and international justice (Chemhuru, 2019), particularly as it relates to issues of climate change (Brandstedt, 2019; Brandstedt & Brülde, 2019). As fields of inquiry, natural disasters and mental health are equally as multi-disciplinary, with many voices contributing to what is understood as being the reality of a situation. This multidisciplinarity has the possibility of bringing a degree of richness to a theory of environmental justice, embodying the participatory nature that many environmental justice theorists call for. The multitudinous sources of information may also present a

very real challenge for any theory of justice: if justice requires preventative action for mental health outcomes after natural disasters (as I have argued), and if our ability to act justly in part depends on our understanding of what constitutes preventative action (and is thus predicated on a degree of shared understanding), and if there is disagreement regarding what action ought to be taken in order to act preventatively due to the multidisciplinarity of the problem, then how ought a theory of environmental justice to engage with a multitude of informational sources? While I do not seek to provide a definite answer to this problem, I will stress certain features that will be of importance for such a theory.

Firstly, I argued above that a theory of environmental justice ought to be framed within a theory of justice more broadly. These broader theories may give direction as to how some of the disputes are to be resolved, which will differ depending upon which theory is being used. For instance, Rawlsian Justice as Fairness (Rawls, 1971, 2005) is intended to describe how society should be initially be established. While certain environmental justice theorists have used Rawls in order to determine what would constitute fair distributions of benefits and burdens (D. Bell, 2004), Rawls' difference principle was not intended to resolve debates regarding the distribution of specific goods. However, the theory of Accountability for Reasonableness (Daniels, 2000) is intended to provide practical guidance on just decision-making. Thus, perhaps this type of theory may provide more specific guidance on how to navigate power imbalances which can arise in the creation of shared knowledge of understanding. Regardless of the theory chosen, there must be a way to account for the multidisciplinary understandings of the problem, in order to promote discussions of what constitutes preventative action, insofar as it is required by justice.

Further, theories of environmental justice must be pragmatic and practicable (Resnik, 2012; Resnik et al., 2018), given that they are predicated on real-world sufferings and inequalities. If they cannot offer prescriptive advice, their usefulness will be limited. In the politically contentious arena of climate change, consensus is often lacking. Another approach to aid in the applicability of environmental justice has been to argue for the use of a theory of pure procedural climate justice (Brandstedt & Brülde, 2019). This theory suggests that, given that there is very infrequently agreement regarding what is considered just outcomes, or who ought to be held responsible for these outcomes, a way to advance the environmental justice agenda is to endorse a

theory of pure procedural justice. From the lens of pure procedural justice, the outcome of a situation is just if the processes which led to the outcome are just. What the outcome actually is, is not a consideration. While this may present a way for political bodies to advance in discussions of climate change, it seems to fall short in accounting for justice, given that the reasons we are concerned about climate and environmental justice are largely because of the outcomes that are produced. Thus, I would argue that, while procedural components are important mechanistically, a purely procedural framework would be insufficient for a theory of environmental justice.

3.4.5. Scale of a Theory of Environmental Justice

In considering mental health outcomes from natural disasters, there is added importance that a theory of environmental justice be political in scale, for in order to effect meaningful change in health outcomes after natural disasters, prevention (as discussed previously) is required, and this prevention will likely also have to contend with the structures of society. As the influences which contribute to inequalities are large-scale and multifaceted in scope, effective preventative measures will also need to be large-scale and multifaceted. Specifically, social and economic structures, having been established through political decisions and processes, mediate many inputs and outcomes of importance to mental illness and natural disasters. Four such components specific to the case of natural disasters are:

(1) Rates of mental illness in a society

During ordinary (non-disaster) times, the ways that wealth is distributed within a society affects the distribution of mental illness in that society, with higher rates of mental illness being experienced by individuals with fewer resources (Allen et al., 2014). It has been shown that public policy impacts the rates of mental illness during economic recessions: during the economic recession of 2007, higher rates of mental illness, including suicide, were documented in many countries, with concerns that these effects would persist after the crisis itself had passed (Wahlbeck & Mcdaid, 2012). Yet, this was not an unavoidable outcome. As stated by Wahlbeck and Mcdaid (2012):

> Societies can be more or less resistant to stressors, which can include both economic upturns as well as crises. The latter can destabilize public service budgets, with many consequences, including some on education, social welfare and health care systems. Policy choices can influence the impact

> of any economic recession on mental health outcomes. Unwise austerity measures in public services for children, families and young people may result in long-lasting and costly mental (and physical) health damages, and create an obstacle to economic recovery. (p. 139)

This shows that policies can have an impact on mental health outcomes, and therefore political avenues are important to consider in a theory of environmental justice seeking to impact mental health outcomes.

(2) The impact of a physical event

While it is presumably uncontroversial that the wealth of a nation will affect its ability to cope with a disaster, what may be overlooked is that the conception of a "natural disaster" is itself a political one (Cannon, 1994; Lavell et al., 2012). This concept recognizes that the development of a physical event into a disaster reflects on the structures and policies in place (or not) meant to mitigate the influence of a physical event, such as a wildfire or a flood. I do not aim to list the variegated ways in which politics, economics, and social structures can influence the outcome of a physical event, as it is likely unique to each disaster (for example, Lin Moe and Pathranarakul (2006) examined the impacts of policies on the outcomes of the 2004 tsunami in Thailand). Rather, this section acts as a reminder that the concept of a disaster is itself political, and thus its impacts in all spheres, including mental health outcomes, are mediated and influenced by political structures.

(3) The individuals and communities most likely to be impacted by a physical event ("the vulnerable")

I have shown above how mental illness is not distributed equally in a society in ordinary time, and how the impact of a physical event can be either mitigated or worsened by social structures and policies. In ordinary times, generally speaking, those most affected by mental illness are the least well-off group in society, who we would typically think of as being vulnerable. Morrow (1999) states that the specific effect of physical events on any one household "results from a complex set of interacting conditions, some having to do with geography and location, some with the dwelling, and still others with the social and economic characteristics of the people living there." (p. 2) To the extent that these factors are influenced by broader social and political structures, these same structures also influence the outcomes from disasters.

(4) Mental health outcomes after natural disasters

Taken together, the above three points show that mental health outcomes after natural disasters are largely influenced by politics, policy, and social structures. More than that, though, this indicates that inequalities in outcomes of mental illness after natural disasters are responsive to the established structures in society. As their distribution is affected by these structures, then it is (at least in theory) possible to avoid resultant *unjust* inequalities, once it is determined which inequalities are unjust. Because mental health inequalities after natural disasters can be distributed across society in a similar way as physical health inequalities – that is, by means of distribution of other social goods such as income and potential for political involvement – it follows that there is a duty to address inequalities of mental illnesses, to the same extent that there is a duty to address inequalities of physical illnesses. Addressing mental illness from natural disasters requires attempts to prevent mental illness from occurring in the first place, by addressing vulnerabilities which contribute to a hazard becoming a disaster.

Notably, the above four components are not only mediated by social structures but also influence each other. This interaction between components may work to magnify the impact that political and/or social interventions (or the lack thereof) have on vulnerable communities. In order for a theory of environmental justice to adequately consider these components, it must be of the appropriate scale to consider social and political structures. This will require developing a more comprehensive theory of environmental injustice, which extends beyond the scope of distributional concerns regarding physical objects (landfills, toxic facilities, etc.) – which then lead to unjust health outcomes – to the distribution of health outcomes themselves. Since mental health outcomes are the result of a confluence of factors, an adequate account of environmental justice will need to be equipped to make sense of multifactorial accounts of causality. This also highlights the need to move away from using principles of justice to justify environmental injustices that have already occurred; as prevention is a necessary condition of justice in the case of mental illness and natural disasters, a theory of environmental justice must be able to address societal structures that contribute to vulnerability which may blossom into actual harms, prior to the occurrence of those harms. Thus, it must be able to identify vulnerabilities which ought to be of concern to a theory of environmental justice.

3.5. Conclusion

In this paper, I have sought to argue that the justness of mental health inequalities after natural disasters could reasonably be understood by using a theory of environmental justice. However, current environmental justice frameworks are frequently ill-equipped to adjudicate the justness of outcomes from natural disasters. In the hopes of providing direction for the development of future theories of environmental justice, I suggested a number of factors that such a theory would need to contend with in considering the mental health outcomes from natural disasters. In line with this, I make one further suggestion here relating to individuals who live closely with the land, that is, whose subsistence relies largely on direct connection with nature (for instance, subsistence fishing and hunting). Not all who rely directly on the land for subsistence are Indigenous peoples, and not all Indigenous peoples live closely with the land; however, certain Indigenous people engage in subsistence hunting and fishing, which are rights recognized and protected (though often contested) by government. Individuals who do rely more closely on the land for survival tend to be more affected by environmental justice concerns. Given the historic and contemporary privileging of western sources of knowledge at the expense of Indigenous knowledge, a theory of environmental justice should also be constructed so as to challenge existing, unjust, power differentials, instead of contributing to them. Once again, this is congruent with its history, as a movement which has sought to protect the rights of those most likely to be, or currently being, harmed or exploited.

In order for a theory of environmental justice to address these interrelated factors, it must be situated at the correct scale: not primarily considering the justness of actions between individuals, or of individuals events, but in considering the justness of socio-political structures – which is, in fact, the scale at which many theory of environmental justice operate.

As Cutter (1995) states,

> Environmental justice is a more politically charged term, one that connotes some remedial action to correct an injustice imposed on a specific group of people, mostly people of colour in the USA (Bullard, 1994b). The principle of environmental justice guarantees 1) the protection from environmental degradation; 2) prevention of adverse health impacts from deteriorating environmental conditions before the harm occurs, not afterwards; 3)

> mechanisms for assigning culpability and shifting the burden of proof of contamination to polluters not residents; and 4) redressing the impacts with targeted remedial action and resources. (p. 112)

Would those principles be applied to the case of natural disasters, it seems to indicate that inaction in prevention engenders injustice in outcomes.

3.6. Works Cited

Agyeman, J. (2014). Environmental justice and sustainability. In G. Atkinson, S. Dietz, E. Neumayer, & M. Agarwala (Eds.), *Handbook of Sustainable Development* (2nd ed., pp. 188–205). Edward Elgar Publishing.

Agyeman, J., Bullard, R. D., & Evans, B. (Eds.). (2003). *Just Sustainabilities: Development in an Unequal World* (1st ed.). Earthscan Publications Ltd.

Agyeman, J., & Evans, B. (2004). 'Just sustainability': The emerging discourse of environmental justice in Britain? *The Geographical Journal*, *170*(2), 155–164. https://doi.org/10.1111/j.0016-7398.2004.00117.x

Agyeman, J., & Evans, T. (2003). Toward Just Sustainability in Urban Communities: Building Equity Rights with Sustainable Solutions. *The Annals of the American Academy of Political and Social Science*, *590*, 35–53. https://doi.org/10.1177/0002716203256565

Alexander, D. (2013). Vulnerability. In K. Penuel, M. Statler, & R. Hagen (Eds.), *Encyclopedia of Crisis Management* (Vol. 1, pp. 981–983). SAGE Publications, Inc. https://doi.org/10.4135/9781452275956

Allen, J., Balfour, R., Bell, R., & Marmot, M. (2014). Social determinants of mental health. *International Review of Psychiatry*, *26*(4), 392–407. https://doi.org/10.3109/09540261.2014.928270

Altay, N., & Green III, W. G. (2006). OR/MS research in disaster operations management. *European Journal of Operational Research*, *175*, 475–493. https://doi.org/10.1016/j.ejor.2005.05.016

Amin, M., MacLachlan, M., Mannan, H., El Tayeb, S., El Khatim, A., Swartz, L., Munthali, A., Van Rooy, G., McVeigh, J., Eide, A., & Schneider, M. (2011). EquiFrame: A framework for analysis of the inclusion of human rights and vulnerable groups in health policies. *Health and Human Rights*, *13*(2), 20.

Been, V. (1993). What's fairness got to do with it? Environmental justice and the siting of locally undesirable land uses. *Cornell Law Review*, *78*(6), 1001–1085.

Bell, D. (2004). Environmental Justice and Rawls' Difference Principle. *Environmental Ethics*, *26*(3), 287–306.

Bell, J. E., Herring, S. C., Jantarasami, L., Adrianopoli, C., Benedict, K., Conlon, K., Escobar, V., Hess, J., Luvall, J., Garcia-Pando, C. P., Quattrochi, D., Runkle, J., & Schreck III, C. J. (2016). Ch. 4: Impacts of Extreme Events on Human Health. In *Climate and Health Assessment* (pp. 99–128). U.S. Global Change Research Program. https://health2016.globalchange.gov/extreme-events

Berke, P., Cooper, J., Salvesen, D., Spurlock, D., & Rausch, C. (2011). Building Capacity for Disaster Resiliency in Six Disadvantaged Communities. *Sustainability*, *3*, 1–20. https://doi.org/10.3390/su3010001

Brandstedt, E. (2019). Non-ideal climate justice. *Critical Review of International Social and Political Philosophy*, *22*(2), 221–234. https://doi.org/10.1080/13698230.2017.1334439

Brandstedt, E., & Brülde, B. (2019). Towards a Theory of Pure Procedural Climate Justice. *Journal of Applied Philosophy*, *36*(5), 785–799. https://doi.org/10.1111/japp.12357

Braveman, P. A., & Gruskin, S. (2003). Defining equity in health. *Journal of Epidemiology & Community Health*, *57*, 254–258. https://doi.org/10.1136/jech.57.4.254

Braveman, P. A., Kumanyika, S., Fielding, J., LaVeist, T., Borrell, L. N., Manderscheid, R., & Troutman, A. (2011). Health Disparities and Health Equity: The Issue Is Justice. *American Journal of Public Health*, *101*(S1), S149–S155. https://doi.org/10.2105/AJPH.2010.300062

Bullard, R. D., & Johnson, G. S. (2000). Environmentalism and Public Policy: Environmental Justice: Grassroots Activism and Its Impact on Public Policy Decision Making. *Journal of Social Issues*, *56*(3), 555–578. https://doi.org/10.1111/0022-4537.00184

Campbell, C., Greenberg, R., Mankikar, D., & Ross, R. D. (2016). A Case Study of Environmental Injustice: The Failure in Flint. *International Journal of Environmental Research and Public Health*, *13*(951), 11. https://doi.org/10.3390/ijerph13100951

Cannon, T. (1994). Vulnerability Analysis and the Explanation of “Natural” Disasters. In A. Varley (Ed.), *Disasters, Development and Environment* (pp. 13–30). John Wiley & Sons Ltd. http://leeclarke.com/courses/disasters/cannon_vulnerability_analysis.pdf

Čapek, S. M. (1993). The “Environmental Justice” Frame: A Conceptual Discussion and an Application. *Social Problems*, *40*(1), 5–24. https://doi.org/10.2307/3097023

Carter-Pokras, O., & Baquet, C. (2002). What is a “health disparity”? *Public Health Reports*, *117*(5), 426–434.

Chemhuru, M. (2019). The paradox of global environmental justice: Appealing to the distributive justice framework for the global South. *South African Journal of Philosophy*, *38*(1), 30–39. https://doi.org/10.1080/02580136.2019.1570712

Chia-Chen Chen, A., Keith, V. M., Airriess, C., Wei Li, & Leong, K. J. (2007). Economic Vulnerability, Discrimination, and Hurricane Katrina: Health Among Black Katrina Survivors in Eastern New Orleans. *American Psychiatric Nurses Association*, *13*(5), 257–266. https://doi.org/10.1177/1078390307307260

Chiu, M., Lebenbaum, M., Cheng, J., de Oliveira, C., & Kurdyak, P. (2017). The direct healthcare costs associated with psychological distress and major depression: A population-based cohort study in Ontario, Canada. *PLoS ONE*, *12*(9), 1–13. https://doi.org/10.1371/journal.pone.0184268

City of Vancouver. (n.d.). *Earthquake Preparedness Strategy*. City of Vancouver. Retrieved July 27, 2020, from https://vancouver.ca/home-property-development/earthquake-preparedness-strategy.aspx

Cutter, S. L. (1995). Race, class and environmental justice. *Progress in Human Geography*, *19*(1), 111–122. https://doi.org/10.1177/030913259501900111

Daniels, N. (2000). Accountability for reasonableness: Establishing a fair process for priority setting is easier than agreeing on principles. *BMJ : British Medical Journal*, *321*, 1300–1301.

Daniels, N. (2008). *Just Health: Meeting Health Needs Fairly*. Cambridge University Press.

Dieltjens, T., Moonens, I., Van Praet, K., De Buck, E., & Vandekerckhove, P. (2014). A Systematic Literature Search on Psychological First Aid: Lack of Evidence to Develop Guidelines. *PLoS ONE*, *9*(12), e114714. https://doi.org/10.1371/journal.pone.0114714

Dilley, M., Chen, R. S., & Deichmann, U. (2005). *Natural Disaster Hotspots: A Global Risk Analysis*. World Bank Publications.

Forster, H. P., Emanuel, E., & Grady, C. (2001). The 2000 revision of the Declaration of Helsinki: A step forward or more confusion? *The Lancet*, *358*(9291), 1449–1453. https://doi.org/10.1016/S0140-6736(01)06534-5

Fothergill, A. (1996). Gender, risk, and disaster. *International Journal of Mass Emergencies and Disasters*, *14*(1), 33–56.

Fox, J. H., Burkle, F. M., Bass, J., Pia, F. A., Epstein, J. L., & Markenson, D. (2012). The Effectiveness of Psychological First Aid as a Disaster Intervention Tool: Research Analysis of Peer-Reviewed Literature From 1990-2010. *Disaster Medicine and Public Health Preparedness*, *6*(3), 247–252. https://doi.org/10.1001/dmp.2012.39

Galea, S. (2007). The long-term health consequences of disasters and mass traumas. *CMAJ*, *176*(9), 1293–1294. https://doi.org/10.1503/cmaj.070368

Greenacre, M., & Fleshner, K. (2017). Distributive justice in disaster triage. *University of Western Ontario Medical Journal*, *86*(1), 35–37. https://doi.org/10.5206/uwomj.v86i1.2162

Hiskes, R. P. (2006). Environmental human rights and intergenerational justice. *Human Rights Review*, *7*(3), 81–95. https://doi.org/10.1007/s12142-006-1023-6

Hoffman, S. (2009). Preparing for Disaster: Protecting the Most Vulnerable in Emergencies. *UC David Law Review*, *42*, 1491–1547.

Hurst, S. A. (2008). Vulnerability in Research and Health Care: Describing the Elephant in the Room? *Bioethics*, *22*(4), 191–202. https://doi.org/10.1111/j.1467-8519.2008.00631.x

Ikeme, J. (2003). Equity, environmental justice and sustainability: Incomplete approaches in climate change politics. *Global Environmental Change*, *13*(3), 195–206. https://doi.org/10.1016/S0959-3780(03)00047-5

Jackson, B., & Huston, P. (2016). Commentary - Advancing health equity to improve health: The time is now. *Chronic Diseases and Injuries in Canada*, *36*(2), 17–20.

Juran, L., & Trivedi, J. (2015). Women, Gender Norms, and Natural Disasters in Bangladesh. *Geographical Review*, *105*(4), 601–611. https://doi.org/10.1111/j.1931-0846.2015.12089.x

Kahn, M. E. (2005). The Death Toll from Natural Disasters: The Role of Income, Geography, and Institutions. *The Review of Economics and Statistics*, *87*(2), 271–284.

Keim, M. E. (2011). Preventing disasters: Public health vulnerability reduction as a sustainable adaptation to climate change. *Disaster Medicine and Public Health Preparedness*, *5*(2), 140–148.

Kizer, K. W. (2000). Lessons Learned in Public Health Emergency Management: Personal Reflections. *Prehospital and Disaster Medicine*, *15*(4), 209–214. https://doi.org/10.1017/S1049023X00025346

Kreimer, A. (2001). Social and Economic Impacts of Natural Disasters. *International Geology Review*, *43*(5), 401–405. https://doi.org/10.1080/00206810109465021

Lavell, A., Oppenheimer, M., Diop, C., Hess, J., Lempert, R., Li, J., Muir-Wood, R., Myeong, S., Moser, S., Takeuchi, K., Cardona, O.-D., Hallegatte, S., Lemos, M., Little, C., Lotsch, A., & Weber, E. (2012). Climate Change: New Dimensions in Disaster Risk, Exposure, Vulnerability, and Resilience. In C. B. Field, V. Barros, T. F. Stocker, & Q. Dahe (Eds.), *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation* (pp. 25–64). Cambridge University Press. https://doi.org/10.1017/CBO9781139177245.004

Lê, F., Tracy, M., Norris, F. H., & Galea, S. (2013). Displacement, county social cohesion, and depression after a large-scale traumatic event. *Social Psychiatry and Psychiatric Epidemiology*, *48*(11), 1729–1741. https://doi.org/10.1007/s00127-013-0698-7

Lee, C. (2002). Environmental justice: Building a unified vision of health and the environment. *Environmental Health Perspectives*, *110*(Suppl 2), 141–144.

Leider, J. P., DeBruin, D., Reynolds, N., Koch, A., & Seaberg, J. (2017). Ethical Guidance for Disaster Response, Specifically Around Crisis Standards of Care: A Systematic Review. *American Journal of Public Health*, *107*(9), e1–e9. https://doi.org/10.2105/AJPH.2017.303882

Lin Moe, T., & Pathranarakul, P. (2006). An integrated approach to natural disaster management: Public project management and its critical success factors. *Disaster Prevention and Management: An International Journal*, *15*(3), 396–413. https://doi.org/10.1108/09653560610669882

Martin, A. K., Tavaglione, N., & Hurst, S. (2014). Resolving the Conflict: Clarifying 'Vulnerability' in Health Care Ethics. *Kennedy Institute of Ethics Journal*, *24*(1), 51–72. https://doi.org/10.1353/ken.2014.0005

Masuda, J. R., Poland, B., & Baxter, J. (2010). Reaching for environmental health justice: Canadian experiences for a comprehensive research, policy and advocacy agenda in health promotion. *Health Promotion International*, *25*(4), 453–463. https://doi.org/10.1093/heapro/daq041

McGurty, E. M. (1997). From NIMBY to Civil Rights: The Origins of the Environmental Justice Movement. *Environmental History*, *2*(3), 301–323. JSTOR. https://doi.org/10.2307/3985352

Mills, C. (2018). From 'Invisible Problem' to Global Priority: The Inclusion of Mental Health in the Sustainable Development Goals. *Development and Change*, *49*(3), 843–866. https://doi.org/10.1111/dech.12397

Morrow, B. H. (1999). Identifying and Mapping Community Vulnerability. *Disasters*, *23*(1), 1–18. https://doi.org/10.1111/1467-7717.00102

Neumayer, E., & Plümper, T. (2007). The Gendered Nature of Natural Disasters: The Impact of Catastrophic Events on the Gender Gap in Life Expectancy, 1981–2002. *Annals of the Association of American Geographers*, *97*(3), 551–566. https://doi.org/10.1111/j.1467-8306.2007.00563.x

North, M. P., Stephens, S. L., Collins, B. M., Agee, J. K., Aplet, G., Franklin, J. F., & Fulé, P. Z. (2015). Reform forest fire management. *Science*, *349*(6254), 1280–1281. https://doi.org/10.1126/science.aab2356

Ostry, A., Ogborn, M., Takaro, T., Bassil, K., & Allen, D. (2008). *Climate Change and Health in British Columbia* (pp. 1–20). Pacific Institute for Climate Solutions. http://www.pics.uvic.ca/sites/default/files/uploads/publications/WP_Health_November2008.pdf

Patel, V., Saxena, S., Lund, C., Thornicroft, G., Baingana, F., Bolton, P., Chisholm, D., Collins, P. Y., Cooper, J. L., Eaton, J., Herrman, H., Herzallah, M. M., Huang, Y., Jordans, M. J. D., Kleinman, A., Medina-Mora, M. E., Morgan, E., Niaz, U., Omigbodun, O., … UnÜtzer, Jü. (2018). The Lancet Commission on global mental health and sustainable development. *The Lancet*, *392*, 1553–1598. https://doi.org/10.1016/S0140-6736(18)31612-X

Prescott, S. L., & Logan, A. C. (2016). Transforming Life: A Broad View of the Developmental Origins of Health and Disease Concept from an Ecological Justice Perspective. *International Journal Of Environmental Research And Public Health*, *13*(11), 1075–1119.

Rataj, E., Kunzweiler, K., & Garthus-Niegel, S. (2016). Extreme weather events in developing countries and related injuries and mental health disorders—A systematic review. *BMC Public Health*, *16*, 1020–1032. https://doi.org/10.1186/s12889-016-3692-7

Rawls, J. (1971). *A Theory of Justice*. Harvard University Press.

Rawls, J. (2005). *Political Liberalism: Expanded Edition*. Columbia University Press.

Resnik, D. B. (2012). Chapter 4: Toward an Environmental Health Ethics. In *Environmental Health Ethics*. Cambridge University Press. https://doi.org/10.1017/CBO9781139161848

Resnik, D. B., MacDougall, D. R., & Smith, E. M. (2018). Ethical Dilemmas in Protecting Susceptible Subpopulations From Environmental Health Risks: Liberty, Utility, Fairness, and Accountability for Reasonableness. *The American Journal of Bioethics*, *18*(3), 29–41. https://doi.org/10.1080/15265161.2017.1418922

Rogeau, M.-P., Flannigan, M. D., Hawkes, B. C., Parisien, M.-A., & Arthur, R. (2016). Spatial and temporal variations of fire regimes in the Canadian Rocky Mountains and Foothills of southern Alberta. *International Journal of Wildland Fire*, *25*(11), 1117–1130. https://doi.org/10.1071/WF15120

Roudini, J., Khankeh, H. R., & Witruk, E. (2017). Disaster mental health preparedness in the community: A systematic review study. *Health Psychology Open*, *4*(1), 1–12. https://doi.org/10.1177/2055102917711307

Schlosberg, D. (2007). *Defining Environmental Justice: Theories, Movements, and Nature*. Oxford University Press.

Schroeder, D., & Gefenas, E. (2009). Vulnerability: Too Vague and Too Broad? *Cambridge Quarterly of Healthcare Ethics*, *18*(2), 113–121. https://doi.org/10.1017/S0963180109090203

Seekins, D. (2009). State, Society and Natural Disaster: Cyclone Nargis in Myanmar (Burma). *Asian Journal of Social Science*, *37*(5), 717–737. https://doi.org/10.1163/156848409X12474536440500

Segall, S. (2010). *Health, luck, and justice*. Princeton University Press.

Shklar, J. N. (1990). *The Faces of Injustice*. Yale University Press.

Shoaf, K. I., & Rottman, S. J. (2000). The Role of Public Health in Disaster Preparedness, Mitigation, Response, and Recovery. *Prehospital and Disaster Medicine*, *15*(4), 18–20. https://doi.org/10.1017/S1049023X00025243

Shrader-Frechette, K. (2002). *Environmental Justice*. Oxford University Press. https://doi.org/10.1093/0195152034.001.0001

Stacey, J. (2018). Vulnerability, Canadian Disaster Law, and The Beast. *Alberta Law Review*, *55*(4), 853–888.

Tavaglione, N., Martin, A. K., Mezger, N., Durieux-Paillard, S., François, A., Jackson, Y., & Hurst, S. A. (2015). Fleshing out vulnerability. *Bioethics*, *29*(2), 98–107. https://doi.org/10.1111/bioe.12065

Taylor, D. (2000). The Rise of the Environmental Justice Paradigm: Injustice Framing and the Social Construction of Environmental Discourses. *American Behavioural Scientist*, *43*(4), 508–580.

The Bellagio Meeting on Social Justice and Influenza. (2012). *Checklist for Pandemic Influenza Preparedness and Response Plan*. The Berman Institute of Bioethics. http://www.bioethicsinstitute.org/wp-content/uploads/2012/12/Influenza-Checklist-English1.pdf

Thomas, V., & López, R. (2015). *Global Increase in Climate-Related Disasters* (p. 45). Asian Development Bank. https://reliefweb.int/sites/reliefweb.int/files/resources/global-increase-climate-related-disasters.pdf

Tierney, K. J. (2000). Controversy and Consensus in Disaster Mental Health Research. *Prehospital and Disaster Medicine*, *15*(4), 55–61. https://doi.org/10.1017/S1049023X00025292

Toya, H., & Skidmore, M. (2007). Economic development and the impacts of natural disasters. *Economics Letters*, *94*(1), 20–25. https://doi.org/10.1016/j.econlet.2006.06.020

United Nations Office for Disaster Risk Reduction. (2015). *Proposed updated terminology on disaster risk reduction: A technical review.* https://www.preventionweb.net/files/45462_backgoundpaperonterminologyaugust20.pdf

Van Aalst, M. K. (2006). The impacts of climate change on the risk of natural disasters. *Disasters*, *30*(1), 5–18. https://doi.org/10.1111/j.1467-9523.2006.00303.x

Vigo, D., Thornicroft, G., & Atun, R. (2016). Estimating the true global burden of mental illness. *The Lancet Psychiatry*, *3*(2), 171–178. https://doi.org/10.1016/S2215-0366(15)00505-2

Wahlbeck, K., & Mcdaid, D. (2012). Actions to alleviate the mental health impact of the economic crisis. *World Psychiatry*, *11*(3), 139–145. https://doi.org/10.1002/j.2051-5545.2012.tb00114.x

Weichselgartner, J. (2001). Disaster mitigation: The concept of vulnerability revisited. *Disaster Prevention and Management: An International Journal*, *10*(2), 85–95. https://doi.org/10.1108/09653560110388609

Wisner, B. (2016). Vulnerability as Concept, Model, Metric, and Tool. In *Natural Hazard Science*. Oxford University Press. https://doi.org/10.1093/acrefore/9780199389407.013.25

Wisner, B., Blaikie, P., Cannon, T., & David, I. (2004). *At Risk: Natural Hazards, People's Vulnerability and Disasters* (2nd ed.). Routledge.

Yoon, D. K. (2012). Assessment of social vulnerability to natural disasters: A comparative study. *Natural Hazards*, *63*(2), 823–843. https://doi.org/10.1007/s11069-012-0189-2

Zack, N. (2010). *Ethics for Disaster*. Rowman & Littlefield Publishers.

Zarowsky, C., Haddad, S., & Nguyen, V.-K. (2013). Beyond "vulnerable groups": Contexts and dynamics of vulnerability. *Global Health Promotion*, *20*(1 Suppl), 3–9. https://doi.org/10.1177/1757975912470062

Chapter 4.

Case Study

4.1. Introduction and background

4.1.1. Wildfires

Increase in the occurrence of wildfires

Natural disasters and extreme weather events[4] such as heat waves, heavy precipitation, and coastal flooding, are increasing, which recent research suggests can be attributed to anthropogenic greenhouse gas emissions (Thomas & López, 2015; Van Aalst, 2006; IPCC, 2014). Notably, the populations which contribute the least to greenhouse gas emissions – namely those in developing countries – will suffer the most climate-related negative health effects (Van Aalst, 2006). Globally, conditions suitable for the occurrence of wildfire have been worsening (Jolly et al., 2015) with significant increases in wildfires predicted for Canada (Wang et al., 2020). One study of the north-western United States suggests that human-caused climate change is responsible for a doubling of the area to have burned from fires between the years 1984 – 2005 than is attributable to natural climate variation alone (Abatzoglou & Williams, 2016). Another study predicts that forests in the Rocky Mountains of the north-western United States will experience an increase in annual mean area burned of 175% between 2000 and 2050 (Spracklen et al., 2009). Since forests act as carbon sinks, a greater amount of carbon may be released into the atmosphere as more forests are burnt, further contributing to global warming (e.g. Chapin et al., 2010).

According to a review commissioned by the Government of Alberta, “historical data and trends indicates that the fire season in Alberta is becoming longer, is starting earlier and is featuring more frequent periods of extreme wildfire hazard” (MNP LLP,

[4] An extreme weather event, also known as extreme climate event or climate extreme, is defined as, “The occurrence of a value of a weather or climate variable above (or below) a threshold value near the upper (or lower) ends of the range of observed values of the variable.” (IPCC, 2012, p. 557)

2017, p. ii). Weather and climate[5] are the most important factors influencing forest fires in Canada, thus climate change may have substantial impacts on the occurrence of fires in this country (Flannigan et al., 2005).

Increased harm from wildfires

While large fires only account for 5% of the total number of fires in the boreal forest of Canada, they account for 85% of total area burned (Macias Fauria & Johnson, 2008). The number of large fires has been increasing over the past 40 years, and this increase has been attributed to climate change (Macias Fauria & Johnson, 2008). In addition to increased area burnt from wildfires, the harm that wildfires inflict on humans is also increasing since more people are living in a wildland-urban interface[6] (Hammer et al., 2009). Drought, build-up of materials to fuel a fire (such as dead vegetation), and the increasing number of homes in a wildland-urban interface all contribute the particularly devastating nature of these fires, in terms of their impact on humans (Mell et al., 2010). Communities across Canada have implemented different measures to mitigate risk of fires at the wildland-urban interface, including prescribed burns, zoning to restrict building in areas of dense vegetation, the removal of vegetation from properties, specification of building materials, and public education, for example through the FireSmart Canada program (McGee, 2007). Yet, wildland urban interface fires still cause extensive damage to humans, not only in property damage but also though multiple adverse health outcomes.

[5] The IPCC (2012, p. 557) defines climate as: "Climate in a narrow sense is usually defined as the average weather, or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period for averaging these variables is 30 years, as defined by the World Meteorological Organization. The relevant quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system."

[6] According to Mell (2010, p. 239), "[t]he basic distinction between land areas that are WUI v. wildland is the presence of structures. A definition of WUI land areas has not been unequivocally determined."

4.1.2. Health outcomes from disasters

Physical and mental health consequences of wildfires

It is estimated that 339,000 people die annually from landscape fire[7] smoke (Johnston et al., 2012). Exposure to forest fire smoke is also consistently associated with adverse respiratory outcomes, particularly for those with airways disease such as asthma and Chronic Obstructive Pulmonary Disease (COPD) (Henderson et al., 2011). For example, after extensive forest fires in British Columbia in 2003, an increase of 10-μg/m^3 in particulate matter was associated with a 5% increase in hospital visits for respiratory causes, and a 6% increase in asthma-specific physician visit (Henderson et al., 2011; Henderson & Johnston, 2012). Many studies have found increased cardiovascular disease outcomes from wildfire smoke as well (Dennekamp et al., 2015; Liu et al., 2015; Rappold et al., 2011), though not consistently (Henderson & Johnston, 2012). In addition to physical illness after wildfires, mental illnesses such as post-traumatic stress disorder (PTSD), anxiety disorder, depressive disorders, and substance use disorders contribute to an increased burden of disease (Laugharne et al., 2011). Dissimilarly, while most physical illnesses present relatively rapidly after the occurrence of the disaster, PTSD, anxiety, and depression can affect individuals both immediately after a trauma, like a natural disaster, and in the long-term (Galea, 2007).

Unequal distribution of physical and mental effects: Women as vulnerable

These physical and mental health effects are not distributed equally within a population. For example, after natural disasters, women generally experience worse health outcomes than men (Dodgen et al., 2016; Fothergill, 1996; Hu et al., 2017; Juran & Trivedi, 2015). In some discussions, women are classified as a 'vulnerable' group (e.g., Dodgen et al., 2016). One study interviewed international experts on mental health and disaster management, of whom 76% of respondents lived in western, industrialized countries. One of the outcomes of these interviews were the recognition of certain groups of people are requiring particular protections (Tavaglione et al., 2015), one group of which was women: "[r]espondents also recognized the needs of particular vulnerable groups. These include not only psychiatric patients in treatment of pre-existing disorders

[7]According to Johnston *et al.* (2012, p. 695), the term 'landscape fire' encompasses "wild and prescribed forest fires, tropical deforestation fires, peat fires, agricultural burning, and grass fires."

and for whom services had been disrupted, but also other groups with particular needs, including women, children, and the elderly who may lack family support" (Weiss et al., 2003, p. 612). Possible reasons for the difference in outcomes between sexes has been attributed to a putative biological pre-disposition towards mental illnesses such as PTSD due to sex difference in how the brain processes stress and fear (Hu et al., 2017; Olff, 2017). The impact of expected gender roles within society on development of mental illness has also been discussed (Hu et al., 2017).

Effect of gender[8] on health outcomes of fires

As with other natural disasters, the prevalence of mental illness increases after wildfires (Jones et al., 2003; Neria et al., 2008; Sohrabizadeh et al., 2016). Yet, in other natural disasters, gender is often a variable which influences distribution of mental illness in a population (Dodgen et al., 2016; Juran & Trivedi, 2015); in the case of wildfires, gender does not seem to be as reliably a predictive factor as it is in other cases of natural disaster. A systematic review including mental health outcomes of fires found that in some cases, sex acted as a predictive factor for mental illness, whereas in other contexts it was not found to be significant (Laugharne et al., 2011). Other sources have reported that after house fires, women experience more anxiety than men (Jones et al., 2003). The variability in findings concerning whether sex is a factor in mental health outcomes after wildfires may be a result of the relative lack of research done in the area of mental health outcomes of wildfires, as compared to other natural disasters such as floods (Dodgen et al., 2016). For instance, in examining the consequences of natural disasters broadly, one paper begins by stating, "During recent decades, the world has seen numerous disastrous earthquakes, tsunamis, epidemics, droughts, and floods" (Sohrabizadeh et al., 2016, p. 977); wildfires are notably excluded. In a systematic review of post-traumatic stress after disasters (manmade, technological, and natural), of the eight natural disasters included, only one was a wildfire, while the other seven were

[8] Gender and sex are distinct. Yet, in the literature, both the terms "gender" and "sex" are used in regards to mental health outcomes of natural disasters. As closely as possible, I have chosen to match my terminology in this section with the terminology that was chosen by the authors. I have done this because there have been some studies showing biological differences between females and males regarding how the brain processes fear (e.g. Archer, 2019) which will be further explored in the Discussion chapter, and therefore it is possible that sex is a factor in determining mental health outcomes. However, mental health outcomes are also clearly influenced by social constructs such as gender. When the report specified neither "sex" nor "gender" and instead discussed "women"/"men", I use the term "gender".

either earthquakes or floods (Neria et al., 2008). Another systematic review, which examined the likelihood of developing a psychiatric disorder post-natural disaster, stated which types of disasters they had included in their analysis, but problematically did not specify the number of each type of disaster (Beaglehole et al., 2018).

4.1.3. Fort McMurray

"The Beast"

On May 1, 2016 a wildfire broke out in a forested area outside of Fort McMurray, Alberta. Known as the Horse River Wildfire (MNP LLP, 2017), its unofficial title of "The Beast" (Quinlan, 2016; Stacey, 2018) perhaps captured more readily the destruction and hellish blaze. The entire city of 66,500 and surrounding area was put under evacuation orders. It caused the largest evacuation in Canadian history, with over 85,000 people being forced to leave their homes (CTVNews.ca Staff, 2018). The fire burnt 589,552 hectares in the space of two months (MNP LLP, 2017). At an estimated $3.6 billion in claims to insurance companies, this natural disaster was the costliest in Canadian history to date (Corporate Communications, 2016). In addition to the insurance costs and evacuation orders, approximately a dozen oil sands projects had to halt their operations (Williams, 2016), causing roughly $1.4 billion in lost revenues (Corporate Communications, 2016).

Wildfires are a natural part of the boreal forest ecosystem in which Fort McMurray is located (Johnson et al., 1998). However, concerns of the impact of anthropogenic climate change (ACC) were raised when a severe drought was experienced the preceding year, prompting the Alberta government to declare the province an Agricultural Disaster Area in August 2015 (Szeto et al., 2016). Both droughts and forest fires are made more likely in Alberta as a result of ACC (Hogg & Bernier, 2005; Soja et al., 2007); therefore, ACC may have been a contributing factor to the Horse River Wildfire.

Demographics of Fort McMurray

Fort McMurray is an urban service area located at a wildland-urban interface (Westhaver, 2017) in the Regional Municipality of Wood Buffalo in northeastern Alberta with a population of approximately 66,500 (Statistics Canada, 2017a). This represents a

doubling of the population in a period of 20 years (Alberta Municipal Affairs, 1996), linked largely to activity in the oil sands (Gabinet & Associates Inc., 2006). Located in the Athabasca Oil Sands, Fort McMurray's economy depends largely on the oil and gas industry, strongly impacting the demographics of the city (Gabinet & Associates Inc., 2006). In 2015, the average age of residents was approximately 33 years old, which is almost 5 years younger than the average age of Albertans as a whole (Statistics Canada, 2017b). Earnings in this area are also not consistent with averages throughout Alberta, with around 82% of the population making more than $100,000 per year; 32,645 of these individuals were men, and 8,680 were women. Of those who made under $10,000 per year, about three-quarters were women (Statistics Canada, 2017a).

4.1.4. Purpose

The goals of this case study are: 1) to determine the mental health outcomes of the Fort McMurray wildfire of 2016; and, 2) to determine the distribution of those mental health outcomes across the population, in order to ascertain whether the distribution is aligned with previously published outcomes from wildfires. Contextual features of Fort McMurray will then be examined to help explain the outcomes.

4.2. Methods

4.2.1. Sources of data

Administrative data from Alberta Health

Aggregated administrative data was obtained from Alberta Health for the number of unique individuals whose primary reason for accessing health care services was for depressive disorders; anxiety, neurosis, stress, adjustment disorders (henceforth called "anxiety disorders"); and substance use disorders. Individuals were identified by Alberta Health using personal health care numbers. This process was done by Alberta Health and I was provided with aggregated data. Data was obtained for each individual who was in Fort McMurray on May 1, 2016, who was also active in Fort McMurray one year prior (n = 83,086). Disorders were determined using ICD-9 and ICD-10 codes. Data were obtained from three sources, which can act as a proxy for severity: physician claims (least severe), ambulatory services, and inpatient services (most severe). Data were

categorised in this way based on personal correspondence with the analyst who provided the data at Alberta Health. Data was aggregated by Alberta Health by both age and sex, and using income quintiles. Because data on income was not available on an individual basis, average income per dissemination area was assumed for all individuals living within that dissemination area. *More information is available in the "Methods" chapter*.

Other sources of data

Quantitative data regarding demographics (specifically, age and sex) and economics (such as, annual household income, income quintile, and average income) in Fort McMurray were obtained from official government documents, StatsCan data, published academic articles, and governmental and non-governmental publications and reports. The specific data used is specified in each instance of its use. Data on mental health outcomes were obtained primarily from the few published journal articles on the subject. Qualitative data was obtained through reports and news articles.

4.2.2. Data analysis

Analysis of administrative data from Alberta Health

Data were analysed through the use of descriptive statistics. Raw data was converted into rates as a function of population; for example, the number of individuals from the lowest quintile (Q1) who utilized inpatient services was converted into a rate by dividing that number by the total number of individuals in Q1, as opposed to in the entire population. This method was chosen to offset any effects of difference in sizes of subpopulations in comparison with the population as a whole. While it was not as important for the quintile aggregations, as each quintile represents 20% of the total population, it became important for analysis of data aggregated by age and sex. The rates were then converted to graphs using Excel 2016.

Analysis of other sources of data

Data from other sources were analyzed using the method of document analysis, as per Bowen (2009). This technique was used to provide background and context for the research question. In brief, this technique consists of: skimming (superficial examination); reading (thorough examination); and interpretation. The use of multiple

sources of data, including the administrative data from Alberta Health, allowed for data triangulation. Corroborating findings through the utilization of multiple sources of evidence strengthens the overall theory that is developed (Yin, 2018). Because individual-level data could not be obtained, ethics approval was not required.

4.3. Quantitative Results

4.3.1. Results of Administrative Data

Administrative data was aggregated into age-sex categories (entitled: "Aggregation by age and sex") and income categories (entitled: "Aggregation by income quintiles"). These two aggregations were then analyzed for each of three classes of mental outcomes: depressive disorders, anxiety disorders, and substance use disorders. *Further information on methods of analysis is given in "Methods" chapter.*

Aggregation by age and sex

Depressive disorders

At the physician claims level, depressive disorders rose at approximately equal rates across all groupings (Figure 4.1). The number of physician claims for depressive disorders increased approximately 2.5% for all groups. This increase continued from pre-fire to two years post-fire, indicating that the number of individuals seeking care for depression also continued to rise over that time period.

At the level of ambulatory care, a notable increase was seen for women aged 55 and above in the year following the fire (Figure 4.2). While this decreased two years following the fire, the rates were still twice as high as pre-fire. Women aged 24 and under had the opposite trend, with a decrease in ambulatory care visits in the year following the fire, and an uptick in the second-year post-fire to a higher rate than pre-fire. While the rates of ambulatory care for men aged 55 and above remained relatively constant from before the fire to the first year after the fire, they decreased by approximately one-third two-years post-fire. Conversely, for men aged 24 and under, there was an increase in ambulatory care for depressive disorders which continued increasing in the two years following the fire. All other categories follow the trend of an increase in the year after the fire, followed by a decrease to similar levels as pre-fire in the second-year post-fire.

At the inpatient level, a similar trend was seen for women age 55 and above as at the ambulatory care level: a sharp increase in the year following the fire, followed by a decrease two-years post fire, with levels remaining higher than pre-fire levels (Figure 4.3). While there was slight variation, levels remained approximately constant for women aged 24 and under. There was approximately a six-fold increase up to two years post-fire for men under age 24 utilizing inpatient services. This increase mirrors the trend seen in ambulatory care, but is much more pronounced. There was variation in the number of men over 55 utilizing inpatient services in the two years following the fire, with an initial decrease followed by an increase to pre-fire levels. For both women and men aged 25 to 54, levels remained approximately constant.

Anxiety disorders

Similar to data for depressive disorders, at the physician claims levels, all groups rose at approximately equal rates to each other (Figure 4.4). Most groups experienced an increase in the year following the fire, which remained constant two years following the fire.

For ambulatory care, most groups again experienced similar rates of increase, with there being a spike in number of people utilizing services in the year following the fire, which then decreased by the second-year post-fire (Figure 4.5). The increase in the year following the fire appears slightly more significant for women over the age of 55, although levels of service utilization had decreased to almost pre-fire levels by two years following the fire. The one group whose rates did not experience a decline two years post-fire is men under the age of 24.

Number of individuals using inpatient services all continued to increase for the two years following the fire for women aged 25 to 54, women over 55, and men under 24 (Figure 4.6). All other groups saw an increase in the year post-fire, followed by a decrease two years post-fire. Men aged 55 and over experienced the smallest increase in the year following the fire, and the largest decline two years post-fire.

Substance use

In both physician claims (Figure 4.7) and ambulatory data (Figure 4.8), rates of substance use remain relatively unchanged from before the fire to two years after the fire. The only notable difference in this data set as compared to depression and anxiety

disorders is that over half of those utilizing the services are male, whereas for other mental illnesses the majority of health service users are female.

There was more of a change in rates in inpatient data as compared to physician claims and ambulatory data (Figure 4.9). Rates for women under 24 and women between 25 and 54 remain relatively unchanged over the three-year time period. Rates for men under the age of 24 increased consistently across the three-year time span, whereas rates for men over 55 decreased consistently over that time. Rates for both men between 25 and 54 and women over 55 increased after the fire, then decreased to approximately pre-fire levels two years following the fire.

Aggregation by income quintiles

Depressive disorders

For all income quintiles, a steady increase was seen for physician claims data, which continued into the second year after the fire (Figure 4.10). In comparing the top two quintiles to the lowest two quintiles, there was almost complete overlap, indicating no difference from socioeconomic status at this level.

In ambulatory care, the rates of all quintiles were clumped together and experienced a very slight increase up to two years post-fire (Figure 4.11). The one exception was in the second lowest-earning quintile (Q2), where a large spike was seen in the year directly following the fire, which decreased two years post-fire. While there is a larger rise in the year immediately following the fire from the lowest quintiles, this may be related to the spike in rates of Q2.

At the inpatient level, the rates of service utilization for highest earners (Q5) decreased in the year following the fire, then increased to above pre-fire levels two years post-fire (Figure 4.12). Rates of the lowest earners (Q1) had the opposite trend of a slight increase in the year post fire, followed by a decrease two years post-fire. Q3 followed the same pattern as Q5 (highest earners), whereas Q4 experienced an increase in rates in the year following the fire which was sustained two years post-fire. Q2 experienced a constant increase from pre-fire to two-years post-fire. When comparing the two highest quintiles to the two lowest quintiles, a difference in rates of service utilization is observed, where the lowest earning quintiles had and maintained higher service utilization than the highest earning quintiles from before the fire to two

years after the fire. While both groups demonstrated increased service utilization, the rate of increase was slightly larger for the higher earning quintiles, meaning that the gap in service utilization had decreased two years after the fire as compared to two years before the fire.

Anxiety disorders

For physician claims, the same pattern as for depressive disorders is observed for anxiety disorders, namely an increased rate of use for all quintiles at approximately equal rates (Figure 4.13). There is no difference observed between the highest and lowest quintiles.

At the ambulatory level, all quintiles experienced a spike in service utilization the year following the fire, which decreased two years after the fire (Figure 4.14). This spike was largest for Q2. Although the highest and lowest earning quintiles had approximately equal rates of service utilization prior to the fire, two years after the fire the rates of the highest earning quintiles returned to approximately pre-fire rates whereas the rates of the lowest earning quintiles are still elevated. This created a gap in service utilization that was not apparent prior to the fire.

All quintiles demonstrated steadily increased rates of service utilization for inpatient services up to two years after the fire, with the exception of the lowest earning quintile, whose rate spiked in the year following the fire and descended to pre-fire levels two years post-fire (Figure 4.15). While there was a gap in service utilization between the highest and lowest quintiles before the fire, which was increased in the year following the fire, ultimately it was lessened by the strong decline in inpatient services for those in the lowest quintile, while the use from other quintiles steadily increased.

Substance use

There was a strikingly clear delineation of service use at the physician claims levels by income quintile, with the highest earning quintile having the lowest rates of service utilization while the lowest earning quintiles had the highest rates of utilization (Figure 4.16). The second lowest earning quintile, Q2, had a constantly higher rate of service utilization than the lowest quintile. These rates remained almost entirely unchanged in all quintiles from before the fire to after the fire. Q1 demonstrated a slight increase in service utilization the year after the fire, which decreased in the second year

following the fire, while service utilization for Q2 declined slightly in both years following the fire.

For ambulatory services, rates for the highest quintiles remained relatively consistent from before the fire to one year after the fire (Figure 4.17). Rates of service utilization for the highest quintile remain almost unchanged from before the fire to after the fire. The rates for the second highest and middle quintile are almost perfectly overlapping, both remaining relatively constant from before the fire to one year after, and demonstrating a minute increase in service utilization two years after the fire. The quintiles which showed the most change were the two lowest earning quintiles. Both Q1 and Q2 had almost identical rates prior to the fire. One year post-fire, rates of utilization for Q2 increased slightly, whereas Q1 stayed constant. Two years post fire, rates for Q2 then decreased, whereas Q1 increased. The gap between the highest earners and lowest earners remained relatively constant from before the fire to two years after the fire.

For inpatient treatment, the highest two quintiles experienced very little change from before the fire to after the fire (Figure 4.18). While the middle quintile had similar rates to the highest two quintiles for the year before the fire and the year following the fire, there was an increase in the rate of service utilization two years following the fire such that it overlapped with rates of usage for the lowest quintile. The second lowest quintile demonstrated a large increase in rates in the year following the fire, which remained constant two years after the fire. The lowest earning quintile remained constant one year after the fire as compared to pre-fire levels, then service utilization decreased two years following the fire.

4.3.2. Results of other quantitative data

Three studies by the same lead researcher (Agyapong et al., 2018; Agyapong, Juhás, Brown, et al., 2019; Agyapong, Juhás, Omege, et al., 2019) were conducted regarding the prevalence of three different mental illnesses: “likely” PTSD, “likely” major depressive disorder (MDD), and generalized anxiety disorder (GAD). Because all three of these studies had the same study design, the methodology of these studies will be described together, before analyzing the results of each study separately.

Prevalence rates of those three mental illnesses were studied by Agyapong *et al.*, with the goal of determining which factors (demographic, clinic, and other) could act as predictors for the occurrence of mental illness. These studies took place six month after the occurrence of the fire. Questionnaires were distributed to 1050 individuals; 588 were returned, yet not all of these were completed, thus only 486 responses were included in the final analyses. This is a description of the variables that were considered in the analyses:

> Respondents' demographic and clinical as well as wildfire exposure and support related information were collected with a data collection form designed for the purpose. These variables included age, employment, relationship status, where residents lived before the fire, relative to the areas with high density of destroyed properties, where residents were on the day of the evacuation, and where respondents' [sic] lived after the fire. Other variables included whether respondents witnessed homes being destroyed by the wildfire and whether they were fearful for their lives and/or those of their family and friends during the evacuation. Clinical variables included history of mental health problems and previous use of psychotropic medication. Finally, we included variables, such as the level of support received during the evacuation from family and friends, insurance companies, the Red Cross, and the Government of Alberta, as well as whether residents received counseling after the wildfire. (Agyapong, Juhás, Brown, et al., 2019)

Generalized anxiety disorder

In a study by Cherry and Haynes (2017) of workers who were believed to be in Fort McMurray at the time of the fire, it was found that three months after the fire, anxiety scores[9] were significantly higher ($p = 0.01$) for those who were evacuated compared to those who were not. Of those evacuated, 16.7% had scores suggestive of moderate or severe anxiety or depression. The mean length of days after the fire for follow-up was 102 days. Mean anxiety scores were higher for those who were followed up later in the study rather than earlier (specifically, with follow-up occurring more than 90 days after the fire) (Cherry & Haynes, 2017). Three months after the fire, a multiple regression analysis indicated that anxiety scores were higher for women, for those who had been evacuated to a motel, and for those interviewed at a longer time since the fire (Cherry & Haynes, 2017). Six months after the wildfire, the one-month prevalence rate for generalized anxiety disorder (GAD) symptomatology was almost 20% (Agyapong et al.,

[9] Measured using the Hospital Anxiety and Depression Scale

2018). Six months after the fire, persons with elevated GAD symptomatology were more like to be female, younger, staying in a rental or other accommodation. Another correlate was having a prior history of mental health condition (Agyapong et al., 2018). The variables which were the most important contributions to a predictive model of GAD symptomatology were witnessing homes burning, relocation after the wildfire, pre-existing history of mental health condition including anxiety, perceived level of support from family/friends, and government, and receipt of counselling. Although significant in a Chi-square analysis, sex was not a significant predictor of GAD symptomatology when entered into a logistic regression model (Agyapong et al., 2018).

PTSD

Approximately 60% of those who participated in an online survey administered three months after the fire had a provisional PTSD diagnosis[10] (Belleville et al., 2019). Clinical interviews conducted on a subgroup of the online survey population revealed that 29.1% met the diagnostic criteria for PTSD. Symptoms of PTSD were more severe for younger people. Neither sex nor age were found to be significant in a hierarchical multiple regression analysis model.

Six months after the fire, the one-month prevalence rate for likely PTSD was found to be 12.8% (Agyapong, Juhás, Omege, et al., 2019), notably less than that discovered through both the online survey and clinical interviews conducted at three months post-fire. Odds ratio for a female having likely PTSD was 1.57, with the 1-month prevalence for likely PTSD being 14.9% for females and 8.7% for males. However, the association between sex as a demographic variable and PTSD was not found to be significant (Chi square, $p = 0.06$), nor was sex a significant predictor when entered into a logistic regression model.

Depression

In a cohort study three months after the fire, Cherry and Haynes (2017) found that those evacuated had significantly higher mean depressive scores than those who were not evacuated. Data collected from an online survey that was open between 25th of July to 5th of September (roughly three to four months after the fire), found that 33.1% of

[10] According to PCL-5 criteria, which assesses probable PTSD and symptom severity (Belleville et al., 2019).

participants endorsed the diagnostic criteria for MDD[11] (Belleville et al., 2019). Follow-up clinical interviews of 55 participants indicated that 25.5% of participants met the diagnostic criteria for MDD. A univariate analysis uncovered sixteen variables which had a significant ($p \leq 0.05$) relationship (either positive or negative) with the occurrence of likely major depressive disorder six months after the fire (Agyapong, Juhás, Brown, et al., 2019).[12] Some of the variables which were found to be statistically significant were: age; employment status; relationship status; having a history of depressive disorder before the wildfire; receiving sufficient support from family and friends; receiving sufficient support from the Red Cross; receiving sufficient support from the Government of Alberta; and, receiving counselling after the fire. In a logistic regression model, only three of these variables made unique statistical contributions, thus acting as predictor variables for the occurrence of likely MDD: history of anxiety disorder; support from family/friends, and receipt of counselling.

Three months post-fire, regression modelling showed that depression scores were higher for women and for those with financial loss due to loss of work (Cherry & Haynes, 2017). While MDD was likely in 10.4% of men and 17.1% of women surveyed, six months after the fire it was found that sex was not significantly correlated ($p = 0.06$) with the occurrence of MDD (Agyapong, Juhás, Brown, et al., 2019).

Substance use

While one study found that substance use did not increase after the fire (Cherry & Haynes, 2017), another study found that rates of self-reported substance use did increase in certain groups after the fire, particularly those with likely PTSD (Agyapong, Juhás, Omege, et al., 2019). Administrative data showed little overall change in rates of substance use, but did show changes within certain economic quintiles, which

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[11] According to the PHQ, which is a screen tool designed to test for the presence of depression, anxiety, alcohol, eating, and somatoform disorders during the past four weeks (Belleville et al., 2019).

[12] To note, in the description of theses findings, the authors attribute certain variables to being protective and others to increasing susceptibility to mental illness. Strictly speaking, the data they present only indicates relationships between variables and outcomes; therefore, in some cases, whether or not a certain variable was interpreted as a protective factor, or a factor which increased susceptibility, seemed to depend on “common sense”, and not statistical findings – yet, the ways in which they discuss their findings (e.g., that younger age was more likely to experience negative outcomes) also leads me to wonder about unpublished data which has allowed them to make these claims.

corresponds with the findings that while overall rates of use may remain unchanged, substance use disorders may have been more affected for certain subpopulations.

4.4. Qualitative results and discussion

4.4.1. Overall increase in mental illness

In all methods of measurement used, researchers reported substantial increases in mental illness in residents of Fort McMurray after the Beast. According to administrative data, for both depressive (Table 4.1) and anxiety (Table 4.2) disorders, increases were seen in percentage of the population utilizing health care services at all levels of treatment for two years after the wildfire. The exception to this is the percentage of those seeking treatment for anxiety disorders from ambulatory care services, which saw a 0.25% decline in the second year post-disaster. The most substantial increases in service utilization were seen in the claims data for anxiety disorders, with an increase of 3.5% in the total population utilizing these services. The service which saw the greatest increase in usage was inpatient services for anxiety disorders, which increased from 0.14% to 0.22% of the population, representing a 53.8% increase between 2015/16 and 2017/18.

Table 4.1. Percentage of total population present in Fort McMurray in the 2015/16 year who utilized health care services anywhere in Alberta over the following two years for a primary diagnosis of depressive disorder.

Depressive Disorders			
Data Source	2015/16	2016/17	2017/18
Claims	4.44%	5.27%	6.02%
Ambulatory	0.27%	0.32%	0.35%
Inpatient	0.13%	0.14%	0.17%

Table 4.2. Percentage of total population present in Fort McMurray in the 2015/16 year who utilized health care services anywhere in Alberta over the following two years for a primary diagnosis of an anxiety disorder.

Anxiety-Stress-Adjustment-Neurosis Disorders			
Data Source	2015/16	2016/17	2017/18
Claims	7.27%	9.93%	10.52%
Ambulatory	0.87%	1.27%	1.02%
Inpatient	0.14%	0.22%	0.22%

These findings are corroborated with news articles, journal articles, and government reports. A news article published on August 16, 2016 stated, “More Fort McMurray residents have been getting counselling this year. Alberta Health Services says mental health staff in the city have received 20,000 referrals since May 10. They typically receive 1,200 referrals each year” (Purdy, 2016). Researchers observed increased rates of post-traumatic stress disorder, anxiety, depression, and insomnia after the fire (Agyapong et al., 2018; Agyapong, Juhás, Brown, et al., 2019; Agyapong, Juhás, Omege, et al., 2019; Belleville et al., 2019). A similar finding was observed in the case of a 2007 wildfire in San Diego (Tally et al., 2013).

4.4.2. Demographic impacts

From the administrative data, it can be seen that for cases of depressive disorders and anxiety disorders, baseline rates for women were substantially higher than for men, consistent with other findings of regarding gender differences in anxiety and depression (Cyranowski et al., 2000; McLean et al., 2011)

Although there were correlations in all data between sex and mental health outcomes (with the exception of substance use) (Agyapong et al., 2018; Agyapong, Juhás, Brown, et al., 2019; Agyapong, Juhás, Omege, et al., 2019; Belleville et al., 2019), only one study found gender to be a statistically significant factor in a regression analysis (Cherry & Haynes, 2017). While being female is generally associated with higher risk of negative mental health outcomes after disasters in general, the research around wildfire data is at this stage indeterminate as to whether being female is a risk

factor for mental illness, apart from the higher baseline prevalence of mental illness in female populations (for related research, see: Dodgen et al., 2016; Gamble et al., 2016; Jenkins, Hsu, Sauer, Hsieh, & Kirsch, 2009; Jones et al., 2003). In the case of Fort McMurray, female sex was almost always associated with higher rates of mental illness, yet only in few instances was it a predictive factor for mental illness. There may be a number of reasons for the apparent discrepancies. A potential reason for this is due to the timing of data collection; given that mental illnesses can develop many months after a disaster (Galea, 2007), differences in timing of data collection likely impacted the results. Therefore, the results observed may highlight the stages of mental illness progression after the fire. Another reason for apparent differences may be because each study utilized a different research method, soliciting responses from various audiences. Different measures of mental illness were used, and the data collected were analyzed through varying statistical methods. Thus, while similarities in findings may strengthen the reliability of those findings, there are many possible reasons as to why dissimilarities may occur. This may be reflective of the many challenges to studying mental health after disasters (Galea & Maxwell, 2009).

Furthermore, it is likely that the samples in the studies were different enough to highlight various factors influencing mental health outcomes. The study by Cherry and Haynes (2017) was done amongst those who had already been recruited for two separate studies – all the participants were either in an occupational cohort study or a study of occupational injury. The demographics of those who participated in this study were quite different from those of the other studies; for example, 26.6% of the participants in this study were living in a work camp at the time of the fire, whereas one of the limitations of a study by another author was the inability to collect data from those in remote camps (Agyapong, Juhás, Omege, et al., 2019). Socioeconomic status, race, and social connections have shown to be important predictive factors for mental illness in other studies (Lê et al., 2013; Perilla et al., 2002); given the differences in recruitment methods, it is possible that those who were recruited for these different studies represented individuals with varying incomes and social supports, which may have influenced the mental health outcomes.

From the administrative data, socioeconomic status appears to be related to mental health, particularly when comparing the highest 40% of earners to the lowest 40% of earners. This was especially pronounced for ambulatory and inpatient data.

Nevertheless, in most instances, pre-existing gaps were not exacerbated after the fire. Although other studies did not directly compare economic status and mental health outcomes, measures were compared which may be used as an imperfect proxy for socioeconomic status, for example: being employed, unemployed, or a student; renting, or living in your own home; or, having insurance (Agyapong et al., 2018; Agyapong, Juhás, Brown, et al., 2019; Agyapong, Juhás, Omege, et al., 2019). Some studies measured whether individuals were able to return to work after the fire and whether they had been working before the fire (Cherry & Haynes, 2017). While certain of these factors were found to be correlated with mental health outcomes, none were found to be predictive. The lack of correlation stands in contrast to the literature, where low socioeconomic status is typically correlated to worse mental health outcomes after natural disasters (Goldmann & Galea, 2014). No studies in Fort McMurray measured socioeconomic status on an individual level, therefore any interpretation of results must be done with caution. The average income in Fort McMurray is significantly higher than in the rest of Alberta, with approximately 82% of the employed population making over $100,000 a year (Statistics Canada, 2017a); this may also have acted to mitigate some of the negative mental health consequences associated with low socioeconomic status.

Being younger often acts as a predictive variable for worse mental health outcomes after disaster (Goldmann & Galea, 2014). Studies in Fort McMurray supported this finding when looking at children between grades 7 and 12 for depression and PTSD, however anxiety was found to be similar as to other children in a cohort study of children in Red Deer (Brown et al., 2019). Red Deer was a good comparator in this study given that both cities have similar numbers of inhabitants, are based in Alberta, and are influenced by the oil economy. In adults, severity of symptoms for PTSD was negatively correlated with age three months after the fire, with those who were younger experiencing more severe symptoms (Belleville et al., 2019), but age was not found to be correlated significantly with PTSD six months after the fire (Agyapong, Juhás, Omege, et al., 2019). At neither time point was it a predictive factor for PTSD. Being younger was significantly correlated with depression (Agyapong, Juhás, Brown, et al., 2019) and anxiety (Agyapong et al., 2018), but similarly did not act as a predictive factor in either case. While in many cases the administrative data does support these findings, in certain instances, differences become apparent looking at data source. Age and sex differences appear to be more significant at the ambulatory and inpatient level as

compared to physician claims. As data source can act as a proxy for severity, this may correspond to symptom severity. While it is not possible to determine significance from the descriptive statistics that I have used, the number of individuals utilizing services seems to be most responsive to change in the categories of women over the age of 55, and men under the age of 24; this second observation correlates to the above finding that symptoms of PTSD are more severe for younger people (Belleville et al., 2019).

4.4.3. Fort McMurray as an oil and gas economy: A look at context

Fort McMurray is situated in the middle of the Athabasca oil sands, and its economy depends largely upon the oil industry. Following a major recession in 2008, another major recession had drastic impacts on the community in 2014:

> Oil prices fell more than 70% over this short period (Alberta Government, 2016) and capital spending in the industry fell over 250% to only CAD$31 billion per year (Canadian Association of Petroleum Producers, n.d.). The downturn was not only swift and dramatic, but it also occurred at a time when the local economy was geared towards a substantial growth trajectory. For example, the number of jobs created in Alberta in 2014 represented over half of all jobs created in the whole country that year, many of which were in the energy sector (Alberta Treasury Board and Finance, n.d.). The sustained oil price crash culminated in a sudden and dramatic decrease in employment-related indices in Fort McMurray. Significant layoffs, reduced working hours and decreased average weekly earnings were the result of the economic decline (Alberta Government, n.d.). In fact, the unemployment rate nearly doubled, from 4.6% to 8.2% in just over 6 months (December 2014 to June 2015) (Alberta Government, 2015; Open Government, n.d.). Moreover, many people who remained employed were faced with considerable uncertainty regarding their continued employment and household income (The New York Times, 2015). (Ritchie et al., 2018, pp. 563–564)

The increase in mental illness as a result of recession is well-documented (Cooper, 2011), although these negative effects can be reduced through effective policy (Wahlbeck & Mcdaid, 2012). In many cases, men are more severely affected by mental illness relating to recessions than women (Frasquilho et al., 2016). Previous research has found that recessions tend to affect those who are ‘vulnerable’ the most severely (Frasquilho et al., 2016); however, in the case of Fort McMurray it was found that Caucasian, males, and those with higher levels of education accounted for the largest increase in services used (Ritchie et al., 2018). This may have particularly affected men living in the area as many had lost their jobs in the oil field; according to a news article,

this was coupled with a lack of access to services, stigma surrounding mental illness, and in some cases an inability to take medications while working in the oil fields, as employees are required to be 'drug-free' (Colborne, 2016).

Because of this recession, the experience of mental illness in the community of Fort McMurray was very pronounced – even before the Horse River fire. In February of 2016, a news article described how one year after the recession, the community was still experiencing higher rates of mental illness (Colborne, 2016). The wildfire would turn out to be the costliest in Canadian history, costing insurance agencies more than $5 billion dollars (Corporate Communications, 2016). Furthermore, the temporary halt on oilsands production is estimated to have stopped the production of 47 million barrels of oil, leading to a total decline of revenues of $1.4 billion for 2016 (Antunes et al., 2016). The effects that the fire had on oil production, coupled with the money required to fight the fire, also had a large impact on Alberta's economy (Morgan, 2016). However, the economy had not fully recovered from the 2014 recession, and it is likely that people had also not fully recovered from its mental health effects (Brown et al., 2019; Frasquilho et al., 2016; Galea, 2007; Morgan, 2016). The mental health outcomes of the Fort McMurray fire are not completely reflective of literature, but that may be because The Beast was not the first disaster that the community had recently undergone.

4.5. Conclusion

Mental illness after the Fort McMurray fire was a concern for many. In September of 2016, the federal government, the government of Alberta, and the Red Cross together pledged $3 million to study the physical and mental health effects of the Fort McMurray fire (Cotter, 2016). While studies have shown the negative health outcomes of the fire, these outcomes cannot be attributed to the fire alone: mental health outcomes from economic crises can be long-lasting, with effects still occurring after ten years (Marmot et al., 2013). The status of Fort McMurray as a resource-based community may also contribute to low social cohesion (Dorow & O'Shaughnessy, 2013), as many individuals move to Fort McMurray for work and leave shortly after – a fact which the city is trying to counteract by limiting the expansion of man camps (Bloomberg News & Tuttle, 2019). In some instances of forced displacements, social cohesion can act as a protective factor against negative mental health outcomes (Lê et al., 2013), meaning that such fluidity in the population may have been a contributing factor to the large increases in mental

illness. In considering policy interventions, which have been shown to be effective in mitigating mental illness after recession (Frasquilho et al., 2016) in the context of natural disasters it is imperative to not only consider the available academic research, but also the context of the community in question (Keim, 2011). The needs of a remote, resource-based city, in the middle of the boreal forest, with a large population of temporary workers, will be quite different than other cities in Canada. While a relevant comparator population would help to contextualize these rates of mental health, accessing data on mental health rates for other resource-dependent communities was not feasible in this project, as such could not be found through publicly-accessible means.

4.5.1. Limitations

This case study had certain challenges. Firstly, the methods and measurements of mental illness used in different studies often varied. Thus, although multiple authors may have assessed depression or PTSD after the fire, there were different methods used which in some cases obtained different results, which made comparisons amongst studies less reliable; however, this may have helped to paint a fuller picture of the mental health landscape of Fort McMurray following the fire. The administrative data from Alberta Health similarly utilized differing measurements and analyses: for example, although other authors focussed on PTSD and generalized anxiety disorder as two separate diagnoses, due to small sample sizes of aggregate data, many different diagnoses of anxiety-related disorders had to be combined in order to obtain sufficient sample sizes for comparisons. This again limited its comparability with other published articles. Further, the conclusions drawn from the economic data from Alberta Health are subject to the ecological fallacy (Wetcher-Hendricks, 2011, p. 320), as this data assumes that every member of a dissemination area earns the average income of that area. Lastly, this study was only able to ascertain inequalities in mental health outcomes in a limited fashion. For example, while race has sometimes been found to be a factor determining mental health outcomes after disasters (Adams & Boscarino, 2005; Lowe et al., 2015), since Canada does not collect data on race and none of the studies on Fort McMurray examined race, it could be not examined in this project. This also applies for other factors which are known to contribute to vulnerability, such as socioeconomic

status (although proxy measures were used), length of time spent living in an area; language skills; and chronic illness (Amin et al., 2011).

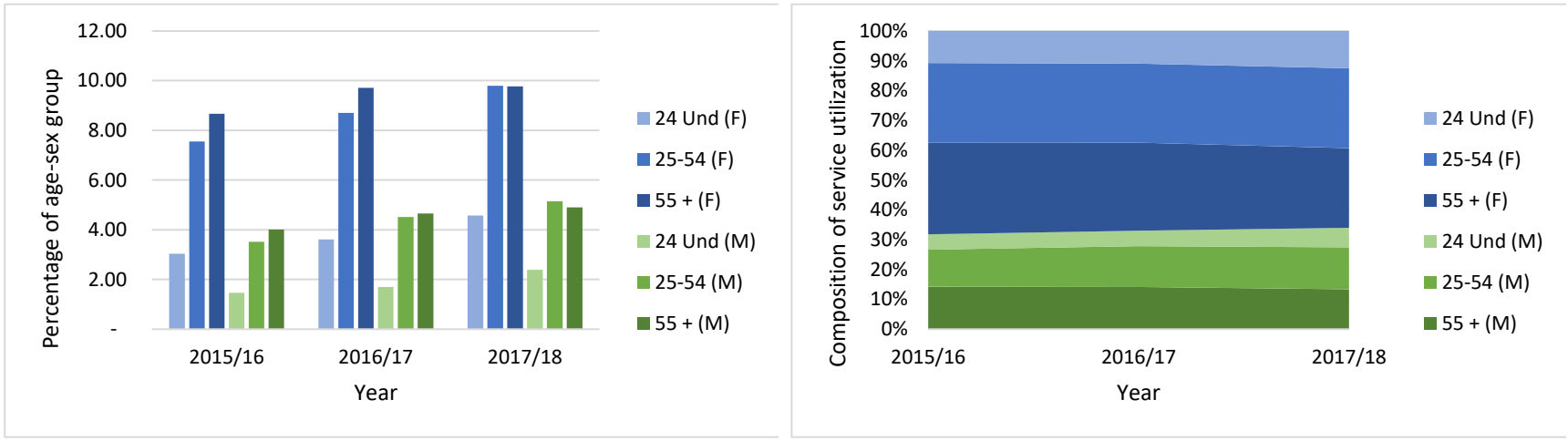
4.5.2. Strengths

This study is the first to examine the potential effects of economic status on mental health outcomes after the Fort McMurray fire. Although the effect of economic status is an area that has been studied in cases of other natural disasters within a country and between countries, this is the first study to ascertain whether economic status affected prevalence of mental illness outcomes in Fort McMurray. Furthermore, using administrative data, this study was able to examine the health service utilization of every individual who had been active in Fort McMurray at the time of the fire, regardless of if they moved to another city in Alberta. Data from individuals was only lost in the case of moving out of province or death. Being able to determine the mental health outcomes of the entire population who was living in Fort McMurray at the time of the fire is one of the greatest strengths of this study, as it provides an accurate picture of the mental health effects of the population and avoids selection bias. Lastly, by considering not only quantitative data, but incorporating qualitative aspects into the case study in order to elucidate context, this study was able to highlight certain important features of 'The Beast' which may have contributed to the pattern of mental health outcomes that was observed. The contextually-relevant nature of this study may help to determine ways in which mental health can be promoted prior to the occurrence of a natural disaster, both in a Canadian context and internationally.

4.6. Figures

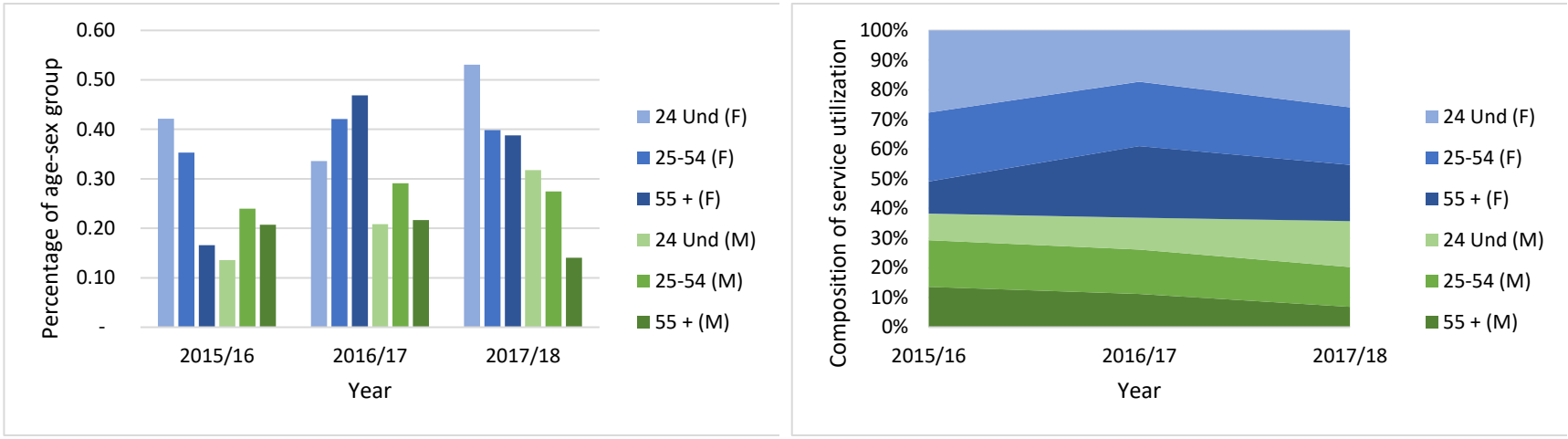
Age-Sex Data

Depressive disorders



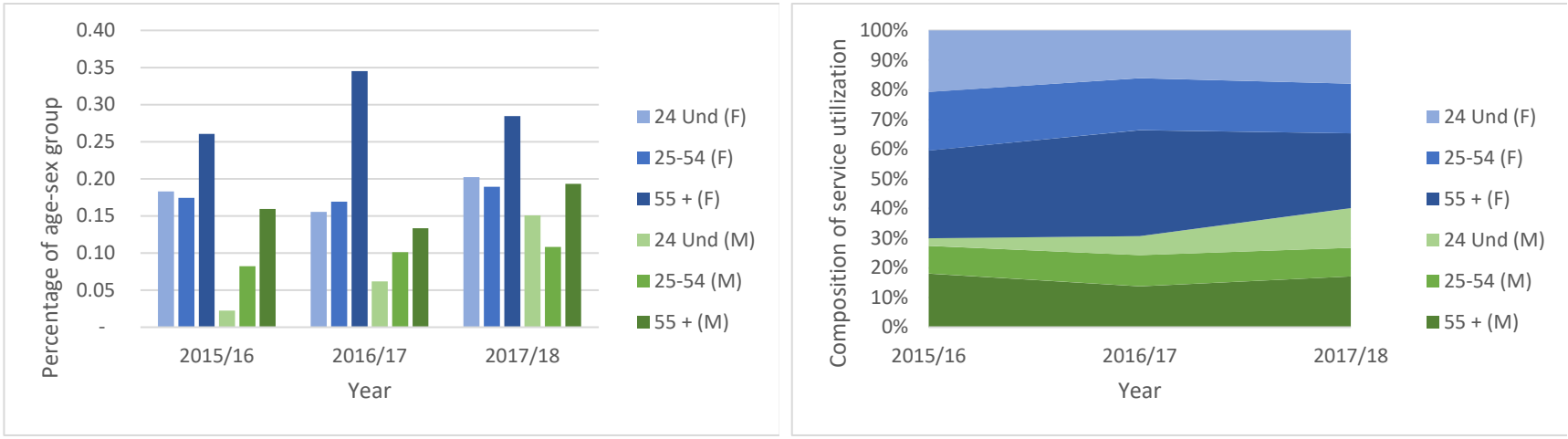
A B

Figure 4.1. Primary diagnosis of a depressive disorder by physician claims data.
A) Percentage of individuals utilizing service es per age-sex grouping. B) Composition of all individuals utilizing services by age-sex grouping.



A B

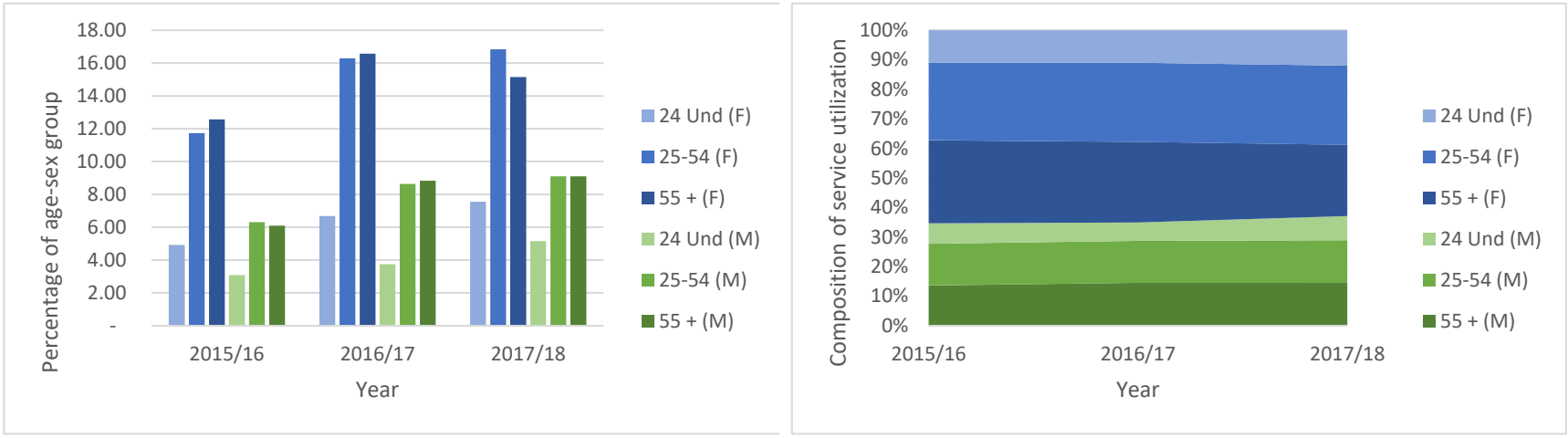
Figure 4.2. Primary diagnosis of a depressive disorder by ambulatory data.
A) Percentage of individuals utilizing services per age-sex grouping. B) Composition of all individuals utilizing services by age-sex grouping.



A B

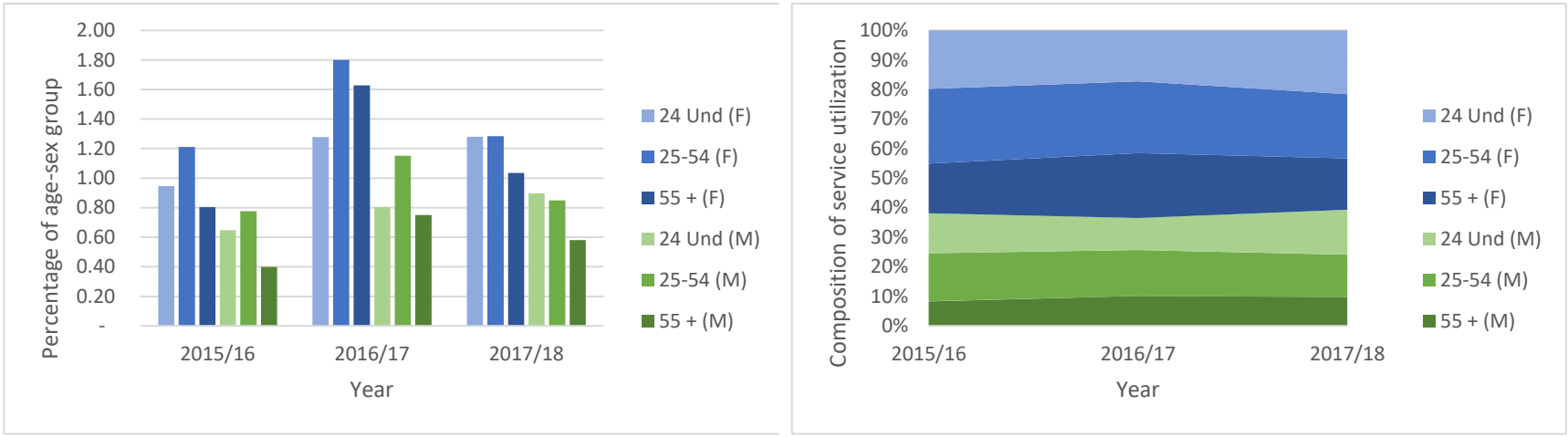
Figure 4.3. Primary diagnosis of a depressive disorder by inpatient data.
A) Percentage of individuals utilizing services per age-sex grouping. B) Composition of all individuals utilizing services by age-sex grouping.

Anxiety, Neurosis, Stress, Adjustment Disorders



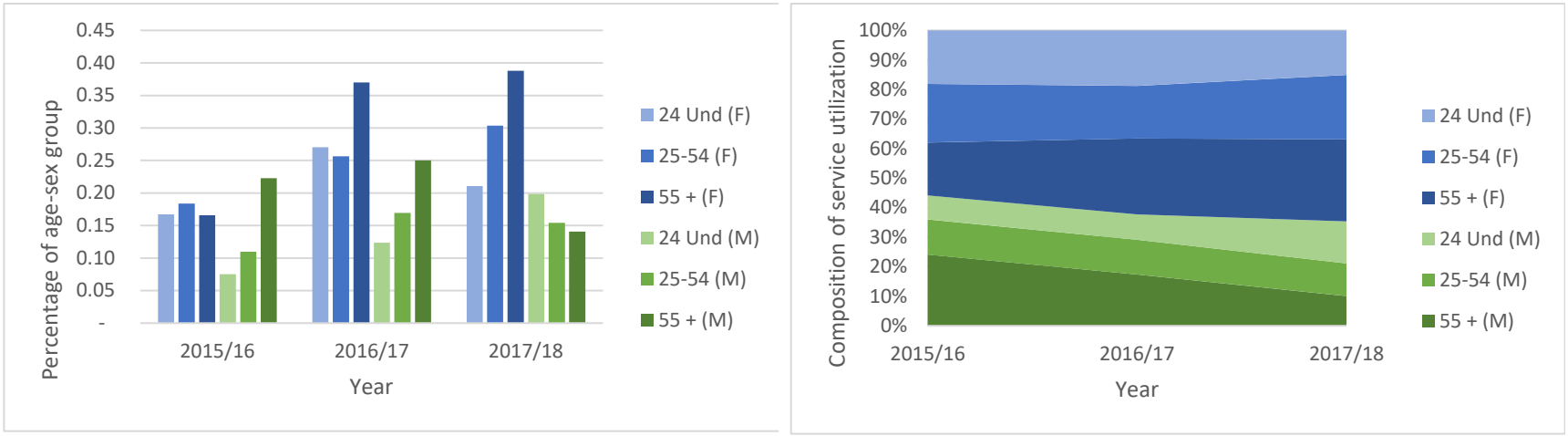
A B

Figure 4.4. Primary diagnosis of an anxiety disorder by physician claims data.
A) Percentage of individuals utilizing services per age-sex grouping. B) Composition of all individuals utilizing services by age-sex grouping.



A B

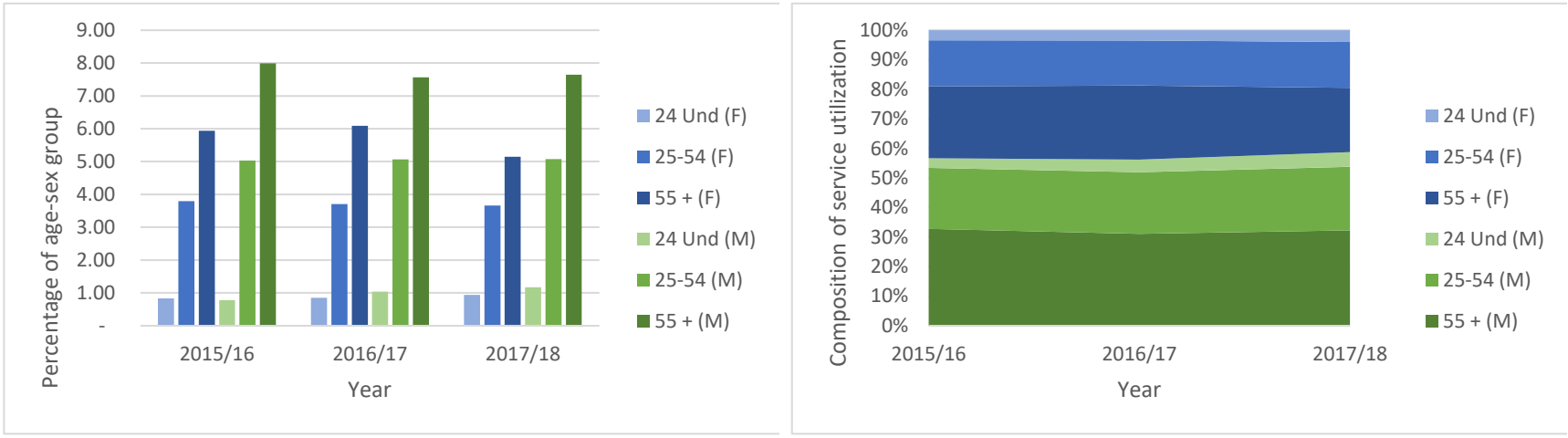
Figure 4.5. Primary diagnosis of an anxiety disorder by ambulatory data.
A) Percentage of individuals utilizing services per age-sex grouping. B) Composition of all individuals utilizing services by age-sex grouping.



A B

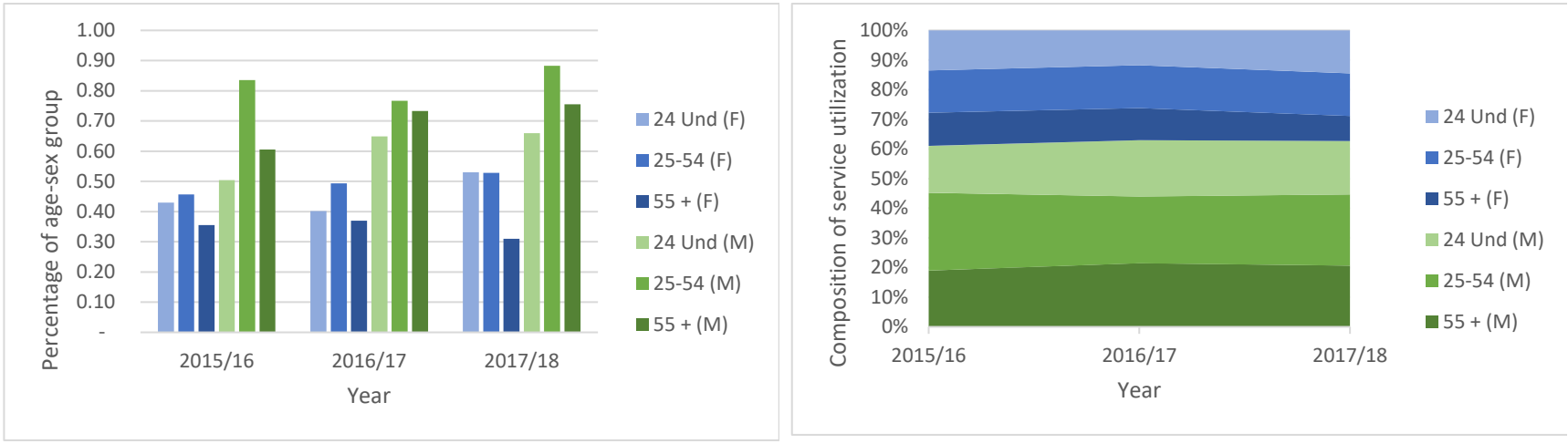
Figure 4.6. Primary diagnosis of an anxiety disorder by inpatient data.
A) Percentage of individuals utilizing services per age-sex grouping. B) Composition of all individuals utilizing services by age-sex grouping.

Substance Use



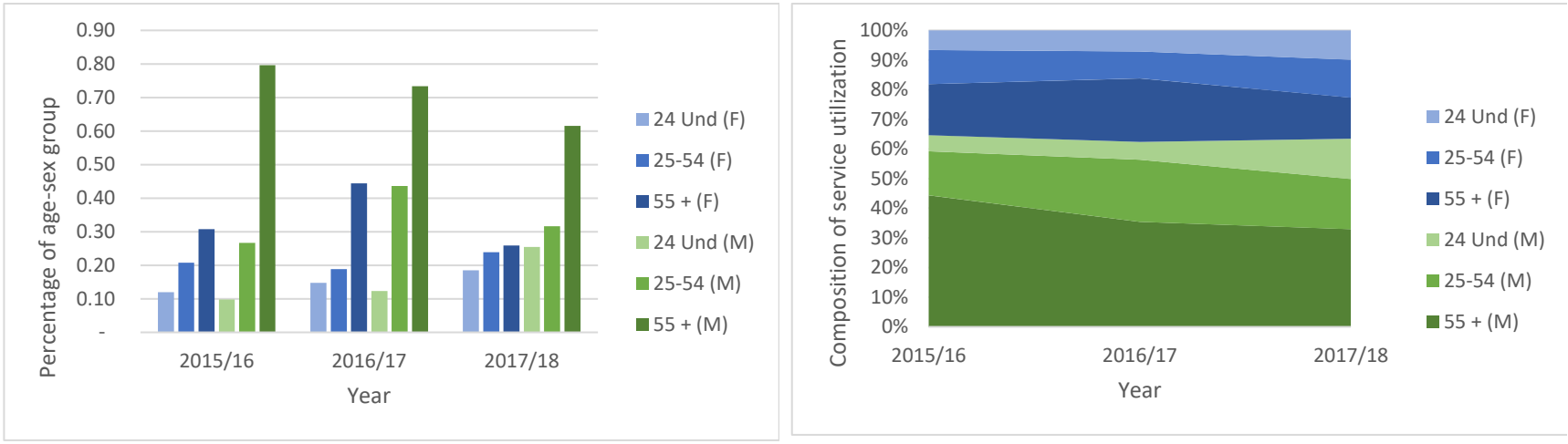
A B

Figure 4.7. Primary diagnosis of a substance use disorder by physician claims data.
A) Percentage of individuals utilizing services per age-sex grouping. B) Composition of all individuals utilizing services by age-sex grouping.



A B

Figure 4.8. Primary diagnosis of a substance use disorder by ambulatory data.
A) Percentage of individuals utilizing services per age-sex grouping. B) Composition of all individuals utilizing services by age-sex grouping.

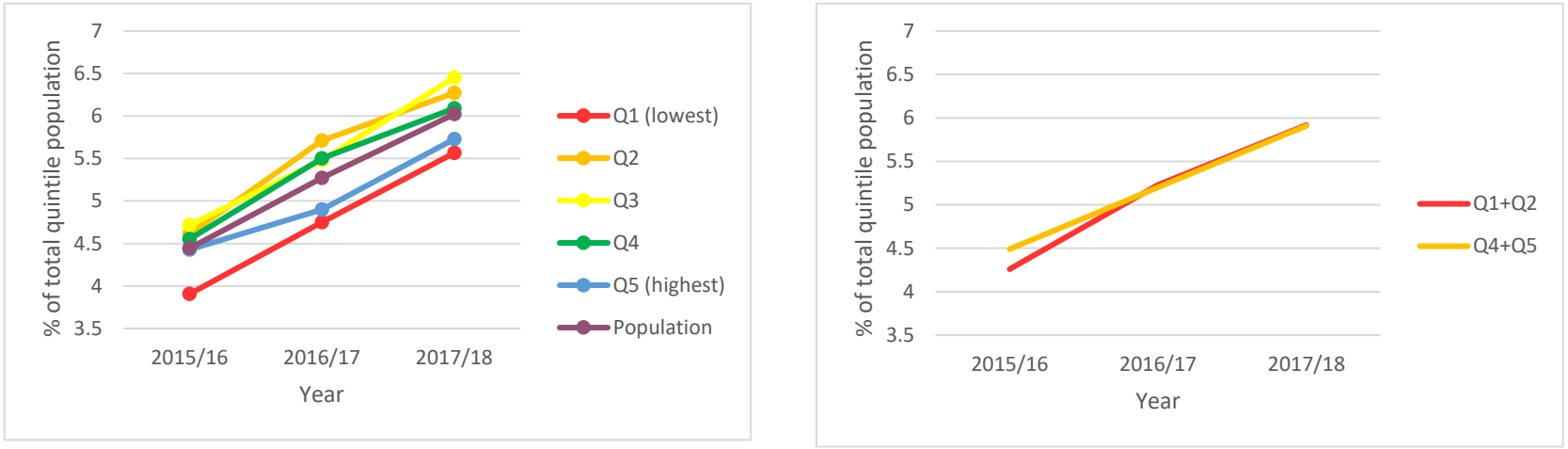


A B

Figure 4.9. Primary diagnosis of a substance use disorder by inpatient data.
A) Percentage of individuals utilizing services per age-sex grouping. B) Composition of all individuals utilizing services by age-sex grouping.

Income Quintile Data

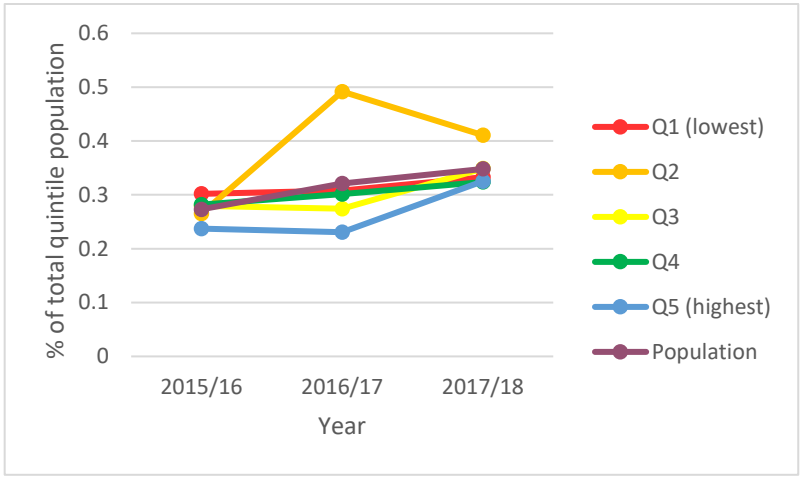
Depressive disorders



A B

Figure 4.10. Percentage of individuals per age-sex grouping utilizing services for a primary diagnosis of a depressive disorder according to physicians claims data.

A) Data per income quintile. B) Data combined for the two lowest and highest income quintiles.



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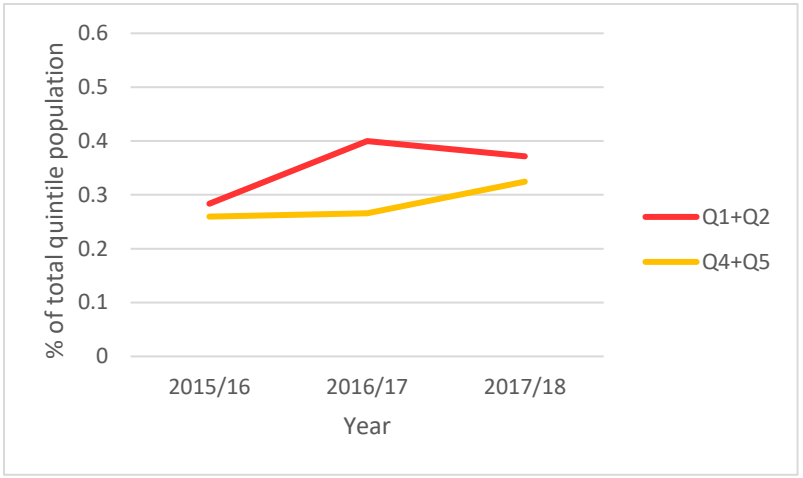
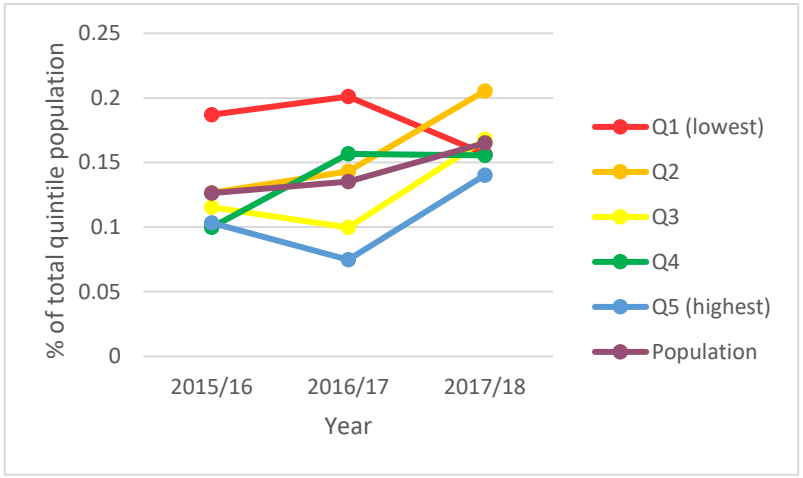


B

Figure 4.11. Percentage of individuals per age-sex grouping utilizing services for a primary diagnosis of a depressive disorder according to ambulatory data.

A) Data per income quintile. B) Data combined for the two lowest and highest income quintiles.



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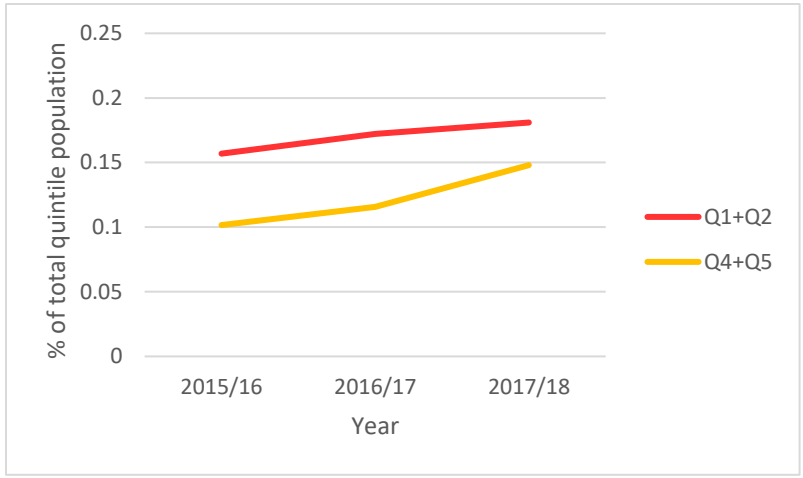
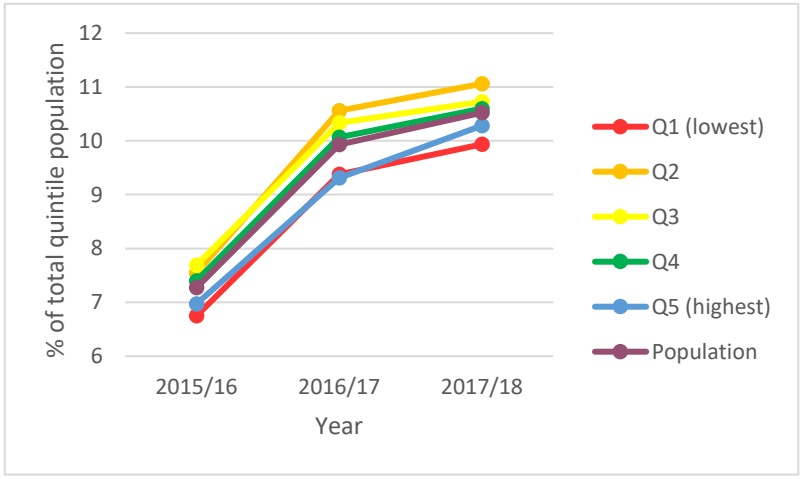


B

Figure 4.12. Percentage of individuals per age-sex grouping utilizing services for a primary diagnosis of a depressive disorder according to inpatient data.

A) Data per income quintile. B) Data combined for the two lowest and highest income quintiles.

Anxiety, Neurosis, Stress, Adjustment Disorders



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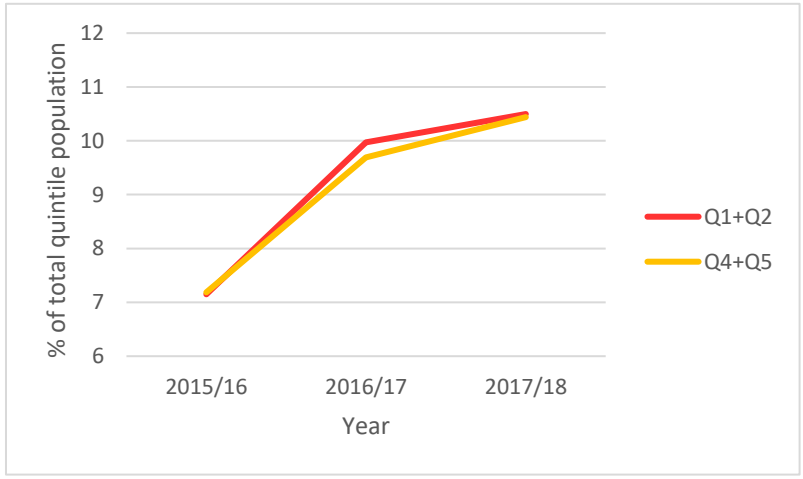
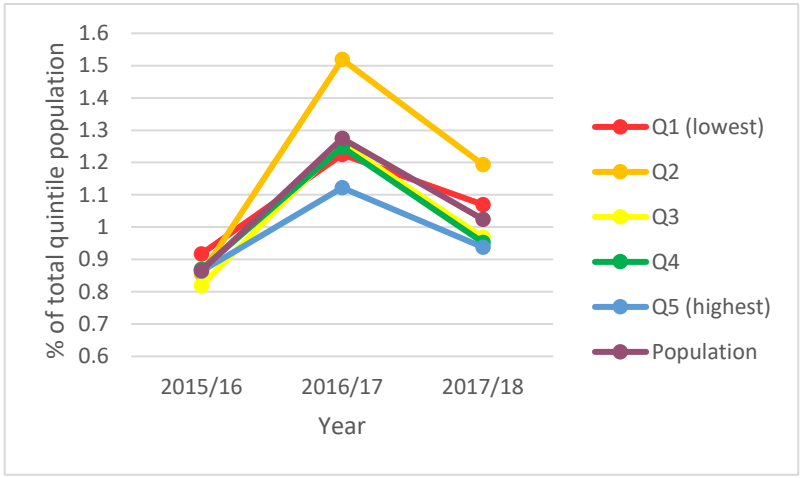


B

Figure 4.13. Percentage of individuals per age-sex grouping utilizing services for a primary diagnosis of an anxiety disorder according to physician claims data.

A) Data per income quintile. B) Data combined for the two lowest and highest income quintiles.



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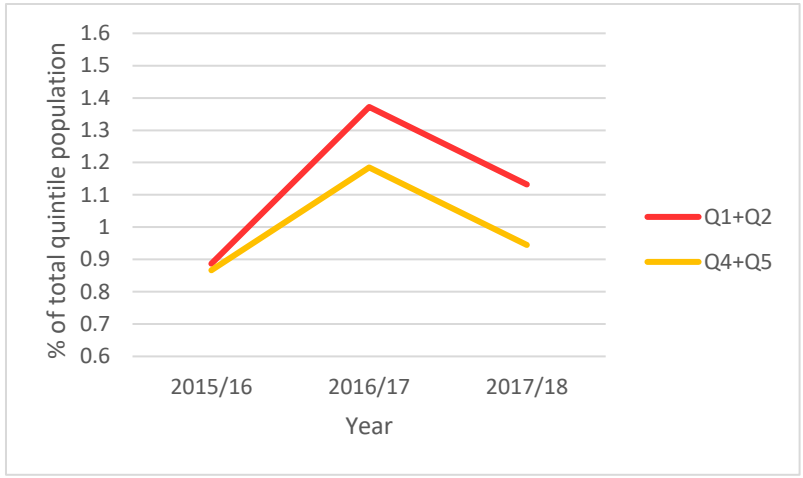
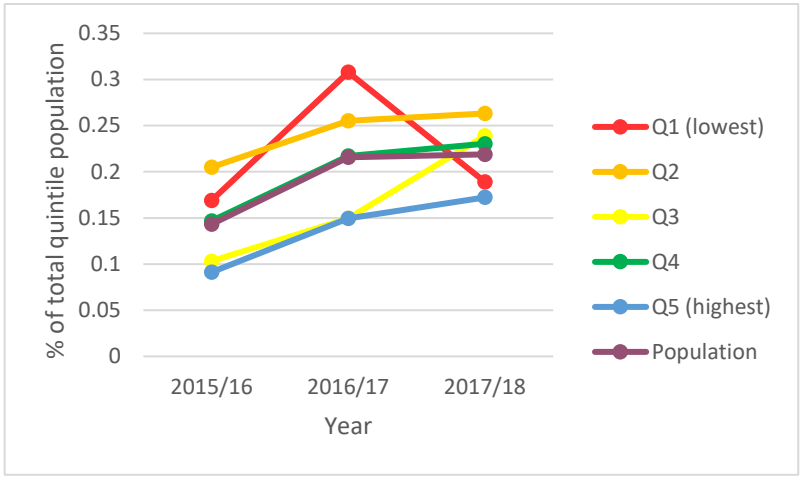


B

Figure 4.14. Percentage of individuals per age-sex grouping utilizing services for a primary diagnosis of an anxiety disorder according to ambulatory data.

A) Data per income quintile. B) Data combined for the two lowest and highest income quintiles.



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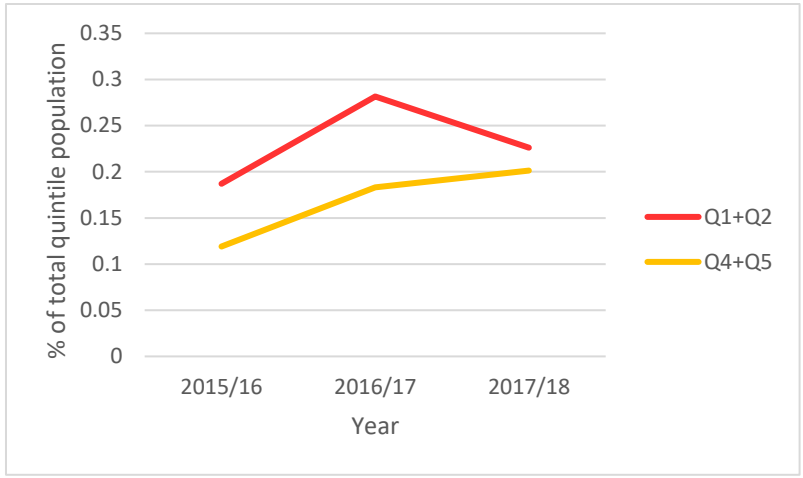
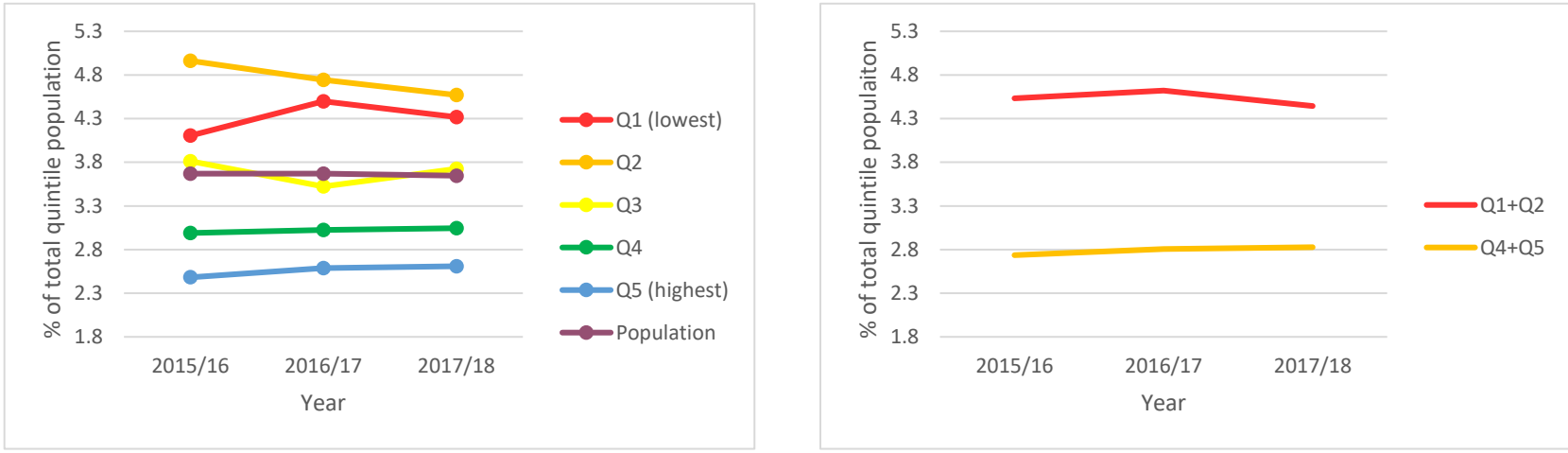


B

Figure 4.15. Percentage of individuals per age-sex grouping utilizing services for a primary diagnosis of an anxiety disorder according to inpatient data.

A) Data per income quintile. B) Data combined for the two lowest and highest income quintiles.

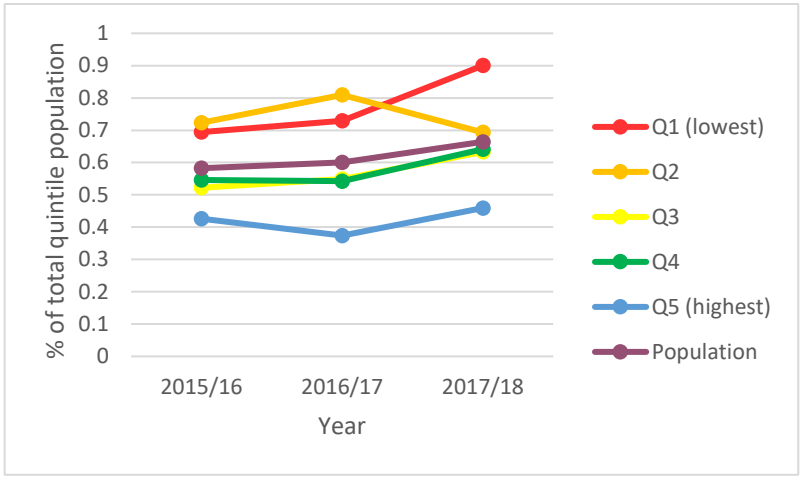
Substance Use



A B

Figure 4.16. Percentage of individuals per age-sex grouping utilizing services for a primary diagnosis of a substance use disorder according to physician claims data.

A) Data per income quintile. B) Data combined for the two lowest and highest income quintiles.



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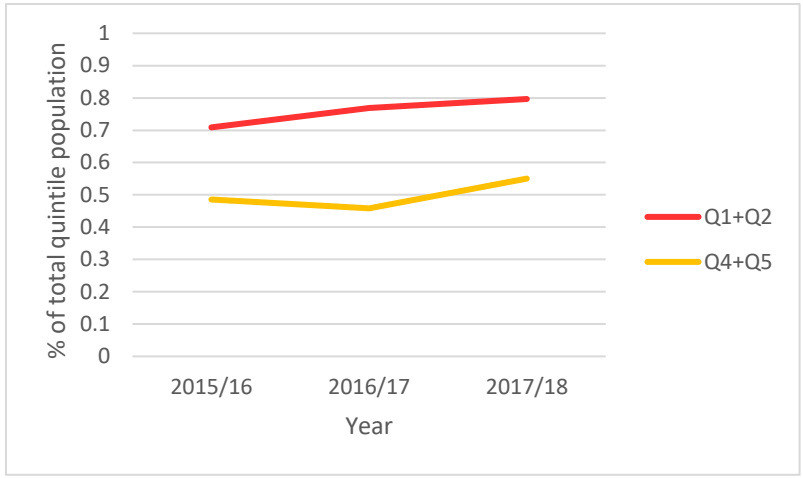
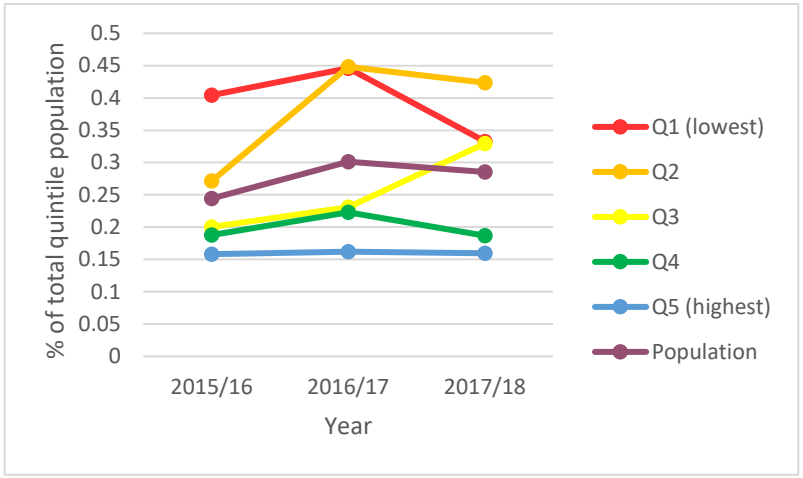


B

Figure 4.17. Percentage of individuals per age-sex grouping utilizing services for a primary diagnosis of a substance use disorder according to ambulatory data.

A) Data per income quintile. B) Data combined for the two lowest and highest income quintiles.



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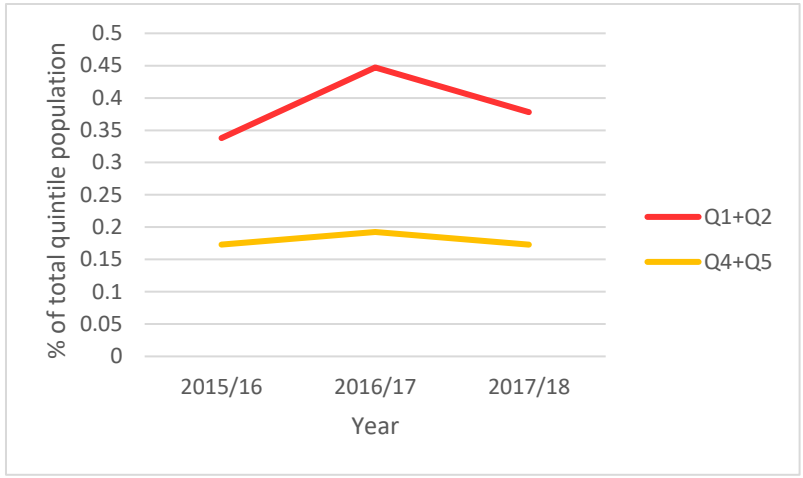

B

Figure 4.18. Percentage of individuals per age-sex grouping utilizing services for a primary diagnosis of a substance use disorder according to inpatient data.

A) Data per income quintile. B) Data combined for the two lowest and highest income quintiles.

4.7. Works Cited

Abatzoglou, J. T., & Williams, A. P. (2016). Impact of anthropogenic climate change on wildfire across western US forests. *Proceedings of the National Academy of Sciences*, *113*(42), 11770–11775. https://doi.org/10.1073/pnas.1607171113

Adams, R. E., & Boscarino, J. A. (2005). Differences in Mental Health Outcomes among Whites, African Americans, and Hispanics Following a Community Disaster. *Psychiatry: Interpersonal and Biological Processes*, *68*(3), 250–265. https://doi.org/10.1521/psyc.2005.68.3.250

Agyapong, V. I. O., Hrabok, M., Juhas, M., Omeje, J., Denga, E., Nwaka, B., Akinjise, I., Corbett, S. E., Moosavi, S., Brown, M., Chue, P., Greenshaw, A. J., & Li, X.-M. (2018). Prevalence Rates and Predictors of Generalized Anxiety Disorder Symptoms in Residents of Fort McMurray Six Months After a Wildfire. *Frontiers in Psychiatry*, *9*(345), 1–12. https://doi.org/10.3389/fpsyt.2018.00345

Agyapong, V. I. O., Juhás, M., Brown, M. R. G., Omege, J., Denga, E., Nwaka, B., Akinjise, I., Corbett, S. E., Hrabok, M., Li, X.-M., Greenshaw, A., & Chue, P. (2019). Prevalence Rates and Correlates of Probable Major Depressive Disorder in Residents of Fort McMurray 6 Months After a Wildfire. *International Journal of Mental Health and Addiction*, *17*, 120–136. https://doi.org/10.1007/s11469-018-0004-8

Agyapong, V. I. O., Juhás, M., Omege, J., Denga, E., Nwaka, B., Akinjise, I., Corbett, S. E., Brown, M., Chue, P., Li, X.-M., & Greenshaw, A. (2019). Prevalence Rates and Correlates of Likely Post-Traumatic Stress Disorder in Residents of Fort McMurray 6 Months After a Wildfire. *International Journal of Mental Health and Addiction*, 1–19. https://doi.org/10.1007/s11469-019-00096-z

Alberta Municipal Affairs. (1996). *Official Population List 1996—Amended* (p. 12). http://www.municipalaffairs.gov.ab.ca/documents/ms/1996population.pdf

Amin, M., MacLachlan, M., Mannan, H., El Tayeb, S., El Khatim, A., Swartz, L., Munthali, A., Van Rooy, G., McVeigh, J., Eide, A., & Schneider, M. (2011). EquiFrame: A framework for analysis of the inclusion of human rights and vulnerable groups in health policies. *Health and Human Rights*, *13*(2), 20.

Antunes, P., Bernard, M.-C., & Owusu, P. (2016). *The Economic Impacts of the 2016 Alberta Wildfires* (p. 22). The Conference Board of Canada.

Archer, J. (2019). The reality and evolutionary significance of human psychological sex differences. *Biological Reviews*, *94*(4), 1381–1415. Scopus. https://doi.org/10.1111/brv.12507

Beaglehole, B., Mulder, R. T., Frampton, C. M., Boden, J. M., Newton-Howes, G., & Bell, C. J. (2018). Psychological distress and psychiatric disorder after natural disasters: Systematic review and meta-analysis. *The British Journal of Psychiatry*, *213*(6), 716–722. https://doi.org/10.1192/bjp.2018.210

Belleville, G., Ouellet, M.-C., & Morin, C. M. (2019). Post-Traumatic Stress among Evacuees from the 2016 Fort McMurray Wildfires: Exploration of Psychological and Sleep Symptoms Three Months after the Evacuation. *International Journal of Environmental Research and Public Health*, *16*(1604), 1–14. https://doi.org/10.3390/ijerph16091604

Bloomberg News, & Tuttle, R. (2019, January 30). Fort McMurray fighting temporary oilsands worker camps in effort to boost population. *Financial Post*. https://business.financialpost.com/commodities/energy/fort-mcmurray-fighting-temporary-oilsands-worker-camps-in-effort-to-boost-population

Bowen, G. A. (2009). Document Analysis as a Qualitative Research Method. *Qualitative Research Journal*, *9*(2), 27–40. https://doi.org/10.3316/QRJ0902027

Brown, M. R. G., Agyapong, V., Greenshaw, A. J., Cribben, I., Brett-MacLean, P., Drolet, J., McDonald-Harker, C., Omeje, J., Mankowsi, M., Noble, S., Kitching, D., & Silverstone, P. H. (2019). After the Fort McMurray wildfire there are significant increases in mental health symptoms in grade 7–12 students compared to controls. *BMC Psychiatry*, *19*(18), 1–11. https://doi.org/10.1186/s12888-018-2007-1

Chapin III, F. S., McGuire, A. D., Ruess, R. W., Hollingsworth, T. N., Mack, M. C., Johnstone, J. F., Kasischke, E. S., Euskirchen, E. S., Jones, J. B., Jorgenson, M. T., Kielland, K., Kofinas, G. P., Turetsky, M. R., Yarie, J., Lloyd, A. H., & Taylor, D. L. (2010). Resilience of Alaska's boreal forest to climatic change. *Canadian Journal of Forest Research*, *40*, 1360–1370. https://doi.org/10.1139/X10-074

Cherry, N., & Haynes, W. (2017). Effects of the Fort McMurray wildfires on the health of evacuated workers: Follow-up of 2 cohorts. *CMAJ Open*, *5*(3), E638–E645. https://doi.org/10.9778/cmajo.20170047

Colborne, M. (2016). Dark forecast for mental health in Alberta. *CMAJ*, *188*(8), E31. https://doi.org/DOI:10.1503/cmaj.109-5207

Cooper, B. (2011). Economic Recession and Mental Health: An Overview. *Neuropsychiatrie*, *25*(3), 113–117.

Corporate Communications. (2016, November 15). Fort McMurray Wildfires to Cost Governments and Insurers More Than $5 Billion. *The Conference Board of Canada*. https://www.conferenceboard.ca/(X(1)S(jkx5vsqaqyc5veh3x5vu5lhe))/press/newsrelease/16-11-15/Fort_McMurray_Wildfires_to_Cost_Governments_and_Insurers_More_Than_5_Billion.aspx?AspxAutoDetectCookieSupport=1

Cotter, J. (2016, September 13). Governments want researchers to study health effects of Fort McMurray wildfire. *The Canadian Press*. http://search.proquest.com/docview/1819481682/abstract/F2923BFF06914CDDPQ/1

CTVNews.ca Staff. (2018, May 3). Two years later: 20 per cent of homes lost during Fort McMurray wildfires fully rebuilt. *CTV News*. https://www.ctvnews.ca/canada/two-years-later-20-per-cent-of-homes-lost-during-fort-mcmurray-wildfires-fully-rebuilt-1.3914654

Cyranowski, J. M., Frank, E., Young, E., & Shear, M. K. (2000). Adolescent Onset of the Gender Difference in Lifetime Rates of Major Depression: A Theoretical Model. *Archives of General Psychiatry*, *57*(1), 21–27. https://doi.org/10.1001/archpsyc.57.1.21

Dennekamp, M., Straney, L. D., Erbas, B., Abramson, M. J., Keywood, M., Smith, K., Sim, M. R., Glass, D. C., Monaco, A. D., Haikerwal, A., & Tonkin, A. M. (2015). Forest Fire Smoke Exposures and Out-of-Hospital Cardiac Arrests in Melbourne, Australia: A Case-Crossover Study. *Environmental Health Perspectives (Online); Research Triangle Park*, *123*(10), 959.

Dodgen, D., Donato, D., Kelly, N., Greca, A. L., Morganstein, J., Reser, J., Ruzek, J., Schweitzer, S., Shimamoto, M. M., Tart, K. T., & Ursano, R. (2016). Mental Health and Well-Being. In *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment* (pp. 217–246). U.S. Global Change Research Program. https://health2016.globalchange.gov/mental-health-and-well-being

Dorow, S., & O'Shaughnessy, S. (2013). Fort McMurray, Wood Buffalo, and the Oil/Tar Sands: Revisiting the Sociology of "Community": Introduction to the Special Issue. *Canadian Journal of Sociology (Online); Toronto*, *38*(2), 121–140.

Flannigan, M. D., Logan, K. A., Amiro, B. D., Skinner, W. R., & Stocks, B. J. (2005). Future Area Burned in Canada. *Climatic Change*, *72*, 1–16. https://doi.org/10.1007/s10584-005-5935-y

Fothergill, A. (1996). Gender, risk, and disaster. *International Journal of Mass Emergencies and Disasters*, *14*(1), 33–56.

Frasquilho, D., Matos, M. G., Salonna, F., Guerreiro, D., Storti, C. C., Gaspar, T., & Caldas-de-Almeida, J. M. (2016). Mental health outcomes in times of economic recession: A systematic literature review. *BMC Public Health*, *16*(1), 115. https://doi.org/10.1186/s12889-016-2720-y

Gabinet & Associates Inc. (2006). *Fort McMurray Community Profile 2006/07* (pp. 1–33). https://www.rmwb.ca/Assets/Departments/Planning+and+Development/pdf/Fort+McMurray+Community+Profile+2006+-+2007.pdf

Galea, S. (2007). The long-term health consequences of disasters and mass traumas. *CMAJ*, *176*(9), 1293–1294. https://doi.org/10.1503/cmaj.070368

Galea, S., & Maxwell, A. R. (2009). Methodological Challenges in Studying the Mental Health Consequences of Disasters. In Yuval Neria (Ed.), *Mental Health and Disasters* (pp. 579–593). Cambridge University Press. https://doi.org/10.1017/CBO9780511730030.034

Gamble, J. L., Balbus, J., Berger, M., Bouye, K., Campbell, V., Chief, K., Conlon, K., Crimmins, A., Flanagan, B., Gonzalez-Maddux, C., Hallisey, E., Hutchins, S., Jantarasami, L., Khoury, S., Kiefer, M., Kolling, J., Lynn, K., Manangan, A., McDonald, M., … Wolkin, A. F. (2016). Chapter 9: Populations of Concern. In *Climate and Health Assessment* (pp. 247–286). U.S. Global Change Research Program. https://health2016.globalchange.gov/populations-concern

Goldmann, E., & Galea, S. (2014). Mental Health Consequences of Disasters. *Annual Review of Public Health*, *35*(1), 169–183. https://doi.org/10.1146/annurev-publhealth-032013-182435

Hammer, R. B., Stewart, S. I., & Radeloff, V. C. (2009). Demographic Trends, the Wildland–Urban Interface, and Wildfire Management. *Society & Natural Resources*, *22*(8), 777–782. https://doi.org/10.1080/08941920802714042

Henderson, S. B., Brauer, M., MacNab, Y. C., & Kennedy, S. M. (2011). Three Measures of Forest Fire Smoke Exposure and Their Associations with Respiratory and Cardiovascular Health Outcomes in a Population-Based Cohort. *Environmental Health Perspectives*, *119*(9), 1266–1271. https://doi.org/10.1289/ehp.1002288

Henderson, S. B., & Johnston, F. H. (2012). Measures of forest fire smoke exposure and their associations with respiratory health outcomes: *Current Opinion in Allergy and Clinical Immunology*, *12*(3), 221–227. https://doi.org/10.1097/ACI.0b013e328353351f

Hogg, E. H. (Ted), & Bernier, P. Y. (2005). Climate change impacts on drought-prone forests in western Canada. *The Forestry Chronicle*, *81*(5), 675–682. https://doi.org/10.5558/tfc81675-5

Hu, J., Feng, B., Zhu, Y., Wang, W., Xie, J., & Zheng, X. (2017). Gender Differences in PTSD: Susceptibility and Resilience. In A. Alvinius (Ed.), *Gender Differences in Different Contexts*. IntechOpen. https://www.intechopen.com/books/gender-differences-in-different-contexts/gender-differences-in-ptsd-susceptibility-and-resilience

Jenkins, J. L., Hsu, E. B., Sauer, L. M., Hsieh, Y.-H., & Kirsch, T. D. (2009). Prevalence of Unmet Health Care Needs and Description of Health Care–seeking Behavior Among Displaced People After the 2007 California Wildfires. *Disaster Medicine and Public Health Preparedness*, *3*(S1), S24–S28. https://doi.org/10.1097/DMP.0b013e31819f1afc

Johnson, E. A., Miyanishi, K., & Weir, J. M. H. (1998). Wildfires in the western Canadian boreal forest: Landscape patterns and ecosystem management. *Journal of Vegetation Science*, *9*(4), 603–610. https://doi.org/10.2307/3237276

Johnston, F. H., Henderson Sarah B., Chen Yang, Randerson James T., Marlier Miriam, DeFries Ruth S., Kinney Patrick, Bowman David M.J.S., & Brauer Michael. (2012). Estimated Global Mortality Attributable to Smoke from Landscape Fires. *Environmental Health Perspectives*, *120*(5), 695–701. https://doi.org/10.1289/ehp.1104422

Jolly, W. M., Cochrane, M. A., Freeborn, P. H., Holden, Z. A., Brown, T. J., Williamson, G. J., & Bowman, D. M. J. S. (2015). Climate-induced variations in global wildfire danger from 1979 to 2013. *Nature Communications*, *6*(7537), 1–11. https://doi.org/10.1038/ncomms8537

Jones, R. T., Ribbe, D. P., Cunningham, P., & Weddle, J. D. (2003). Psychosocial Correlates of Wildfire Disaster: Post Disaster Adult Reactions. *Fire Technology*, *39*(2), 103–117. https://doi.org/10.1023/A:1024229812303

Juran, L., & Trivedi, J. (2015). Women, Gender Norms, and Natural Disasters in Bangladesh. *Geographical Review*, *105*(4), 601–611. https://doi.org/10.1111/j.1931-0846.2015.12089.x

Keim, M. E. (2011). Preventing Disasters: Public Health Vulnerability Reduction as a Sustainable Adaptation to Climate Change. *Disaster Medicine and Public Health Preparedness*, *5*(2), 140–148. https://doi.org/10.1001/dmp.2011.30

Laugharne, J., Van de Watt, G., & Janca, A. (2011). After the fire: The mental health consequences of fire disasters. *Current Opinion in Psychiatry*, *24*(1), 72–77. https://doi.org/10.1097/YCO.0b013e32833f5e4e

Lê, F., Tracy, M., Norris, F. H., & Galea, S. (2013). Displacement, county social cohesion, and depression after a large-scale traumatic event. *Social Psychiatry and Psychiatric Epidemiology*, *48*(11), 1729–1741. https://doi.org/10.1007/s00127-013-0698-7

Liu, J. C., Pereira, G., Uhl, S. A., Bravo, M. A., & Bell, M. L. (2015). A systematic review of the physical health impacts from non-occupational exposure to wildfire smoke. *Environmental Research*, *136*, 120–132. https://doi.org/10.1016/j.envres.2014.10.015

Lowe, S. R., Sampson, L., Gruebner, O., & Galea, S. (2015). Psychological Resilience after Hurricane Sandy: The Influence of Individual- and Community-Level Factors on Mental Health after a Large-Scale Natural Disaster. *PLOS ONE*, *10*(5). https://doi.org/10.1371/journal.pone.0125761

Macias Fauria, M., & Johnson, E. A. (2008). Climate and wildfires in the North American boreal forest. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *363*(1501), 2315–2327. https://doi.org/10.1098/rstb.2007.2202

Marmot, M., Bloomer, E., & Goldblatt, P. (2013). The Role of Social Determinants in Tackling Health Objectives in a Context of Economic Crisis. *Public Health Reviews*, *35*(1), 1–24. https://doi.org/10.1007/BF03391694

McGee, T. K. (2007). Urban residents' approval of management measures to mitigate wildland–urban interface fire risks in Edmonton, Canada. *Landscape and Urban Planning*, *82*(4), 247–256. https://doi.org/10.1016/j.landurbplan.2007.03.001

McLean, C. P., Asnaani, A., Litz, B. T., & Hofmann, S. G. (2011). Gender differences in anxiety disorders: Prevalence, course of illness, comorbidity and burden of illness. *Journal of Psychiatric Research*, *45*(8), 1027–1035. https://doi.org/10.1016/j.jpsychires.2011.03.006

Mell, W. E., Manzello, S. L., Maranghides, A., Butry, D., & Rehm, R. G. (2010). The wildland—Urban interface fire problem—Current approaches and research needs. *International Journal of Wildland Fire*, *19*(2), 238–251. https://doi.org/10.1071/WF07131

MNP LLP. (2017). *A Review of the 2016 Horse River Wildfire: Alberta Agriculture and Forestry Preparedness and Response*. https://www.alberta.ca/assets/documents/Wildfire-MNP-Report.pdf

Morgan, J. (2016, August 23). Alberta in worst recession since government began recording data in 1980s as deficit balloons to $10.9 billion | Financial Post. *Financial Post*. https://financialpost.com/news/economy/alberta-in-worst-recession-since-government-began-recording-data-in-the-1980s-as-deficit-balloons-to-10-9-million

Neria, Y., Nandi, A., & Galea, S. (2008). Post-traumatic stress disorder following disasters: A systematic review. *Psychological Medicine*, *38*(4), 467–480. https://doi.org/10.1017/S0033291707001353

Olff, M. (2017). Sex and gender differences in post-traumatic stress disorder: An update. *European Journal of Psychotraumatology*, *8*(sup4). https://doi.org/10.1080/20008198.2017.1351204

Perilla, J. L., Norris, F. H., & Lavizzo, E. A. (2002). Ethnicity, Culture, and Disaster Response: Identifying and Explaining Ethnic Differences in PTSD Six Months After Hurricane Andrew. *Journal of Social and Clinical Psychology*, *21*(1), 20–45. https://doi.org/10.1521/jscp.21.1.20.22404

Purdy, C. (2016, August 16). Painful memories causing sleepless nights for Fort McMurray fire victims: Study. *National Observer*. http://search.proquest.com/docview/1812347873/abstract/77F8DEA6839F4DB8PQ/1

Quinlan, P. (2016, December 19). 'The Beast' is still burning east of Fort McMurray 1 year later. *Global News*. https://globalnews.ca/news/3137099/the-beast-is-still-burning-east-of-fort-mcmurray/

Rappold, A. G., Stone, S. L., Cascio, W. E., Neas, L. M., Kilaru, K. V., Carraway, M. S., Szykman, J. J., Ising, I., Cleve, W. E., Meredith, J. T., Vaughan-Batten, H., Deyneka, L., & Devlin, R. B. (2011). Peat Bog Wildfire Smoke Exposure in Rural North Carolina Is Associated with Cardiopulmonary Emergency Department Visits Assessed through Syndromic Surveillance. *Environmental Health Perspectives*, *119*(10), 1415–1420. https://doi.org/10.1289/ehp.1003206

Ritchie, A., Hrabok, M., Igwe, O., Omeje, J., Ogunsina, O., Ambrosano, L., Corbett, S., Juhás, M., & Agyapong, V. I. (2018). Impact of oil recession on community mental health service utilization in an oil sands mining region in Canada. *International Journal of Social Psychiatry*, *64*(6), 563–569. https://doi.org/10.1177/0020764018785401

Sohrabizadeh, S., Sogand Tourani, P., & Khankeh, H. R. (2016). Women and health consequences of natural disasters: Challenge or opportunity? *Women & Health*, *56*(8), 977–993. https://doi.org/10.1080/03630242.2016.1176101

Soja, A. J., Tchebakova, N. M., French, N. H. F., Flannigan, M. D., Shugart, H. H., Stocks, B. J., Sukhinin, A. I., Parfenova, E. I., Chapin, F. S., & Stackhouse, P. W. (2007). Climate-induced boreal forest change: Predictions versus current observations. *Global and Planetary Change*, *56*(3), 274–296. https://doi.org/10.1016/j.gloplacha.2006.07.028

Spracklen, D. V., Mickley, L. J., Logan, J. A., Hudman, R. C., Yevich, R., Flannigan, M. D., & Westerling, A. L. (2009). Impacts of climate change from 2000 to 2050 on wildfire activity and carbonaceous aerosol concentrations in the western United States. *Journal of Geophysical Research: Atmospheres*, *114*(D20). https://doi.org/10.1029/2008JD010966

Stacey, J. (2018). Vulnerability, Canadian Disaster Law, and The Beast. *Alberta Law Review*, *55*(4), 853–888.

Statistics Canada. (2017a). *Fort McMurray [Population centre], Alberta and Saskatchewan [Province]* (Census Profile Statistics Canada Catalogue no. 98-316-X2016001; 2016 Census). Government of Canada. http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=POPC&Code1=0292&Geo2=PR&Code2=47&Data=Count&SearchText=FortMcMurray&SearchType=Begins&SearchPR=01&B1=All&wbdisable=true

Statistics Canada. (2017b). *Alberta [Province] and Canada [Country]* (Census Profile Statistics Canada Catalogue no. 98-316-X2016001; 2016 Census). Government of Canada. https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E

Szeto, K., Zhang, X., White, R. E., & Brimelow, J. (2016). The 2015 Extreme Drought in Western Canada. In S. C. Herring, A. Hoell, M. P. Hoerling, J. P. Kossin, C. J. S. Iii, & P. A. Stott (Eds.), *Explaining Extreme Events of 2015 from a Climate Perspective* (Vols. 97, No. 12, pp. S1–S145). Bulletin of the American Meteorological Society.

Tally, S., Levack, A., Sarkin, A. J., Gilmer, T., & Groessl, E. J. (2013). The Impact of the San Diego Wildfires on a General Mental Health Population Residing in Evacuation Areas. *Administration and Policy in Mental Health and Mental Health Services Research*, *40*(5), 348–354. https://doi.org/10.1007/s10488-012-0425-9

Tavaglione, N., Martin, A. K., Mezger, N., Durieux-Paillard, S., François, A., Jackson, Y., & Hurst, S. A. (2015). Fleshing out vulnerability. *Bioethics*, *29*(2), 98–107. https://doi.org/10.1111/bioe.12065

Thomas, V., & López, R. (2015). *Global Increase in Climate-Related Disasters* (p. 45). Asian Development Bank. https://reliefweb.int/sites/reliefweb.int/files/resources/global-increase-climate-related-disasters.pdf

Van Aalst, M. K. (2006). The impacts of climate change on the risk of natural disasters. *Disasters*, *30*(1), 5–18. https://doi.org/10.1111/j.1467-9523.2006.00303.x

Wahlbeck, K., & Mcdaid, D. (2012). Actions to alleviate the mental health impact of the economic crisis. *World Psychiatry*, *11*(3), 139–145. https://doi.org/10.1002/j.2051-5545.2012.tb00114.x

Wang, X., Studens, K., Parisien, M.-A., Taylor, S. W., Candau, J.-N., Boulanger, Y., & Flannigan, M. D. (2020). Projected changes in fire size from daily spread potential in Canada over the 21st century. *Environmental Research Letters*, *Advance Online Publication*. https://doi.org/10.1088/1748-9326/aba101

Weiss, M. G., Saraceno, B., Saxena, S., & van Ommeren, M. (2003). Mental Health in the Aftermath of Disasters: Consensus and Controversy. *The Journal of Nervous and Mental Disease*, *191*(9), 611–615. https://doi.org/10.1097/01.nmd.0000087188.96516.a3

Westhaver, A. (2017). *Why Some Homes Survived: Learning from the Fort Mcmurray Wildland/urban Interface Fire Disaster*. Institute for Catastrophic Loss Reduction.

Wetcher-Hendricks, D. (2011). *Analyzing Quantitative Data: An Introduction for Social Researchers* (1st ed.). John Wiley & Sons, Incorporated. http://ebookcentral.proquest.com/lib/sfu-ebooks/detail.action?docID=1602765

Williams, N. (2016, June 14). Humans probably caused Fort McMurray wildfire: Canadian police. *Reuters*. https://www.reuters.com/article/us-canada-wildfire-cause/canadian-police-say-fort-mcmurray-wildfire-likely-caused-by-humans-idUSKCN0Z02OO

Yin, R. K. (2018). *Case Study Research and Applications: Design and Methods* (6th ed.). SAGE Publications, Inc.

Chapter 5.

Discussion

5.1. Introduction

In this chapter, I aim to illustrate how a modified environmental justice perspective (as described in Chapter 3) can be applied to a real-world scenario (Chapter 4), to determine the justness of mental health outcomes.

To do this, I will remind the readers of components which are found near-ubiquitously in accounts of environmental justice. After analysing how accounts of environmental justice have been previously applied to natural disasters, I will briefly recapitulate the mental health outcomes of the Fort McMurray disaster. Taken together, these sections will provide the relevant context for my analysis of justice.

My justice analysis begins with a consideration of the role of the oil sands in contributing to the mental health outcomes of the Beast. Given the nature of mental health outcomes and natural disasters, the concept of risk is interwoven through this section to help better illustrate some of the ethical tensions inherent in the case. I evaluate the impact of the oil sands on socioeconomic status and gender, which are both factors that may contribute to increased risk of mental illness in natural disasters. Secondly, I address the role that the oil sands (firstly, as any industry; secondly, qua oil sands) may have played in putting people at risk. I establish three tentative categories of risk to aid in considerations of justice. Throughout the discussion, I highlight that prevention is a necessary component of an account of environmental justice. In my discussion of risk, I also explicate the role that transparency has in regards to prevention. I use a distributive justice lens to tease apart and comment on the associated benefits and harms of the oil sands, arguing that it is in theory possible to keep the distributive benefits, while reducing associated burdens.

In conducting this analysis, certain necessary features of an account of environmental justice became apparent. Therefore, the concluding section of this chapter will point to what more is needed for an account of environmental justice to be able to assess the justness of mental health outcomes related to natural disasters. Finally, I discuss the limitations encountered and relevant observations that occurred to me during this analytic process.

5.1.1. Features of Environmental Justice

As discussed in my ethical analysis chapter, there are certain features which are present near-ubiquitously in theories of environmental justice. In that chapter, I intentionally did not relate these qualities to any case in particular, as the goal of that section was to analyze features that may be relevant to all cases of environmental justice. In order to test the effectiveness of these qualities as they relate to a particular case, I will here give a brief overview of these qualities, with introductory comments on certain aspects as they relate to the case of The Beast in Fort McMurray. This commentary will be more fully developed throughout the chapter, but this section is intended to lay out the groundwork in broad strokes and paint a picture of the larger landscape within which my analysis will then proceed. In applying current traits of a theory of environmental justice to a particular case, it will then also be possible to determine what further qualities are needed.

The first feature of environmental justice is that these theories are predominantly distributive – their concerns lie largely with the distribution of harms and benefits (Mohai et al., 2009). This is in contrast to a theory which expounds the need for an overall reduction in harms, in addition to distributive concerns. This type of theory is argued for by Agyeman in Just Sustainabilities (Agyeman et al., 2003) and it is not the mainstream approach to environmental justice theories. However, in the case of natural disasters, the application of purely distributive theories may be limited as there are few clear benefactors outside of disaster response industries after a disaster strikes. As I will discuss, this fact necessitates a shift from considering solely distributive effects, to implementing preventative efforts.

The second feature of these theories is that they normally contain participatory aspects. Environmental justice theories often explicitly and intentionally shift the power dynamics in decision making away from those with systematic privilege, and towards those who are systematically marginalized or oppressed. For example, Minkler et al. (2008) describe a theoretical model used in their research, the goal of which was geared towards, “increasing citizen and partnership power to achieve improvements in the environment and health” (p. 119). These egalitarian theories argue that it is unjust for one group, people, class, race, gender, etc. to suffer harms from capitalism, exploitation, extraction, and other uses of the environment, while another group prospers from these same actions and systems (Stewart et al., 2014). Although it is systems that are causing the distress, individuals are harmed; a tenet of these theories is that these externally-imposed, ensuing health (and other) problems faced by

marginalized communities or individuals often cannot, and should not, be solved by the community alone (Hall, 2016). Participatory theories often promote and emphasize the inclusion of marginalized members into decision-making; in the context of environmental justice theories, along with this, those in positions of power are also often "invited to the table" (Bacon et al., 2013; Minkler et al., 2008). Those whose voices matter are not solely those who have been harmed, but also those with the necessary connections and tools to effect change, for instance, through policy-making. Thus, those with the appropriate knowledge (however "appropriate" is defined, be it scientific, cultural, or other), also need to be involved in the conversation, to inform the discussion and help ensure that any ensuing decisions are properly grounded in facts, as per Jiwani's (2015) distinction of facts and values.

Thirdly, these theories are both political and pragmatic, as illustrated above. They are nonideal theories, rooted in real-world and typically immediate concerns. This can be contrasted with Rawlsian Justice as Fairness (Rawls, 1971) – a highly influential ideal theory of distributive justice. I further elaborate on the impact of the ideal/nonideal distinction in section 5.3.

The final feature of environmental justice theories (as a result of environmental justice movements) that I will mention is that they seek to right a wrong. Environmental justice movements began in response to a harm that has occurred, with a focus on identifying responsible parties as necessary to rectify or remediate harm caused. Environmental justice theories similarly find their genesis in recognition of a wrong, so that it can be righted. The concept of "environmental debt" is intrinsically tied to the notion of "environmental justice" (Warlenius et al., 2015). Implicit in these theories is the fact that, oftentimes, the redressing harms is predicated on being able to identify a body to whom responsibility can be attributed.

5.1.2. Environmental Justice in Natural Disasters

Environmental justice theories have not often been used to determine justness in the context of natural disasters, although there has been some recent work done in this area (García-López, 2018). For the most part, environmental justice theories have been applied after the fact to analyze the outcome of a natural disaster (for example, Weeden's (2006) paper regarding Hurricane Katrina). I argue that applying a theory of environmental justice to determine the justness of outcomes after a disaster has already occurred is insufficient. Rather, these theories must help to identify possible future harms and work to prevent them, prior to the occurrence of harm. This is because preventing harms/suffering is a greater good than

remedying harms/suffering that have been allowed to occur. Pre-emptive measures of prevention are superior to methods of reparation because methods of reparation can never fully do away with a harm that has already occurred, nor can they fully compensate (if compensations here is taken to mean “return to the original condition”) for a harm. While prevention has been discussed in many contexts, in order to adequately prepare for a large-scale event like a natural disaster it is crucial that both those who are affected by, and those who need to act on, preventative measures have the correct information and the ability to carry out whatever tasks are required. Given the possible severity, it is also imperative that the preventative measures put in place are going to be the most effective. Therefore, two questions of prevention ought to be considered. The first is, to whom was relevant information available, and was there adequate transparency? If precautions have been taken against negative outcomes of natural disasters, a second question which can be posed is: were the precautions taken evidence-informed?

5.1.3. Mental health outcomes

The first step in applying these principles of justice to determine the justness of outcomes is to quantitively understand what the outcomes of a particular disaster were. For this, I used the 2016 fire of Fort McMurray, known as The Beast, as a case study. I briefly review some of the findings described in my case study here, in order to provide context for analysis. In a sense, the results from the Fort McMurray fire of 2016 were congruent with findings from other wildfires, in that there was no clearly discernable group which was most impacted. By some measures and in some cases, particular groups seemed to have experienced worse health outcomes than others, but the group which was the most adversely affected was not the same across multiple measures.

Overall, the increase in mental illness was fairly consistent across different groups with some exceptions. For example, increases in inpatient visits for depression were much greater for men than they were for women. Given that women had higher levels of depression prior to the fire, this increase actually led to more similar rates of diagnosed depression between men and women after the fire. This is one instance of why it is necessary to have a clear definition of “equity”: although greater equality is often confounded with greater equity, it is likely not the case that an increase in harms for one group, such that the levels are similar between groups, is what is desirable for achieving this equality. While this observation may seem to be common-sensical, it is certainly a possibility that one comparatively well-off group may be harmed while

another less-well-off group is helped, given that limited resources are being used to achieve well-being across a population. In a context where not everyone can be helped equally, we must wrestle with the question of whether it is more equitable to maintain the status quo, or whether it is in fact more defensible for some groups to suffer health loss so that a lesser-well-off group can benefit.[13]

Natural disasters are fraught with uncertainty: there is uncertainty as to their occurrence, severity, precise location, and the harms they will cause. Because of this uncertainty, potential harms cannot be "distributed" in the same way as is possible for other situations, for instance, determining eligibility for flu shots. This uncertainty relates to the notion of risk: whichever path is chosen carries with it the risk of having been the incorrect path. Having an environmental justice framework being connected to a broader theory of justice at least can help to provide clarity regarding how equity is understood and utilized. In this way, although precise outcomes cannot be predicted, there can at least be a clearer goal towards which policies are aiming, minimizing associated risk.

The concept of equity is a relational concept (Braveman & Gruskin, 2003), and therefor it is crucial that an appropriate comparator group is chosen when determining equitability of health states after disasters. How does one deal with pre-existing differences in a population? At what point do we determine if those inequalities are inequitable, and, if the starting point was inequitable in itself, then is it true that because harm in two groups increased similarly that an inequity was not worsened? There are two common methods used to compare groups: either comparing one group (Group A) to a different group (Group B), either at a single point in time or over time; or, comparing one group (Group A) to itself, at two different times points (T1 and T2). This can be visualized graphically as either comparing the slopes of two different lines (the first scenario) or as comparing two different points along a single line (the second scenario). For the case study, I took the first approach, of comparing changes in one group (Group A) to changes in a second group (Group B), at three different points in time. A feature of this method is that it ignores any pre-existing differences in health states. This can be of benefit, in that it simplifies the comparison, but also has the troubling consequence of offering no way to reveal pre-existing

[13]In egalitarianism, this is known as the 'leveling down' objection. This objection is relevant to environmental justice theories, although I posit that it is not of central importance, given that the distribution of mental health outcomes after natural disasters is causally much more complicated and uncontrollable than the distribution of wealth or positions of power, to which this argument is generally applied. While it is a key consideration to keep in mind, I will not be pursuing this question further, and instead suggest Segall (2010), Brake (2004), or Doherty (2007) for further reading on this objection.

vulnerability of inequalities within the population. Addressing pre-existing inequalities did not fall within the scope of the project, so this line of exploration was not pursued; nevertheless, the ensuant consequences of how the questions of equity posed above are answered will impact affected groups.

5.2. Justice considerations

The considerations discussed in the preceding sections offer a foundation on which the rest of this analysis is built. The analysis that I present in the remainder of this chapter reflects both contextual features and theoretical findings which may affect the justness of outcomes.

5.2.1. Oil sands as an economic driver

Fort McMurray and surrounding areas are in the midst of the Athabasca Oil Sands, which represent the third largest oil sand deposit in the world. A large driver for population growth in the area has been employment and economic opportunities (Keough, 2015). The average earnings of individuals in Fort McMurray is substantially higher than that of the rest of Alberta (Statistics Canada, 2017a). For those who are able and who seek economic gain, working in the oilfields is a lucrative opportunity. Growth of the Athabasca oil fields – which has not been uncontroversial (e.g., the Jackpine Mine Expansion Project (Alberta Energy Regulator & Canadian Environmental Assessment Agency, 2013; Zalik, 2015)) – and the concomitant growth in manpower required to sustain these large operations has been the primary reason for the growth in the population of Fort McMurray (Blake, 2016). Stacey (2018) has made poignant observations around that fact:

> A wildfire in the middle of the boreal forest may not be a disaster. But a wildfire in the boreal forest bearing down on a remote city of 80,000 people with only one highway out of town has all the makings of a disaster. […] Writing about the Lisbon earthquake over 300 years ago, Jean-Jacques Rousseau famously penned: “it was hardly nature that there brought together twenty-thousand houses of six or seven stories.”43 Indeed, the same can be said for Fort McMurray: it was hardly nature that built one of Alberta’s major urban centres in the middle of the vast boreal forest. (p. 859).

The oil sands, therefore, have a role in determining the number of people who were at risk of a wildfire in that the oil sands were an economic driver, incentivizing many people to live in a particular area. The purpose of considering the oil sands purely as an economic driver is that it disentangles possible responsibilities relating to the fact that oil sands are also a

contributor to climate change, which increases the chance of wildfires. The possible responsibilities of oil sands as an economic driver, and oil sands as contributors to climate change, will be dealt with separately. In this section, the same questions could be posed of any industry which implements pull factors encouraging people to move to an area at risk of a natural disaster.

Given that Canada is a capitalist society, economic drivers are generally viewed positively as they create jobs for the citizens and have other beneficial effects. Because these positively-viewed economic drivers can cause harm – for instance, to individuals, or to the environment – the Canadian government uses rules and regulations to attempt to keep the risk of these harms (or the harms themselves) to what is deemed to be an acceptable limit. Living or working in certain areas that are at risk of a natural disaster may pose a risk of harm to individuals. This raises the question of: what duties or responsibilities might the government have towards people who choose to live in places at risk of particular, identifiable dangers, as a result of economic or other draws? I will attempt to answer that question – or if not to answer fully, then to offer my thoughts on aspects related to risk, responsibility, health impacts, and particular types of vulnerability that may be seen in these contexts – over the following pages.

Establishing context: Socioeconomic Status and Gender in Fort McMurray

In my analysis of a case study (Chapter 4), I sought to examine the impact that socioeconomic status and gender may have had on mental illness. In my analysis, no clear pattern was found (although it may be possible to distinguish a pattern utilizing other methods); however, there are many contextual features regarding these outcomes which deserved to be explored, especially because they are directly related to the fact that this study was carried out in a town whose economy is driven by the oil and gas industry.

I will here briefly restate some of the results presented in my case study chapter so that these particular results can be analysed. In 2016, 80% of those living in Fort McMurray made more than $100,000 per year. The total average market income (2015) was $103,280; disaggregated by sex, those figures are $132,680 for males, and $68,148 for females (Statistics Canada, 2017b). These incomes greatly exceed the average income in Alberta at that time, where the total average market income was $62,997; for males, $80,282, and for females, $44,766 (Statistics Canada, 2017c). My analysis disaggregated income by income quintiles; however, no direct numbers for income were given. Nevertheless, in comparing with these

numbers, the top two to three quintiles would all be making over $100,000 per year[14]. Financial stability can act as a protective factor against mental illness. In comparing the top two quintiles of earners, then, in the case of Fort McMurray this may mean comparing those who are all making over (say) $120,000 – but with one group perhaps making $20,000 more on average than the other. If income has decreasing utility in acting as a protective factor above a certain point – by which I mean a $20,000 difference in income will be much more pronounced for someone making $40,000/year than someone making $120,000 per year – the question arises as to whether differences seen in income quintiles are the result of the income level itself, or perhaps there are other factors at play. I would suggest that, given the clear delineation of illness by income level, the role of income in substance use is directly correlated; however, given the lack of a clear pattern by income in the other cases, it may be that the level of income is such that any protective factors it offers against mental illness may be experienced relatively equally by all the population. This is a hypothesis which would need further research.

Another fact to notice is that females have a significantly lower income than males. While this is true at a provincial level as well, the differences are more pronounced in Fort McMurray. In Alberta, on average men earned approximately 1.79 times as much as women; in Fort McMurray, that number was 1.95. The number of women in the lowest quintile is higher than men – using census data from 2015 to find the aggregation of men and women in approximate quintiles[15], it was determined that the lowest-earning quintile earned below $40,000/year, and was comprised of twice as many women as men, even though there were almost two-thirds more men than women who were represented. While the exact interaction between sex and income was not able to be analysed in this study, an intersectoral analysis which appropriately weighs both sex, income, and the interactions between the two would be especially insightful in the context of a resource-extracting community such as Fort McMurray.

This is an example of a context-dependent factor, which are key to environmental justice theories. Income (or rather, comparative lack of income) and sex can both act as factors contributing to vulnerability. The way in which those factors interact with each other may be unique in this community. The idea of intersectionality (Morrison, 2015) helps to illustrate the

[14] As the average (not median) income was approximately $100,000, it follows that half of the five quintiles would earn more than that, and half would earn less.

[15] Note that this data source is different than what was used in the analysis of data from Alberta Health. The numbers given do not represent precise quintiles and are only meant to illustrate a trend rather than provide exact percentages.

importance of understanding both vulnerabilities separately, but also the way they can magnify and multiply each other. The idea of intersectionality points to the reality that the whole (of vulnerability) can be greater than the sum of its parts. To illustrate, lack of sufficient or reliable income may lead to a certain amount of vulnerability, and sex to a different amount; but the vulnerability for women of low or unstable income may be magnitudes greater than for either of those factors separately. For natural disasters, the consequences of this interaction can be immediate, if indeed the interactions of vulnerabilities results in increased risk of harm. The importance of prevention in the theory of environmental justice cannot be overstated in cases such as these in order to avoid harms to individuals who are already at higher risk, instead of preparing or attempting to minimize their impact later. While from an epidemiological perspective overall impact may be reduced at a population level, there remains a higher chance that the risk which occurs will disproportionately impact those most vulnerable.

5.2.2. Oil Sands and Risk

Before assessing the role of oil companies in this context, it must be explained why it is necessary to explore the possible responsibilities of oil companies – as the industry which acted as an economic driver, and as oil companies in particular – in the occurrence of mental illnesses after the fire. The short response to this is that it is because environmental justice theories are political theories. These theories are action-based, pragmatic, and upon identifying an injustice, they call for change. Identifying those who may be responsible for causing damage, and therefore may be responsible for preventing, rectifying, remediating, and otherwise making reparations for unjust harms suffered, is a main goal of these theories. Identifying an injustice is only half the battle.

There are three areas of risk which I would like to explore: working in proximity to a risky environment; risks associated with the work itself; and, risk of harm to those surrounding the location in question. I will call these proximal risks (in proximity to a risky environment), direct risks (risks resulting as a direct result of the work itself), and indirect risks (risks arising indirectly from proximity to a risky workplace). These types of risks are not unique to Fort McMurray but are likely relevant to many situations.

To note, there are also many risks associated with oil sands that are not specifically work-related. One of these is climate risk. It is well-known that the oil industry contributes to climate change, which, through a series of causal events, poses risk both to the oilfield workers,

the natural environment surrounding the oilfields, and at macro levels, the global population. While there is an indirect aspect of this risk, the "indirect" in the preceding category of risk pertains primarily from an individual's physical proximity to a workplace, whereas the "indirectly" in a climate-risk sense pertains more to the causal chain between action and consequence: there are a series of complicated and interacting steps between extraction of oil from oil sands, to negative climate effect. Of course, these particular steps will vary, depending on the "negative climate effect" in question. In this section, I aim to examine risks which are in direct causal relationship to a particular working environment, or particular type of work, and therefore will not be discussing the important and latticed category of climate risk. This discussion is warranted, however, as there are definitive risk pathways which extend, through a number of vectors, between greenhouse gas emissions and increased wildfires, amongst many other concerns.

Before individually examining these categories, it is important to clarify what is meant by 'risk'[16]. The concept of risk is paramount in discussions of natural disasters (Wisner et al., 2004). Vulnerability, or being more likely to incur harm than others, is also extremely relevant to the idea of risk: "very often people are disadvantaged because they are exposed to risks which they would not have taken had they had the option or are forced to take risks that in one way or another are bigger than others are being exposed to take" (Wolff & De-Shalit, 2007, p. 66). The idea of risk can be intuitive, but has many components. For my purposes, I will borrow from Oberdiek's observation regarding the way 'risk' is used in common parlance. As he states, "Sometimes, [risk] means the probability that a bad thing will occur, while other times it means not the bare probability of a bad thing happening, but that probability multiplied by the degree of badness of the bad thing" (Oberdiek, 2017, pp. 15–16). Both the probability of occurrence and the magnitude of risk imposed is relevant in discussing environmental justice issues. The concept of risk is further muddied by the fact that in many cases it relies on probability – and, I would suggest, that this account of probability can be applied to both the occurrence ("probability of a bad thing [disaster] occurring"), and magnitude ("probability of the extent of harm that may occur [mental/physical illness] as a result of a bad thing [disaster] occurring".

[16] The concept of 'risk' is one which is highly theorized and discussed within the philosophical literature. While I introduce it as a concept which can help clarify different areas of consideration which are of import in a theory of justice, the purpose of this section is not meant to further the conversation of 'risk' from the perspective of philosophical discussions thereof. Rather, its inclusion here is meant to further the conversation of environmental justice, by incorporating these understandings of risk.

Note that there is a third option, namely, that a bad thing can occur, with no resulting harm.) These probabilities will be kept in mind as I examine the following three categories of risk.

Direct Risk

The first situation of risk that I will mention is risk that is primarily associated with the work itself (direct risk). These risks fall under the umbrella of workplace hazard. They are generally well-defined and regulated, and in some instances compensated as is the case for hazard pay. (Whether or not there is compliance with these standards is another matter.) Presumably, those who work in oil fields are aware of these types of risks. This category is relatively straightforward and is not of direct pertinence to this particular environmental justice issue.

Proximal Risk

The second area of risk to be explored is that of working in proximity to a risky environment (proximal risk). One example of this is mining. There are certainly direct risks associated with this line of work. But, leaving aside the hazards associated with the work in particular, we can also look to the location where the work is situated. Due to the nature of mining, it has to occur in a given location: unlike, perhaps, a water purification plant, or a factory. With employment such as mining, it is of necessity localised. One may also think of other jobs, for instance, those involving animal-tracking (whether for research, conservation, or hunting) as having this same limitation: the choice of location is relatively non-negotiable.

Now that we have established that certain types of employment are required to happen in a particular environment, we can turn our attention to the environment itself. Common framings of the environment present it as either a source of risk to humans or as a benefit to humans. The concept of a natural disaster itself shows how we view the environment as a source of risk. As Wisner et al. (2004) note:

> The crucial point about understanding why disasters happen is that it is not only natural events that cause them. They are also the product of social, political and economic environments (as distinct from the natural environment), because of the way these structure the lives of different groups of people. There is a danger in treating disasters as something peculiar, as events that deserve their own special focus. It is to risk separating ‘natural’ disasters from the social frameworks that influence how hazards affect people, thereby putting too much emphasis on the natural hazards themselves, and not nearly enough on the surrounding social environment. (p. 4)

However, as many news articles reveal, in the occurrence of a natural disaster, we look to nature, and not social conditions, as the sole culprit: “Hurricane Takes Lives”; “Flooding Destroys Homes”; or “Fire Ravages Community” are all familiar headlines. The second way we see nature is as a benefit to us, which is embedded in the idea of a carrying capacity (Binder et al., 2020; Cohen, 1997; Mote et al., 2020): how much of the Earth’s resources can we use before it will cease to be a benefit and become a harm?

This same mentality is also held in relation to many employments that occur in close proximity to the natural environment, for instance, mining. In the process of extracting benefit, there may also be harm that arises as a result of being in a particular environment. Being in a particular environment presents a set of risks that are particular to that environment. Taking natural hazards as the example, this may be a probability of wildfire, or flood, or earthquake. The probability of occurrence, and the probability of harm, will likely differ in each of these scenarios – both from the magnitude of the hazard should it occur, and from the social structures surrounding where the hazard occurs. While this is not a direct risk from the work itself, as the risk could cease if the work could happen in a different location, certainly there is an aspect of risk that is inherent in work that must be localised.

Fort McMurray is situated in the middle of the boreal forest. The year prior there had been a massive drought, and many were concerned that the fire season the following year would be catastrophic (MNP LLP, 2017). This occurred in tandem with the provincial budget for firefighting being decreased (Graney, 2016) – which, notably, a report from Alberta Agriculture and Forestry did not deem to be a significant factor in how The Beast was responded to (MNP LLP, 2017, p. 33). Even with allowances made for the shortcomings of foresight, there was enough evidence available to indicate that a large wildfire was a pressing and immediate risk, both due to natural processes – that the boreal forest is regenerated by fire – and by the extreme climate circumstances of the preceding year.

Those who worked in the oilfields were therefore put at risk by virtue of being in an environment that was risky. Given the economic possibilities present in working in the oil industry, many individuals may relocate to that area for financial reasons. Is there a responsibility for the employer to then inform possible employees of environmental risks? I believe that in this case we can follow the principle of informed consent. Based on the probability of occurrence, and probability of magnitude, it may be the case that if an individual is

aware of the risks, yet still chooses to work there, they are making an informed decision for their benefit.

Of course, this answer is complicated by a number of factors. Firstly, if someone is being pulled by the draw of financial gain due to a lack of resources, we must ask whether they are truly giving informed consent – this is akin to terminal patients enrolling in drug trials with hidden hopes of a cure (Carrieri et al., 2018; Luce, 2003). Was this the case in Fort McMurray? To even ask this question, it must be presupposed that my previous answer of informed consent is both correct, and has been implemented – even if the first point stands[17], it is unlikely that such warning of wildfire was given to those relocating for their employment. Thus, any answer that is provided could at best be speculation.

The idea of informed consent is embedded in a political ideal of liberalism. While individuals are free to make choices, in many instances that freedom is limited or curtailed in any number of ways. We make individual choices against a backdrop of unchosen limitations and incentives. Informed consent must both involve an adequate sharing of information, and adequate freedom from coercion to make a decision that best aligns with the goals that we are trying to meet; in the case of medical treatment, it has been said that informed consent "requires (1) that patients are provided with and understand information about the treatment options and the risk and benefits involved (ie, adequate disclosure), (2) that patients are capable of deliberation, and (3) that their choice is not the outcome of undue influence." (Ploug, 2018, p. 543). There may be a point at which financial incentives are such that they no longer act as incentives, but affect an individual in a way that undermines freedom from coercion in their decision-making (Gelinas et al., 2018). Framing the question as one which is solely individual choice and thus individual responsibility is blind to the context in which these choices are being made. According to Shrader-Frechette (2002), "If freedom involves both the opportunity to choose between genuine alternatives and ready access to knowledge that will make the selection an informed one, then ignoring environmental justice issues may limit freedom" (p. 46).

[17] The first point being that we ought to adopt a model of informed consent, which includes both the possibility of harm directly related to work, as well as possibility of harm from the surrounding environment in which the work occurs. Even if this model was accepted and adopted, it may not have been the case that the probability of wildfire was such that employees should have been warned about it; given that humans have a very difficult time understanding and evaluating risk, it is also uncertain whether informing someone of this risk would really have any benefit, given that the possible gain is immediate and significant, so any mention of risk may seem inconsequential.

While the oilfield workers may have been aware of workplace hazards, it is unclear if they had "ready access to knowledge" regarding the proximal risks associated with the oilfield.

The responsibility for managing this risk may not reasonably have fallen onto the shoulders of the oilfield worker. Life, after all, is not devoid of risks; typically, our strategy is one of risk-mitigation. While the individual oilfield worker could have mitigated their risk by simply refusing the position, and therefore not working in the environment, certainly other risk mitigation strategies are possible. But, whose responsibility ought they to be? While the government is responsible for environmental disaster planning, there may be reason to believe that companies also have a responsibility to ensure the health and safety of their workers in regards to proximal risks, particularly if the job location is such that it cannot be performed elsewhere.

Having knowledge about what preparation measures may have been taken by the government or businesses, then, seems to be imperative in order to move closer to understanding the outcomes of The Beast through an environmental justice lens. While I looked for documentation regarding prevention, it should be specified that this documentation is not specific to oilfield workers (such as is proximal risk, as I have described it), but is for all those who lived in the area which was affected by the fire. Nevertheless, there seems to be either a lack of documentation or low transparency regarding what, if any, mitigation measures were taken by the government of Alberta in order to reduce risk from wildland-urban interface fires. Planning regarding mental health outcomes could also not be found. This does not indicate that no such planning took place, but without adequate consultation with those who may have access to this information, it cannot be determined whether a plan was in place for the mitigation of mental illness as a result of wildfire. Further to this, without knowledge of such a plan, there can be no analysis as to compliance to its prescriptions, nor its efficacy.

A psychosocial response and recovery report was also undertaken, sponsored by Alberta Health (Kulig et al., 2017). These responses did prioritize vulnerable populations, although 'vulnerability' was not defined in the report. The goal of the psychosocial response was to promote post-traumatic growth in relying on individual areas of resilience. This seems to have been done successfully, as "[c]onsistently participants replied to questions with stories of strengthened relationships, communities, and sense of self- and community-efficacy" (Kulig et al., 2017, p. 19). In the midst of a disaster, it is certainly laudable to aim towards growth and expand resilience. Nonetheless, as I have argued in my ethical analysis, relying on resilience

shifts the burden from on the shoulders of government (or in this case, possibly on industry) to being on the shoulders of individuals. If there was no preparation for the mental health outcomes of this fire, then that cannot be made up for by positive outcomes which have relied on an individual's capacity for resilience.

Indirect Risk

The third concept of risk that I will assess is what I call 'indirect risk', meaning harms that may occur as a result of living in close proximity to hazards, which result from particular workplaces. The risk, in these scenarios, is only extant due to the activities of other humans. This is the scenario which is most often discussed in environmental justice. These are the cases of water poisoning in Flint (Campbell et al., 2016), or dumping PCB-contaminated soil along the road shoulders of the Warren county (McGurty, 1997). And it is this category, I believe, that is most problematic in Fort McMurray. I will examine two instances of indirect risk: firstly, the risk that comes to family members; and secondly the risk that arises to community members, using the conflict surrounding health outcomes (in the oil sands in general and Fort Chipewyan in particular (Chalifour, 2010; McLachlan, 2014)) and a lawsuit led by the Beaver Lake Cree Nation (Donald, 2012; Lameman v Alberta, 2013) as particular examples of those affected by this type of risk.

Not all who move to work in the oilfields move there in isolation. Some also come with families. A large reason for the growth in population in Fort McMurray was linked to oil sand development, which would include families who relocated due to one member's employment opportunity. While adults typically have the authority to make decisions regarding their own welfare, within the constraints that I discussed above regarding freedom and informed consent, children do not have this liberty. No clear patterns were distinguishable in the outcomes of mental illness from Fort McMurray among adults; however, Brown et al. (2019) found significant increases in anxiety in children after the Fort McMurray fire as compared to children living in Red Deer. Of course, increases in mental illness are to be expected after having experienced a natural disaster. Previous research has found children to be more vulnerable to mental illness in the wake of a disaster, which has been attributed to their lack of prior experiences from which to draw upon and the fact that their brains are still developing (Dodgen et al., 2016). Yet, counterfactually, these children may not have been exposed to this disaster, had their families not been in the area due to the involvement of the oil sands. This would be true of any industry where there is proximal risk. The problematic point regarding mental illness in children is that

children are not capable of consenting to these risks, and parents have a fiduciary relationship with their children. Therefore, if parents have limited freedom to consent to risks, or if they are not informed of these proximal risks, then ensuing harm may not only come to them but to those most vulnerable in the family.

The most common battle of environmental justice movements, and rightly so, concerns indirect risks to those who pre-inhabited an area, which is now experiencing the risk of, or actualization of, development/industry-related harms. While communities surrounding the oil fields have reported health concerns, whether these concerns relate directly to the oil sands is a matter of debate – the outcome of research is frequently that more research is needed (Bari & Kindzierski, 2018; Chalifour, 2010; Edwards, 2014; Gosselin et al., 2010; Nikiforuk, 2008). While waiting for this research to materialize and consequent action to be taken, individuals and communities continue to be at risk of harm, through no choice of their own.

In 2010, the Royal Society of Canada Expert Panel released a comprehensive report on the Environmental and Health Impacts of Canada's Oil Sands industry (Gosselin et al., 2010) which concluded that the residents of the Regional Municipality of Wood Buffalo were experiencing higher level of health risks than in comparable Alberta towns; however, the report notes that there health risks are also comparable to other boomtowns. Environmental justice perspectives have been used to discuss the uncertainty of risks posed by oil sands projects. Chalifour (2010) uses an environmental justice perspective to analyse the higher rates of cancers and illness occurring in the Fort Chipewyan community, putatively in relation to the oil sands development. Contrary to other instances of environmental justice, she states that in cases such as this, "[t]he issue is not that energy companies have deliberately chosen to locate their projects near Aboriginal communities. Rather, the concern is that the government-sanctioned actions of those companies are resulting in marginalized communities bearing a significant burden of environmental harm as compared to the more privileged communities" (p. 46). The environmental justice concerns related to oil sands projects are also a focal point in the lawsuit raised by the Beaver Lake Cree Nation, which partially overlaps with the RMWB, against the governments of Alberta and Canada, arguing that the cumulative effects of the oil sands development impacts the land such that it infringes on their Treaty rights (Lameman v Alberta, 2013).

In relation to the health outcomes of Canada's oil sands, the Royal Society Expert Panel (Gosselin et al., 2010) concluded the following:

> "Effects on community health and effects on the wider determinants of health and well-being are considered as being highly negative effects because they affect both physical and mental health directly or indirectly and in some cases may be permanent in nature. They can be high intensity, long-duration effects, occurring over a wide geographical area and affecting a large number of people (over 500 people).
>
> However, some effects can also be beneficial, mainly through increased employment and income, and in that case, they are also considered highly positive effects as they can enhance well-being significantly and reduce exacerbations of existing illnesses as well as the occurrence of acute or chronic diseases." (p. 261)

In other words, the physical and mental health risks and harms that are highly negative result directly from the oil fields qua oil fields. The highly positive effects are related to employment and income, which can be attained through other industries. From this perspective, it is in theory possible to keep the benefits that the oil sands are providing in terms of health outcomes, while obviating the highly negative effects. Since environmental justice theories often are concerned with distribution of burdens and benefits, the occurrence and distribution of these positive and negative effects is, in fact, an issue of environmental justice. While the report did discuss mental health, it only used three indices of mental health in its assessment. The few indices coupled with the fact that all data came from Statistics Canada as opposed to original research may indicate that little research has been done regarding mental health in this region; searching through databases did not reveal any further research, either. They found that overall sense of mental health was similar to other regions of Alberta (Gosselin et al., 2010, p. 210), but having a very or somewhat strong sense of communal belonging was over ten percent less (p. 211). They too recommended that there are research needs in the area to better understand the health impacts on mental health (Gosselin et al., 2010, p. 299).

5.2.3. What needs to be added to a theory of environmental justice to make it most useful?

Facts alone do not determine what is the right decision; rather, it is right facts coupled with right values (Jiwani, 2015). "Evidence-informed" must also be understood as research that has been done towards the most effective means of reaching a particular goal. For environmental justice movements, there have been many goals that have been stipulated, and I would suggest that, even if all of them are compatible (which in itself may not be the case), there will have to be a prioritization of goals, as these goals perhaps do not all have equal importance. In understanding the recommendations from evidence-informed research, we must query as to what the goal was of the research.

In order to help prioritize these values and direct research, a second component of environmental justice theories which must be given further consideration is developing theoretical links with a broader theory of justice. This, amongst other benefits, will allow the goals of evidence-informed recommendations to be carefully weighed against the goals stated by an environmental justice framework. For example, while evidence-informed recommendations may be made, we ought to be explicit about if the priority for these recommendations was on saving the most lives, or if there was an equity component in ensuring that lives saved are not all from privileged backgrounds? Having a theoretical connection to a broader theory of justice will allow environmental justice theorists to more easily and consistently borrow from the vast amount of research that has already been done on these questions. A related issue is in ensuring that the sources of knowledge and information that are being used to make these evidence-informed decisions are inclusive. There needs to be a discussion to ensure clarity around what counts as "knowledge". This discussion will lay the groundwork for any environmental justice endeavours with participatory components; and therefore, discussions regarding what type of information counts as "knowledge" ought to be held by groups at all levels (municipal, provincial, federal; non-governmental organizations; charities, etc.) who seek to include multiple perspectives in the discussion.

Environmental justice theories must also have the right scale (Buse et al., 2019). They must be able to function at a political level in order to effect change, while also creating space to recognize the needs of individuals who may be affected by these disasters. Further, they need to have an ability to be grounded in a particular time and specific geography. This connects to the last point which I argued needs to be added to a theory of environmental justice, which is that there needs to be a well-theorized conception of "vulnerability", which can similarly account for differences in context. As has been discussed for Fort McMurray, there are many contextual factors which may influence the vulnerability of particular communities. Without an adequate understanding of these risks, it is difficult to really focus prevention, preparation, and response efforts around those who may be most vulnerable.

These additional three components ought to be considered in conjunction with those that are commonly included in theories of environmental justice: that they are distributive, participatory, political, and that they seek to right a wrong. While these components have been stated separately, it bears noting that they are not all independent, but are in fact connected. How one component is conceptualized will influence how we view the other – for instance, while distributive concerns are at the heart of environmental justice perspectives, it is because those

who are vulnerable are most often harmed. Therefore, an analysis of vulnerability will add more robustness to the understanding of distributive concerns. This will also influence how we consider participatory justice – inclusion of the vulnerable is often at the heart of such a view of justice. Issues of scale arise in consideration of all three layers of justice: while distributive concerns tend to be at an individual level, and participatory concerns are potentially at a community level, political and pragmatic considerations can extend to policies, laws, etc. that impact nations.

Importantly, both individual and societal factors contribute to either health or disease outcomes, which is crucial to bear in mind in an analysis of justice. The is another issue of scale, as it is applied to how issues of mental health are treated. A proper understanding of the mental health outcomes of natural disasters can similarly be undertaken at multiple levels, ranging from biological factors to the way society is structured. For instance, there is evidence suggesting that women tend to experience more anxiety than men due to the way the brain processes fear, and that this anxiety produces more severe outcomes in women than men (Archer, 2019; Day & Stevenson, 2019; McLean et al., 2011; McLean & Anderson, 2009). However, while women participate more frequently in activities creating social cohesion than men – which has been long-known to benefit health (Ferlander, 2007) – women tend to experience worse mental health, suggesting a gendered relationship between social capital and mental health (Berry & Welsh, 2010). During natural disasters, these relationships are simultaneously strained (increased individual and familial physical needs, coupled with often decreased means, and geographical distance can make maintaining relationships more difficult), and more needed (social cohesion, and support of family and friends, are important indicators of mental health outcomes after natural disasters) (Lê et al., 2013; Rung et al., 2017; Townshend et al., 2015; Wong et al., 2019). This can increase the mental burden on women during times of distress, leading to increased anxiety. This is an example of the multitudinous causality of mental illness after natural disasters, illustrating how different explanations can be given depending on at what scale the problem is assessed.

Neither of these above issues of scale or causality are specific to either environmental justice issues, or considerations of mental health effects. Issues of scale are questions that must be dealt with by all theories of justice, requiring either clear distinctions for at what scale the theory is being applied; or, more commonly, an appreciation for the effects of the theory as it is applied at multiple scales. While this is common in other theories of justice, an explicit acknowledgement of this feature in environmental theories of justice would be beneficial.

Acknowledgement of the limitations of scale from environmental justice theories will both allow critiques to be appropriately placed, and may facilitate their implementation. Similarly, in viewing mental health outcomes with questions of scale in mind, I am utilizing a social-ecological perspective of health and illness, which has often been applied for both mental and physical illnesses.

5.3. What type of theory ought we to use?

As I indicated at the outset, I believe that an ideal theory of environmental justice is impossible, given that it needs to interact with real-world situations and account for noncompliance for it to be practicable. Brandstedt (2019) discusses what a non-ideal theory of justice needs to consider. In particular, he highlights three different ways that non-ideal theory had been considered by climate ethicists. The first way that is discussed is that of partial compliance, which confronts the fact that non-compliance, or partial-compliance, is a politically problematic reality which impedes the ability of societies to adequately tackle to problem of climate change. The second distinction he draws is between utopian and more realistic theories of climate change. In this case, realism is conceptualised as solutions which are currently politically practicable, wherein the climate ethicist is able to suggest particular policies and courses of action to take. The third distinction he discusses is that of transitional justice. He states that, “The ‘transition’ is not, or at least not directly, to the ultimate goals of ideal theory. Rather, it is to a clean-energy economy. The theoretical focus is on giving ground to and justification for grievances such a transition may bring about.” (Brandstedt, 2019, p. 229). Brandstedt seems to define “non-ideal” by how it is currently used in climate theory, notably in identifying and expanding on the concepts that the term has been used to capture and bound. In this way, which is likely the purpose in this writing, the author is able to offer multiple solutions forward for achieving the goal of a clean energy economy.

Problematically, what this theorizing takes for granted is the ideal state. As Brandstedt states, “Non-ideal theory presupposes ideal theory: the aim of the former is to approximate the latter” (2019, p. 224). The ideal state which is being approximated through these non-ideal notions of justice is implicitly acknowledged, but never defended, nor is it even made explicit until the third of these considerations of justice. What has been theorized as the ideal state of justice is this: a clean-energy economy. This is certainly an important goal, and one that individuals, companies, and nations should aspire to. However, I contest that it is wrong to have a clean-energy economy as the ideal state of justice towards which climate ethicists are aiming.

My objection rests on two main points. Firstly, that it is possible for such a narrow focus as a clean-energy economy to be the ultimate goal of an account of justice; and secondly, even if such a narrow goal ought to be the focus of justice, it ought not be the focus of an account of environmental climate justice. I shall discuss these in turn.

5.3.1. Narrow Focus

Simmons (2010) leans heavily on Rawls in his discussion of ideal theory. This is not inappropriate, given that it is Rawls who created the initial distinction between ideal and non-ideal theory in his work A Theory of Justice. For Rawls, the ideal/non-ideal distinction turns only on the matter of compliance – whereas ideal theory is meant to capture how a just society ought to function, non-ideal theories are meant to address how to manage and theorize cases of noncompliance while working towards an ideal theory. As Simmons states, "Rawls' account of the ideal-nonideal distinction, of course, constitutes his proposed solution to the venerable problem of characterizing the relationship between philosophical theory and political practice" (2010, p. 6). What is key to note is that the philosophical theory that Rawls was creating regarded the creation of a well-ordered society, and not simply advancing the goals of justice in particular arenas, or domains:

> … [I]f the goal for nonideal theory (that is presented to it by ideal theory) is an integrated goal of overall perfect justice, then neither ideal nor nonideal theory can be pursued "partially" or in piecemeal fashion. There is no reason to suppose in advance that justice in one domain is independent of justice in other domains. So ideal theory cannot set "partial" targets until it first determines that hitting those targets will be consistent with all other aspects of overall societal justice, which implies, of course, the need to first determine at least most of the content of that integrated ideal. (Simmons, 2010, p. 22)

The problem with an ideal of a clean-energy economy is that it is a partial target of what would be required for an entire theory of justice, and therefore should not be considered as the sole ideal to be pursued, but perhaps as one of many principles ("the content", as stated above) to which an ideal theory of justice ought to aspire. However, this move from the goal of an ideal theory, to a goal of an ideal theory, has obvious implications for the non-ideal theories of justice which Brandstedt discussed. Namely, such theories are lacking a reflection of the other goals that should be held in such a theory of justice.

In his writings, Rawls considers neither the environment nor health in great detail. Yet, many tenets and principles have been derived from his writings, and applied in these arenas,

whether correctly or not (for example, the application of the difference principle, which Rawls explicitly states was only meant as a means of regulating the basic structures of society, and not a rule to make decisions in particular instances (Rawls, 1971, p. 53)). When applying something such as the idea of an "ideal theory of justice" to the realms of health, or the environment, it clearly becomes difficult to envisage what such a theory may comprise – while we may have principles that we think are helpful, balancing all of the needs of a society in light of these two unpredictable factors does not produce the clearly theorized society that Rawls was attempting to depict. This is because the very factors that he intentionally removes from his theorizing are those which are currently contributing largely to societal instability, international tensions, and domestic cries of injustice. Given this reality, it seems wise to use the principles from Rawlsian theories which are helpful and can be correctly applied to other instances, and leave behind those things which no longer apply to our circumstances[18]. I only wish to suggest here that the ideal/nonideal distinction can be applied in particular instances, and not solely to entire systems of societal justice, such that it is possible to determine the goal to which our nonideal theories are aspiring. Certainly there would need to be appropriate bounds, and further deliberation over how to handle 'ideal theories of justice' which are at odds with each other.

In Rawlsian terms, an ideal theory is immutable (re: Simmons). Such a restriction, when applied to the practicable realms of health and environment, produces goals which are either impossible, and/or too vague to be helpful. The primary problem with this vagueness is not its impracticability – for it is the purpose of nonideal theories to move society closer to the goals stated by an ideal theory. Rather, it is that we simply cannot know the future, and therefore cannot with certainty theorize an ideal goal, based on the current information and limitations that we have, which will actually represent what is, in fact, the most just future scenario to which we should aspire. Therefore, I suggest we consider the above modification to Rawlsian theory, regarding allowing "domains", not as representing an ideal theory, in the way that he suggested, but rather as a type of "most ideal" theory. By this, I mean a Rawlsian ideal theory, bounded within a particular domain, and without the theoretical limitation of immutability. This is a pragmatic position, and not one that I mean to suggest Rawls himself would adopt (but given his relative silence around the environment and health, it is not one that he has previously opposed, either).

[1] While this suggestion deserves fuller theorizing, that is outside of the scope of this discussion.

5.3.2. Goals of Environmental Climate Justice

With this modification, then, Brandstedt's discussion of climate ethics is perhaps justified. This brings me to the second objection that I have: that a clean-energy economy ought not to be the goal of climate ethics. I indicated above that, should the ideal/nonideal distinction be allowed for only partial theories of justice, an appropriate domain needs to be specified. Let us assume that the domain of climate justice is, indeed, an appropriate domain[19]. If it is, then our conception of an ideal theory of climate justice must address the domain as a whole, and not merely one particular aspect of it.

Having the goal of a clean energy economy drastically reduces the purview of what an ideal theory of "climate ethics" ought to cover. The problem with this is that it is theoretically possible to completely (globally) transition to a clean energy economy, and still have many instances of climate injustice.

In this chapter, I have discussed to the best of my knowledge what would be required in order to determine the justness of outcomes after a natural disaster. This is not an ideal theory of justice for at least two reasons. Firstly, I am using an unfinished theory for the purpose of illustration. Due to the unfinished nature of this theory, the components which I discussed may not (and I would say, likely do not) encompass all of the relevant features which ought to be taken into account when determining justice for mental health and natural disasters, specifically. Secondly, even if all of the relevant components were taken into account, this theory would not address all aspects of environmental health justice, and therefore even though I stipulate goals that we ought to work towards, it does not meet the requirements for an ideal theory of justice, even if this theory is restricted to particular domains. This is the same weakness that is present for Brandtstedt's discussion of climate justice.

In the same way that I specified an ideal theory of justice could be used for smaller domains than for an all-encompassing theory of justice, I argue that a theory of environmental health justice (or its equivalent acceptable domain, however determined) is also able to make use of the ideal/nonideal distinction. I also would suggest that, for the same reasons I have given above for climate justice, this not be considered as a fixed "ideal" theory, but rather as a "most ideal" theory – given the best knowledge that we have to date, in this particular domain,

[19] To clarify, this is the domain that Brandstedt is working within; let us keep separate "climate justice" from "environmental justice", as these are two separate issues.

what would be the requirements of justice? And in fact, this is what I have briefly attempted to do. I have only considered a very small piece of what may be required for a broader “most ideal” theory, and would suggest that the certain areas need to be considered for such a theory to develop in the space of environmental health ethics. The areas I will discuss in turn are privacy, sustainability, and practicability.

Privacy is a key concern in health. Although progress is being made, mental illness is still highly stigmatized. Maintaining privacy of those who are vulnerable, both in obtaining an evidence base and in making plans for harm reduction, must be a key priority. There are very few exceptions for when a patient’s privacy may be breached, and even in those situations, there must be adequate justification. Typically, the only time when a patient’s privacy will be breached is when that patient is a risk of harm either to themselves or others, for example, in the case of suicide, or if a patient carries an infectious disease which is easily spread and may have infected others (Rothstein, 2014). Maintaining the privacy of individuals, and particularly of vulnerable populations whose privacy has historically not always been respected, must be considered in this case. In order to provide an evidence-informed basis for considering certain populations as vulnerable to a particular harm (in this case, mental illness resulting from a natural disaster), it is necessary to have adequate evidence.

Sustainability must also be considered, particularly from a systems perspective. If justice demands what is too burdensome, then it cannot be carried out; and if it is impossible, it cannot be used as a benchmark. We must tread carefully on this ground though, so as to be able to properly assess what is required by justice, with an eye towards current capability, while not bowing the knee to the status quo. Simply being difficult is not a sufficient reason for not remedying injustice. Devoting all resources in a society to eradicate any mental illness is also practically impossible, not to mention a hopeless goal, given that there cannot be a perfect state of health, either physical or mental. Yet, there is certainly an amount of resources that ought to be dedicated towards mental health, particularly in the context of natural disasters. Preparatory measures ought to be taken. Response measures will need to happen. Prevention is imperative – since mental illness after disaster is correlated with mental illness prior to disaster, promoting overall mental health in society is a reasonable goal, and one that may in fact be required by justice. All of these actions, though, will need to be done with an eye to sustainability of the enterprise.

Lastly, practicability must also be taken into consideration. Although I have indicated above that practicability ought not be the only concern of climate ethicists, Brandstedt was not amiss in indicating that it is an important component. In the realm of environmental health justice, as in other areas of justice, what is determined to be just must first be possible; justice must in fact be attainable. As mentioned, this does not mean it needs to be easy to attain, but rather that the solutions offered are relevant for the current situation, and that the theory developed takes into account reality as it is – not as it was, or as we wish it was. There may be areas where, due to environmental degradation, a prior conception of justice is no longer achievable. While there must be space to discuss remediation of prior injustices, it must be coupled with the notion of transitional justice (Bradley, 2017) – what is the just course of action, given the current situation? This is not to say that remedial justice ought not occur: indeed, it should. Rather, in addition to recognition of past injustices, we must also look forward to determine what a "most ideal" theory of justice ought to be, so that our theory of justice is one that is possible, based on the actual state of affairs.

The distinction between ideal theory, nonideal theory, and my categorization of "most ideal" theory has implications for policy-making. The goal to which we are aspiring is a "most ideal" theory of justice, through means of a nonideal theory (Simmons, 2010). As we assess events, such as the Fort McMurray fire, it must be recognized that certain information will be lost. I have laid out above certain features which need to be considered for determining justice, but I recognize that in many cases of natural disasters, there may not be access to all of this information. This information loss is inevitable, as we are working within an imperfect system. This points to a few important considerations. There must be resilience in the system within which we are working[20]. While resilience is a crucial component of recovery for individuals and communities, it is also crucial that our systems be resilient: both in how they are able to manage disasters, and in how they are able to gather and store the information that is needed for purposes of justice (amongst other purposes, not discussed here.) We must also begin to develop of sense of the type of information that is likely to be lost. In many ways, with

[20] While I have noted certain limitations with the way that the concept of resilience is used, particularly at the expense of adopting a vulnerability lens, the fact of resilience still has a central role to play in the discussion of natural disasters. My primary contention with how resilience is often used in the literature, as I have discussed in my philosophical analysis, is simply that if the focus of attention is solely on resilience, and not on vulnerability, then we risk shifting the burden of prevention to individuals (as those expected to be resilient), as opposed to placing the proper locus of responsibility on systems, typically those created and maintained by government. This does not negate the importance of resilience in our systems, or the necessary fact of individual resilience in the face of trauma. The literature around post-traumatic growth has many interesting contributions to this effect.

preparation, loss of certain information is likely avoidable. Thus, if we are aware that some information will inevitably be lost, this inevitable loss can occur in a more informed manner. It may be the case that the information will be lost nonetheless – but there is space to acknowledge that in a perfect scenario, certain information may be collected, and since that information is unavailable, then specific measures are being taken the compensate. We ought not to leave these decisions to the last minute; recognizing that information will be lost and being prepared for such a loss is at times the most just thing that can occur, while working in an imperfect system. Information loss is a matter of justice. The quality of the decisions that we make is based on the quality of evidence that we have for those decisions. Loss of information decreases the availability of information on which decisions can be based, which may decrease the opportunity for recognition of particular individuals or communities who are typically underrepresented.

5.4. Limitations and observations

Often, equity implications of natural disasters are stratified by race, sex, language spoken in relation to the dominant language, socioeconomic status, homelessness, and other factors which are posited to affect vulnerability status of a group of people (Amin et al., 2011). Comparing outcomes of this fire with outcomes from other natural disasters would be more enlightening had these types of demographic information been collected in the case of Fort McMurray. While these factors are employed in analyses to different extents, race and socioeconomic status are often used in equity analyses. The effect of race on health outcomes was in fact the initial reason that environmental justice movements began (Taylor, 2000); other methods of stratifying such as sex were only added to the movement at a later date. Such a comparison would not be possible in this case, however. Although race is collected through census data, this information was not available in this study; further, because of small sample sizes of certain races, as well as the unknown races of the shadow population in Fort McMurray, further coupled with the fact of race as a social construct, statistical analyses by race would have yielded unreliable results. Other researchers similarly did not collect data on race, and therefore it could not be included in this analysis.

One important point to note in this discussion of race is that there is a significant First Nations population who lives in, or in close proximity, to Fort McMurray. A report was released from the perspectives of some of the First Nations people on their experiences with The Beast, including mental health outcomes. It would have been very valuable to include First Nations

health outcomes and experiences in this study, because of colonialism and systematic racism this group of people has had and currently has experiences in the health care system, which bear special scrutiny. In order to do justice to this type of study, it would have required (at the very least) relationship-building with members of the community in order to properly understand what some of the impacts of this fire were, from their perspective. Because of the limitations of this study, I did not have the ability to do this type of research well, and do not want to contribute further harm to First Nations people by doing this type of research poorly. I therefore mention the comprehensive report, written by First Nations people from a First Nations perspective, detailing their experiences from various sectors as it relates to The Beast. Notably, one trend which wove through the report was that of non-inclusion: there was not adequate communication between government officials and First Nations leaders; some individuals encountered overt racism when they went to receive help in community centers. This points to the continuation of systematic issues which affect First Nations people both in quotidian and uncommon circumstances.

Some information on socioeconomic status was obtained in this case study. Although I was not able to access specific income levels, data on income quintiles was gathered, which can act as a relative measure for specific income. Even though there are high incomes in Fort McMurray, this also takes place against a backdrop of very high costs of living. The idea of socioeconomic status encompasses not only a person's income, but is a complex notion that cannot be captured by a single variable (Braveman et al., 2005). While this study has looked at income, it has not done a full analysis of the comparative worth of that income in Fort McMurray. As discussed in a previous section, given the high costs of living, having a higher income – as statistics show over half the population does – may not necessarily translate into higher socioeconomic status. The potential impact of socioeconomic status as it relates to income in Fort McMurray remains unknown.

Another area where data is lacking is in regards to the population of those experiencing homelessness. Although I could not find any documents relating to emergency planning from before the Beast, it seems that many such documents were created in response to the fire for communities in the area of Wood Buffalo (Community Emergency Management Plans, n.d.). These documents did detail a list of possible vulnerabilities and associated plans for evacuation for those who are particularly vulnerable, notably with mobility impairments. Although having such plans in place prior to the disaster would have been ideal – and indeed, perhaps there

were such plans, but they are not publicly available – creating them afterwards, with consideration of those who are most vulnerable, is still a positive thing.

While the importance of these plans should be emphasized, there are two aspects which are concerning. Firstly, there was an admission of a hidden homeless population – yet, there was no means of connecting with those individuals in the event of a disaster. For example, for Fort McKay (Regional Municipality of Wood Buffalo, 2019), the most ideal means of communicating with individuals was identified as going door-to-door. This method will not be effective for those experiencing homelessness, but there was no alternate plan proposed to contact and evacuate these people. Secondly, and similarly, there was an admission that the Regional Municipality of Wood Buffalo did not have access to vehicles which would be able to transport those with severe mobility issues. Although they had done a count to identify those with mobility issues, it is troubling that there is no plan in place to evacuate those for whom the mobility challenges are greater.

The last area where there is missing information is in regards to what prevention measures took place. This is not to condemningly claim that no such measures were in effect. The problem is one of participation. Although I have done much research, it remains the case that certain information is confidential, or classified, and cannot be accessed in the ways that scholarly literature, or administrative data, is typically accessed. While this participatory limitation has resulted in missing information for this study, more importantly, it highlights the need for participatory justice in an environmental justice theory.

In the process of applying this theory to the fires of Fort McMurray, I discovered that certain information which I expected to find was lacking. As I searched through the literature on vulnerability, I found out that certain factors (which in other circumstances contribute to vulnerability) are not collected in Canada: for example, race. Further, other factors which contribute to vulnerability are difficult to collect and maintain (homelessness, or length of time spent living in a particular location). These are also concerns around privacy, sustainability, and practicability in actually gathering and storing this information. These examples represent some of the “known unknowns” that I encountered. The ability to apply this theory to a real case was very limited by the data that was available. This lack of data is not only an artefact of an imperfect system, but also can act as a powerful silencer: for, if we do not have information about something, it becomes impossible to speak about it. I had a rough idea in mind of the type of data that I was looking for, but in many cases it became apparent that, whether or not the

data existed, I would not be able to access it. This emphasizes the necessary participatory element, both for those affected and for those who manage data. In many instances it became clear that I would not be able to obtain data necessary to answer questions of justice, even if it does exist, because I was not collaborating with the right individuals, or did not have access to the right data. Moreover, I am sure that there are pieces of data which would have been relevant for considerations of justice that I am unaware of ("unknown unknowns"). Some of these were highlighted to me as I attempted to apply this theory in practice – for instance, the idea of informed consent and risk, in regards to jobs that require someone to work in a particular location (e.g., in the oil fields). As I applied the theory, I became confronted with the questions of whether it was a requirement of "informed consent", in accepting an employment, of disclosing risks that may be associated not with the job site per se, but the environment within which the job is situated. Although I assume this is not done in practice, based on the information that I had access to, I could not answer this question. (Certain) unknown unknowns can be made known as a theory is applied to a real situation; and as illustrated above some of those (now) known unknowns can have normative import. If data exists but is simply unavailable, then the silencing occurring due to a dearth of data can be reversed by enacting the participatory nature of an environmental justice framework, and may also work to reveal more unknown unknowns.

5.5. Conclusion

Natural hazards will increase as a result of climate change. The chance that these will have disastrous outcomes only increases if there is not adequate prevention. I have argued that you cannot have justice without also considering prevention – preparation is a necessary but insufficient stand-in. In light of the apparent lack of preparation or prevention outcomes directed towards minimizing mental health impacts of wildfire, and a city expanding in the middle of the boreal forest, the outcomes seen in Fort McMurray were very lucky (Stacey, 2018). Given the workings of government, many preventative and preparatory measures, if undertaken, would be undertaken without any documentation necessarily coming to the eye of the public. There is often a lack of transparency associated with government policies, both in the process of their creation and in how they are enacted. While this lack of transparency may be problematic for reasons of its own, it does not necessarily entail that no preparatory or preventative measures were taken. In order to properly determine if adequate measures were taken, there needs to be an element of participatory justice, where not just affected individuals get a seat at the

proverbial table, but also where elected officials and those in positions of power and privilege can come to represent and speak to the state of affairs from a governmental perspective.

There remain many questions which need to be addressed. There is uncertainty regarding the impact of protective factors such as finances. Another area which requires more research is for those who may have been most affected: those living most closely with the land, homeless populations, unemployed, and racial minorities. These would all benefit from future quantitative and qualitative research.

In Fort McMurray, it was found that the mental health those the vulnerable – children – were harmed (Brown et al., 2019). This raises a number of theoretical questions, on which I have begun to ponder, but which could certainly benefit from future research as well. What is the role of informed consent as it relates to those who are unable to choose for themselves? What is the import of agency for people who (must) live in a particular location for economic reasons – and have their families with them?

I believe that we are learning. We were more prepared for the Fort McMurray fire than we were for the Calgary flood of 2013; we were more prepared for those floods than for the Slave Lake fire of 2011 (Kulig et al., 2017). While more research is certainly needed, what it most required now is not necessarily an increase in knowledge, but an increase in knowledge-informed action. Humans have never before had the ability to influence natural disasters. We are now in a new place historically, where we have found that our actions have begun to affect the world around us in ways we never could have imagined. Much is at stake, but much has been learned. This is why prevention is key – because from where we stand, we have the opportunity to make impactful changes, benefit those most vulnerable, and to react not with fear, but with hope.

5.6. Works Cited

Agyeman, J., Bullard, R. D., & Evans, B. (Eds.). (2003). *Just Sustainabilities: Development in an Unequal World* (1st ed.). Earthscan Publications Ltd.

Alberta Energy Regulator, & Canadian Environmental Assessment Agency. (2013). *Report of the Joint Review Panel Shell Canada Energy Jackpine Mine Expansion Project: Application to amend approval 9756 Fort McMurray area.* (CEAA Reference No. 59540). Alberta Energy Regulator ; Canadian Environmental Assessment Agency.

Amin, M., MacLachlan, M., Mannan, H., El Tayeb, S., El Khatim, A., Swartz, L., Munthali, A., Van Rooy, G., McVeigh, J., Eide, A., & Schneider, M. (2011). EquiFrame: A framework for analysis of the inclusion of human rights and vulnerable groups in health policies. *Health and Human Rights*, *13*(2), 20.

Archer, J. (2019). The reality and evolutionary significance of human psychological sex differences. *Biological Reviews*, *94*(4), 1381–1415. Scopus. https://doi.org/10.1111/brv.12507

Bacon, C., deVuono-Powell, S., Frampton, M. L., LoPresti, T., & Pannu, C. (2013). Introduction to Empowered Partnerships: Community-Based Participatory Action Research for Environmental Justice. *Environmental Justice*, *6*(1), 1–8. https://doi.org/10.1089/env.2012.0019

Bari, Md. A., & Kindzierski, W. B. (2018). Ambient volatile organic compounds (VOCs) in communities of the Athabasca oil sands region: Sources and screening health risk assessment. *Environmental Pollution*, *235*, 602–614. https://doi.org/10.1016/j.envpol.2017.12.065

Berry, H. L., & Welsh, J. A. (2010). Social capital and health in Australia: An overview from the household, income and labour dynamics in Australia survey. *Social Science & Medicine*, *70*(4), 588–596. https://doi.org/10.1016/j.socscimed.2009.10.012

Binder, S., Holdahl, E., Trinh, L., & Smith, J. H. (2020). Humanity's Fundamental Environmental Limits. *Human Ecology*, *48*, 235–244. https://doi.org/10.1007/s10745-020-00140-w

Blake, M. (2016, February 23). *Fort McMurray: A little context goes a long way*. CBC. https://www.cbc.ca/news/canada/edmonton/fort-mcmurray-a-little-context-goes-a-long-way-1.3454162

Bradley, M. (2017). More than Misfortune: Recognizing Natural Disasters as a Concern for Transitional Justice. *International Journal of Transitional Justice*, *11*, 400–420. https://doi.org/10.1093/ijtj/ijx024

Brake, D. L. (2004). When Equality Leaves Everyone Worse Off: The Problem of Leveling down in Equality Law. *William and Mary Law Review*, *46*, 513.

Brandstedt, E. (2019). Non-ideal climate justice. *Critical Review of International Social and Political Philosophy*, *22*(2), 221–234. https://doi.org/10.1080/13698230.2017.1334439

Braveman, P. A., Cubbin, C., Egerter, S., Chideya, S., Marchi, K. S., Metzler, M., & Posner, S. (2005). Socioeconomic Status in Health Research: One Size Does Not Fit All. *JAMA*, *294*(22), 2879–2888. https://doi.org/10.1001/jama.294.22.2879

Braveman, P. A., & Gruskin, S. (2003). Defining equity in health. *Journal of Epidemiology & Community Health*, *57*, 254–258. https://doi.org/10.1136/jech.57.4.254

Brown, M. R. G., Agyapong, V., Greenshaw, A. J., Cribben, I., Brett-MacLean, P., Drolet, J., McDonald-Harker, C., Omeje, J., Mankowsi, M., Noble, S., Kitching, D., & Silverstone, P. H. (2019). After the Fort McMurray wildfire there are significant increases in mental health symptoms in grade 7–12 students compared to controls. *BMC Psychiatry*, *19*(18), 1–11. https://doi.org/10.1186/s12888-018-2007-1

Buse, C. G., Smith, M., & Silva, D. S. (2019). Attending to scalar ethical issues in emerging approaches to environmental health research and practice. *Monash Bioethics Review*, *37*, 4–21. https://doi.org/10.1007/s40592-018-0080-3

Campbell, C., Greenberg, R., Mankikar, D., & Ross, R. D. (2016). A Case Study of Environmental Injustice: The Failure in Flint. *International Journal of Environmental Research and Public Health*, *13*(951), 11. https://doi.org/10.3390/ijerph13100951

Carrieri, D., Peccatori, F. A., & Boniolo, G. (2018). The ethical plausibility of the 'Right To Try' laws. *Critical Reviews in Oncology/Hematology*, *122*, 64–71. https://doi.org/10.1016/j.critrevonc.2017.12.014

Chalifour, N. J. (2010). Bringing Justice to Environmental Assessment: An Examination of Kearl Oil Sands Joint Review Panel and the Health Concerns of the Community of Fort Chipewyan. *Journal of Environmental Law and Practice*, *21*, 31–64.

Cohen, J. E. (1997). Population, Economics, Environment and Culture: An Introduction to Human Carrying Capacity. *Journal of Applied Ecology*, *34*(6), 1325–1333. JSTOR. https://doi.org/10.2307/2405250

Community Emergency Management Plans. (n.d.). Regional Municipality of Wood Buffalo. Retrieved December 4, 2019, from http://www.rmwb.ca/Municipal-Government/municipal_departments/Emergency-Services---Law-Enforcement/RES/Community-Emergency-Management-Plans.htm

Day, H. L. L., & Stevenson, C. W. (2019). The neurobiological basis of sex differences in learned fear and its inhibition. *European Journal of Neuroscience*, *52*(1), 2466–2486. Scopus. https://doi.org/10.1111/ejn.14602

Dodgen, D., Donato, D., Kelly, N., Greca, A. L., Morganstein, J., Reser, J., Ruzek, J., Schweitzer, S., Shimamoto, M. M., Tart, K. T., & Ursano, R. (2016). Mental Health and Well-Being. In *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment* (pp. 217–246). U.S. Global Change Research Program. https://health2016.globalchange.gov/mental-health-and-well-being

Doherty, J. M. (2007). Law in an Elevator: When Leveling down Remedies Let Equality off in the Basement. *Southern California Law Review*, *81*, 1017.

Donald, D. (2012). Forts, Colonial Frontier Logics, and Aboriginal-Canadian Relations: Imagining Decolonizing Educational Philosophies in Canadian Contexts. In *Decolonizing Philosophies of Education* (pp. 91–111). Brill | Sense. https://brill.com/view/book/edcoll/9789460916878/BP000008.xml

Edwards, J. (2014). Canada's oil sands residents complain of health effects. *The Lancet*, *383*, 1450–1451. https://doi.org/10.1016/S0140-6736(14)60703-0

Ferlander, S. (2007). The Importance of Different Forms of Social Capital for Health. *Acta Sociologica*, *50*(2), 115–128. https://doi.org/10.1177/0001699307077654

García-López, G. A. (2018). The Multiple Layers of Environmental Injustice in Contexts of (Un)natural Disasters: The Case of Puerto Rico Post-Hurricane Maria. *Environmental Justice*, *11*(3), 101–108. https://doi.org/10.1089/env.2017.0045

Gelinas, L., Largent, E. A., Cohen, I. G., Kornetsky, S., Bierer, B. E., & Fernandez Lynch, H. (2018). A Framework for Ethical Payment to Research Participants. *New England Journal of Medicine*, *378*(8), 766–771. https://doi.org/10.1056/NEJMsb1710591

Gosselin, P., Hrudey, S. E., Naeth, M. A., Plourde, A., Therrien, R., Van Der Kraak, G., & Xu, Z. (2010). *The Royal Society of Canada Expert Panel: Environmental and Health Impacts of Canada's Oil Sands Industry*. The Royal Society of Canada. https://www.ceaa-acee.gc.ca/050/documents_staticpost/59540/81969/appendices_-_part_21.pdf

Graney, E. (2016, April 19). Alberta cuts nearly $15 million from wildfire management budget. *Edmonton Journal*. https://edmontonjournal.com/news/local-news/alberta-cuts-nearly-15-million-from-wildfire-management-budget

Hall, M. (2016). Victims of Environmental Crime: Routes for Recognition, Restitution and Redress. In T. Spapens, R. White, & M. Kluin (Eds.), *Environmental Crime and its Victims: Perspectives within Green Criminology* (pp. 103–118). Routledge.

Jiwani, B. (2015). Ethically justified decisions. *Healthcare Management Forum*, *28*(2), 86–89. https://doi.org/10.1177/0840470414562663

Keough, S. B. (2015). Planning for growth in a natural resource boomtown: Challenges for urban planners in Fort McMurray, Alberta. *Urban Geography*, *36*(8), 1169–1196. https://doi.org/10.1080/02723638.2015.1049482

Kulig, J., GermAnn, K., Parker, N., Salt, V., Walker, D., & Scott, C. (2017). *Psychosocial Response and Recovery Evaluation of the RMWB Wildfire 2016—Final Report*. PoliceWise for Children & Families.

Lameman v Alberta, No. 1203-0169-AC; 1203-0170-AC (Court of Appeal April 30, 2013). http://canlii.ca/t/fx7j2

Lê, F., Tracy, M., Norris, F. H., & Galea, S. (2013). Displacement, county social cohesion, and depression after a large-scale traumatic event. *Social Psychiatry and Psychiatric Epidemiology*, *48*(11), 1729–1741. https://doi.org/10.1007/s00127-013-0698-7

Luce, J. M. (2003). Is the concept of informed consent applicable to clinical research involving critically ill patients? *Critical Care Medicine*, *31*(3), S153–S160.

McGurty, E. M. (1997). From NIMBY to Civil Rights: The Origins of the Environmental Justice Movement. *Environmental History*, *2*(3), 301–323. JSTOR. https://doi.org/10.2307/3985352

McLachlan, S. M. (2014). *"Water Is a Living Thing": Environmental and Human Health Implications of the Athabasca Oil Sands for the Mikisew Cree First Nation and Athabasca Chipewyan First Nation in Northern Alberta: Phase Two Report* (p. 242). University of Manitoba. https://landuse.alberta.ca/Forms%20and%20Applications/RFR_ACFN%20Reply%20to%20Crown%20Submission%206%20-%20TabD11%20Report_2014-08_PUBLIC.pdf

McLean, C. P., & Anderson, E. R. (2009). Brave men and timid women? A review of the gender differences in fear and anxiety. *Clinical Psychology Review*, *29*(6), 496–505. https://doi.org/10.1016/j.cpr.2009.05.003

McLean, C. P., Asnaani, A., Litz, B. T., & Hofmann, S. G. (2011). Gender differences in anxiety disorders: Prevalence, course of illness, comorbidity and burden of illness. *Journal of Psychiatric Research*, *45*(8), 1027–1035. https://doi.org/10.1016/j.jpsychires.2011.03.006

Minkler, M., Vásquez, V. B., Tajik, M., & Petersen, D. (2008). Promoting Environmental Justice Through Community-Based Participatory Research: The Role of Community and Partnership Capacity. *Health Education & Behavior*, *35*(1), 119–137. https://doi.org/10.1177/1090198106287692

MNP LLP. (2017). *A Review of the 2016 Horse River Wildfire: Alberta Agriculture and Forestry Preparedness and Response*. https://www.alberta.ca/assets/documents/Wildfire-MNP-Report.pdf

Mohai, P., Pellow, D., & Roberts, J. T. (2009). Environmental Justice. *Annual Review of Environment and Resources*, *34*, 405–430. https://doi.org/10.1146/annurev-environ-082508-094348

Morrison, V. (2015). *Health inequalities and intersectionality*. National Collaborating Centre for Healthy Public Policy. http://www.ncchpp.ca/docs/2015_Ineg_Ineq_Intersectionnalite_En.pdf

Mote, S., Rivas, J., & Kalnay, E. (2020). A Novel Approach to Carrying Capacity: From a priori Prescription to a posteriori Derivation Based on Underlying Mechanisms and Dynamics. *Annual Review of Earth and Planetary Sciences*, *48*, 657–683. https://doi.org/10.1146/annurev-earth-053018-060428

Nikiforuk, A. (2008). *Tar Sands: Dirty Oil and the Future of a Continent*. Greystone Books.

Oberdiek, J. (2017). *Imposing Risk: A Normative Framework*. Oxford University Press.

Ploug, T. (2018). Physicians' framing and recommendations. Are they nudging? And do they violate the requirements of informed consent? *Journal of Medical Ethics*, *44*(8), 543–544. https://doi.org/10.1136/medethics-2017-104653

Rawls, J. (1971). *A Theory of Justice*. Harvard University Press.

Regional Municipality of Wood Buffalo. (2019). *Fort McKay Community Emergency Management Plan (CEMP)*. https://www.rmwb.ca/Assets/Departments/Emergency+Services/Emergency+Management+Plans/Fort+McKay+Community+Emergency+Management++Plan.pdf

Rothstein, M. A. (2014). Privacy and confidentiality. In Y. Joly & B. M. Knoppers (Eds.), *Routledge Handbook of Medical Law and Ethics*. Taylor & Francis Group. http://ebookcentral.proquest.com/lib/sfu-ebooks/detail.action?docID=1791212

Rung, A. L., Gaston, S., Robinson, W. T., Trapido, E. J., & Peters, E. S. (2017). Untangling the disaster-depression knot: The role of social ties after Deepwater Horizon. *Social Science and Medicine*, *177*, 19–26. Scopus. https://doi.org/10.1016/j.socscimed.2017.01.041

Segall, S. (2010). *Health, luck, and justice*. Princeton University Press.

Shrader-Frechette, K. (2002). *Environmental Justice*. Oxford University Press. https://doi.org/10.1093/0195152034.001.0001

Simmons, A. J. (2010). Ideal and Nonideal Theory. *Philosophy & Public Affairs*, *38*(1), 5–36. JSTOR.

Stacey, J. (2018). Vulnerability, Canadian Disaster Law, and The Beast. *Alberta Law Review*, *55*(4), 853–888.

Statistics Canada. (2017a). *Fort McMurray [Population centre], Alberta and Saskatchewan [Province]* (Census Profile Statistics Canada Catalogue no. 98-316-X2016001; 2016 Census). Government of Canada. http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=POPC&Code1=0292&Geo2=PR&Code2=47&Data=Count&SearchText=FortMcMurray&SearchType=Begins&SearchPR=01&B1=All&wbdisable=true

Statistics Canada. (2017b). *Fort McMurray [Population centre], Alberta and Wood Buffalo [Census agglomeration], Alberta* (Census Profile Statistics Canada Catalogue no. 98-316-X2016001; 2016 Census). Government of Canada. https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=POPC&Code1=0292&Geo2=CMACA&Code2=860&Data=Count&SearchText=Fort%20McMurray&SearchType=Begins&SearchPR=01&B1=All

Statistics Canada. (2017c). *Alberta [Province] and Canada [Country]* (Census Profile Statistics Canada Catalogue no. 98-316-X2016001; 2016 Census). Government of Canada. https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E

Stewart, I. T., Bacon, C. M., & Burke, W. D. (2014). The uneven distribution of environmental burdens and benefits in Silicon Valley's backyard. *Applied Geography*, *55*, 266–277. https://doi.org/10.1016/j.apgeog.2014.09.016

Taylor, D. (2000). The Rise of the Environmental Justice Paradigm: Injustice Framing and the Social Construction of Environmental Discourses. *American Behavioural Scientist*, *43*(4), 508–580.

Townshend, I., Awosoga, O., Kulig, J., & Fan, H. (2015). Social cohesion and resilience across communities that have experienced a disaster. *Natural Hazards*, *76*, 913–938. https://doi.org/10.1007/s11069-014-1526-4

Warlenius, R., Pierce, G., & Ramasar, V. (2015). Reversing the arrow of arrears: The concept of "ecological debt" and its value for environmental justice. *Global Environmental Change*, *30*, 21–30. https://doi.org/10.1016/j.gloenvcha.2014.10.014

Weeden, L. D. (2006). Hurricane Katrina and the Toxic Torts Implications of Environmental Injustice in New Orleans. *John Marshall Law Review*, *40*(1), 1–40.

Wisner, B., Blaikie, P., Cannon, T., & David, I. (2004). *At Risk: Natural Hazards, People's Vulnerability and Disasters* (2nd ed.). Routledge.

Wolff, J., & De-Shalit, A. (2007). *Disadvantage*. Oxford University Press.

Wong, H., Huang, Y., Fu, Y., & Zhang, Y. (2019). Impacts of Structural Social Capital and Cognitive Social Capital on the Psychological Status of Survivors of the Yaan Earthquake. *Applied Research in Quality of Life*, *14*(5), 1411–1433. Scopus. https://doi.org/10.1007/s11482-018-9661-9

Zalik, A. (2015). Resource sterilization: Reserve replacement, financial risk, and environmental review in Canada's tar sands. *Environment and Planning A: Economy and Space*, *47*(12), 2446–2464. https://doi.org/10.1177/0308518X15609218