

Université de Montréal

**Reframing Climate Change as a Public Health Issue:
a Canadian Case Study, 2008-2020**

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Abstract

Climate change represents a major threat to public health in Canada and elsewhere. Conversely, climate action could procure potential health co-benefits. Although research on climate communication is growing, only a few studies have explored how the media connect climate change to its impacts on human health. The media can play a key role in shaping people's understanding of the issue as well as their support for policy change. This media content analysis investigates the coverage of climate change impacts on human health in the Canadian news outlet *The Globe and Mail* between 2008 and 2020. Our study suggests that the public health frame remains largely underutilized to this date, and that journalists fail to make comprehensive links between climate change and health. When the issue is addressed, the content is most often unprecise, with either no particular health risk, social mediating factor or vulnerable population identified. Climate action health co-benefits can convey positive emotions and induce greater behavior change. Yet, they are rarely mentioned. While previous studies have shown that health professionals are best equipped to communicate the risks, we found that members of civil society with no medical expertise were the most regularly cited individuals in the articles. Finally, the Covid-19 pandemic could be described as a missed opportunity to reframe climate change, as our study demonstrates that the public health frame was not more often used in 2020 than it was before.

Keywords: Climate change, human health, impacts, health co-benefits, links, frame, media, Canada, Covid-19 pandemic, *The Globe and Mail*.

Résumé

Les changements climatiques représentent une menace majeure pour la santé publique au Canada et ailleurs. À l'inverse, l'action climatique pourrait procurer des éventuels co-bénéfices santé. Bien que la recherche en matière de communication sur les changements climatiques soit en plein essor, seulement une poignée d'études ont exploré comment les médias relient les changements climatiques à leurs impacts sur la santé humaine. Les médias peuvent jouer un rôle clef, de par leur capacité à modeler la compréhension du public ainsi que son adhésion à des politiques nouvelles. Cette analyse de contenu examine la couverture des impacts sanitaires des changements climatiques dans le journal canadien *The Globe and Mail* entre 2008 et 2020. Notre étude suggère que le cadrage santé demeure sous-utilisé à ce jour, et que les journalistes ne réussissent pas à faire des liens exhaustifs entre climat et santé. Lorsque la question est abordée, le contenu est le plus souvent imprécis ; sans risque sanitaire, facteur social médiateur ou population vulnérable identifiés. Les co-bénéfices santé émanant de l'action climatique peuvent convier des émotions positives et ainsi inciter davantage à un changement comportemental. Malgré tout, ils demeurent rarement mentionnés. Tandis que des études précédentes montraient que les professionnels de la santé sont les mieux équipés pour communiquer les risques, nous avons constaté que ce sont les membres de la société civile, la plupart n'ayant pas d'expertise médicale, qui sont les plus souvent cités dans les articles. Enfin, la pandémie de Covid-19 peut être décrite comme une opportunité manquée pour recadrer les changements climatiques, puisque notre étude démontre que le cadrage santé n'était pas plus utilisé en 2020 qu'auparavant.

Mots-clefs : Changements climatiques, santé humaine, impacts, co-bénéfices santé, liens, cadre, média, Canada, pandémie Covid-19, *The Globe and Mail*.

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List of Abbreviations

- CAPE: Canadian Association of Physicians for the Environment
- CDC: United States Center for Disease Control
- CMA: Canadian Medical Association
- CO₂: Carbon Dioxide
- COP21: United Nations Climate Change Conference in Paris, France, 2015
- COP24: United Nations Climate Change Conference in Katowice, Poland, 2018
- EPA: United States Environmental Protection Agency
- GM: The Globe and Mail
- HC: Health Canada
- IPCC: Intergovernmental Panel on Climate Change
- NPF: Narrative Policy Framework
- NRC: Natural Resources Canada
- PHAC: Public Health Agency of Canada
- SCC: Survey of the Canadian Consumer
- UCL: University College London
- UN: United Nations
- UNCBD: United Nations Convention on Biological Diversity
- UNESCO: United Nations Educational, Scientific and Cultural Organization
- UNFAO: United Nations Food and Agricultural Organization
- UNICEF: United Nations Children's Fund
- US: United States of America
- WHO: World Health Organization

Reframing Climate Change as a Public Health Issue: a Canadian Case Study, 2008-2020

‘Climate change is the biggest global health threat of the 21st century’. This conclusion was first reached in a report commissioned by the world prestigious medical journal *The Lancet* and the University College London (UCL) in 2009. Yet, public awareness regarding climate change impacts on human health remains low (Maibach et al. 2010; Akerlof et al. 2010; Cardwell & Elliott 2013). Greater attention was generally given to the reports published by the Intergovernmental Panel on Climate Change (IPCC), in which human health is addressed but only constitutes a small fraction of the assessed impacts. After the publication of the latest IPCC special report in 2018, various governments across the globe symbolically declared national climate emergencies. Today, health professionals in Canada and elsewhere urge decision-makers to further consider climate change as a *public health* emergency.

Although research on climate communication is growing, only a few studies have explored how the media connect climate change to its impacts on human health. The media can play a key role in shaping people’s understanding of the issue as well as their support for policy change (Boykoff 2011; Bakaki et al. 2019). Prior studies have examined the regional and temporal distributions of climate and health news coverage, as well as the recurrent themes characterizing the public health frame (Nisbet et al. 2010; Hart & Nisbet 2012; Weathers 2013; Weathers & Kendall 2016; Depoux et al. 2017; King et al. 2019; Harrison et al. 2020). Historically, only one study (King et al. 2019) examined climate and health coverage in Canadian national print media. The authors focused on articles that were written between 2005 and 2015.

Since then, the transnational scientific production of knowledge increased dramatically. In 2015, an international and multi-disciplinary research initiative called *The Lancet Countdown* was launched, with the objective in mind to report annually on climate change impacts on human health. Other international organizations also recently published influential reports. For instance, the World Health Organization (WHO) produced a special report prior to the 2018 COP24, which made recommendations to decision-makers on ‘maximizing the health benefits of tackling climate change and avoiding the worst health impacts of this global challenge’ (WHO 2018). In the latest 2018 IPCC report, a thirty-page long chapter focused exclusively on human health, and the confidence in the projected impacts has only grown. More recently, the advent of the Covid-19 pandemic brought to the fore discussions surrounding global health. Consequently, we have reasons to believe that climate change impacts on human health could have received greater attention in the media since 2015. As far as we know, no previous research has investigated the most recent climate and health news coverage in Canada. It is therefore of interest to know whether the public health frame was used more frequently in the recent years.

As such, the present study investigates the coverage of climate change impacts on human health in the Canadian news outlet *The Globe and Mail* between 2008 and 2020. Accordingly, it consists of a media content analysis of what has been previously described as Canada’s ‘newspaper of record’ (Wallace 1996), using mostly quantitative data. In fact, *The Globe and Mail* continues to date to have the largest national readership across the country, according to the latest Vividata’s 2020 Survey of the Canadian Consumer (SCC) (GM 2020). In order to conduct our research properly, we consulted literatures on both climate change communication and health promotion.

Our study relies on three main concepts issued from communication studies. The first one is *agenda-setting*, which refers to the capacity of the media to decide what constitutes news. The second one is often discussed in tandem with the former and is called *priming*. It corresponds to the process by which the media can shape people's preconceptions and thereby influence how they evaluate a situation. The works of Iyengar & Kinder (1987) and Scheufele & Tewksbury (2007) will be used as the main reference sources for these two concepts. While agenda-setting and priming both examine *what* information is presented, the third concept looks at *how* information is presented. *Framing* challenges the cherished journalistic norm of balance (i.e. impartiality), as it impacts how people make sense of news. Our understanding of this concept will be essentially based on the definitions given by Entman (1993) and Chong & Druckman (2007).

Another important concept in our study is *Planetary Health*, which has been recently put forward in the health promotion literature. Often times, there has been some confusion about its definition at the theoretical conceptual level. While other similar concepts such as EcoHealth and One Health tend to embrace both animal and human health, Planetary Health differentiates itself as a more anthropocentric approach, focusing primarily on climate change impacts on human health (Lerner & Berg 2017).

Fundamentally, the goal of exploratory research is to gather preliminary information that will help define and better understand problems that have not been thoroughly investigated in the past. Thus, our study is primarily descriptive rather than explanatory. Moreover, though solid description inevitably produces important insights, this study is taken as a first empirical take, and does not intend to offer final nor conclusive solutions about what needs to be done to communicate more effectively on climate change health risks.

Our first objective is to determine the prominence of the public health frame in the articles addressing climate change published by *The Globe and Mail*. In other words, we desire to know in what proportions this frame is used compared to other climate frames (e.g. scientific or economic). With a span covering the last 12 years, our study also examines the timing of when the public health frame is used, and whether there have been changes over time. The data will enable us to observe if climate change impacts on human health received as much attention in the media as they did recently in the international scientific community.

The second objective of this study is to explore which characteristics of the public health frame are put forward by journalists. Most importantly, we want to know who speaks for the cause. In the health promotion literature, it was argued that health professionals are best equipped to communicate climate health risks (Maibach et al. 2010; Boykoff 2011). Our study verifies if journalists reached out to health experts and how frequently they did. Older studies tended to solely analyze the types of health risks that were identified. However, the classification they used was often broad and therefore did not precisely depict media content. Moreover, there is more to the climate and health relationship than just the health risks. As described in various publications from *The Lancet*, here we also look at which social mediating factors, most vulnerable populations and climate action health co-benefits are identified.

Last but not least, another objective we have, is to determine whether the recent Covid-19 pandemic was a game-changer in the process to reframe climate change as a public health issue. An emerging literature seeks to connect the Covid-19 pandemic with the climate crisis in various ways. Experts notably believe there are numerous similarities in terms of causes, impacts and crisis management failures. However, whether or not climate communication has seized on the pandemic as an opportunity to tie the climate crisis to a salient issue, or whether

or not the pandemic has crowded-out space for communicating on climate change more generally, remain open questions.

Accordingly, our study attempts to answer three exploratory research questions:

1. *What is the prominence of the public health frame? Has it changed over time?*
2. *What are the characteristics of the public health frame most often found in the media?*
3. *Did the Covid-19 pandemic pave the way to reframe climate change as a public health issue?*

Chapter 1 describes the impacts of climate change in a public health context, setting the stage for an understanding of messages and frames potentially found in media coverage seeking to draw a link between climate change and public health. Given the complexity of climate change and its cause and effect mechanisms, the background information presented in this chapter allows us to better understand the severity of the climate crisis and why it is important to talk about its associated health risks.

Chapter 2 summarizes the relevant literature for our study, with a particular focus on framing theory applied to climate change and health. The chapter portrays the weaknesses of the traditional frames used to describe climate change, and reveals how the public health frame may potentially bridge the gap. The research contributions are subsequently presented.

Chapter 3 outlines the methods used to conduct the media content analysis, from the screening and search strategies to the codebook creation process and data extraction. The research design limitations are also addressed.

Chapter 4 discusses the results and offers some insights on the initial research questions. The findings are then compared with those from previous studies. The media content is also compared to the scientific literature in order to determine which arguments are left out by journalists.

Our study suggests that the public health frame has been poorly used, thereby questioning the journalists' capacity to make comprehensive links between climate change and health. Finally, it offers recommendations for future research.

CHAPTER 1: BACKGROUND

The Canadian Public Health Association (CPHA) defines public health as ‘the organized effort of society to keep people healthy and prevent injury, illness and premature death’ (2017). Public health activities include health protection, monitoring, prevention and promotion. In other words, public health authorities must act to protect a population’s health against immediate threats, identify priorities and assess policy effectiveness, while also raising public awareness about the importance of the social determinants of health (e.g. the environment). As we shall see, all of these roles are relevant when applying a public health context to climate change.

1.1. Extreme Weather Events & Associated Health Risks

According to the 2009 Lancet report, if greenhouse gas emissions were to continue to rise, the health risks associated with a changing climate would increase, as well as the number of people exposed to them. These risks are unevenly distributed across space, can potentially overlap with one another, and are classified as either direct or indirect. Figure 1, which was initially published in the 2015 Lancet Countdown report, illustrates well the cause and effect mechanisms at play. For the perspective of climate change communication, the figure highlights how complex the links between climate change and health can be.

Essentially, there are four types of extreme weather events which could particularly exacerbate current health issues: storm-surge flooding, droughts, heatwaves, and fires (Lancet 2009). All of these can cause fatal injuries. In fact, the WHO (2014) declared that ‘between 2030 and 2050,

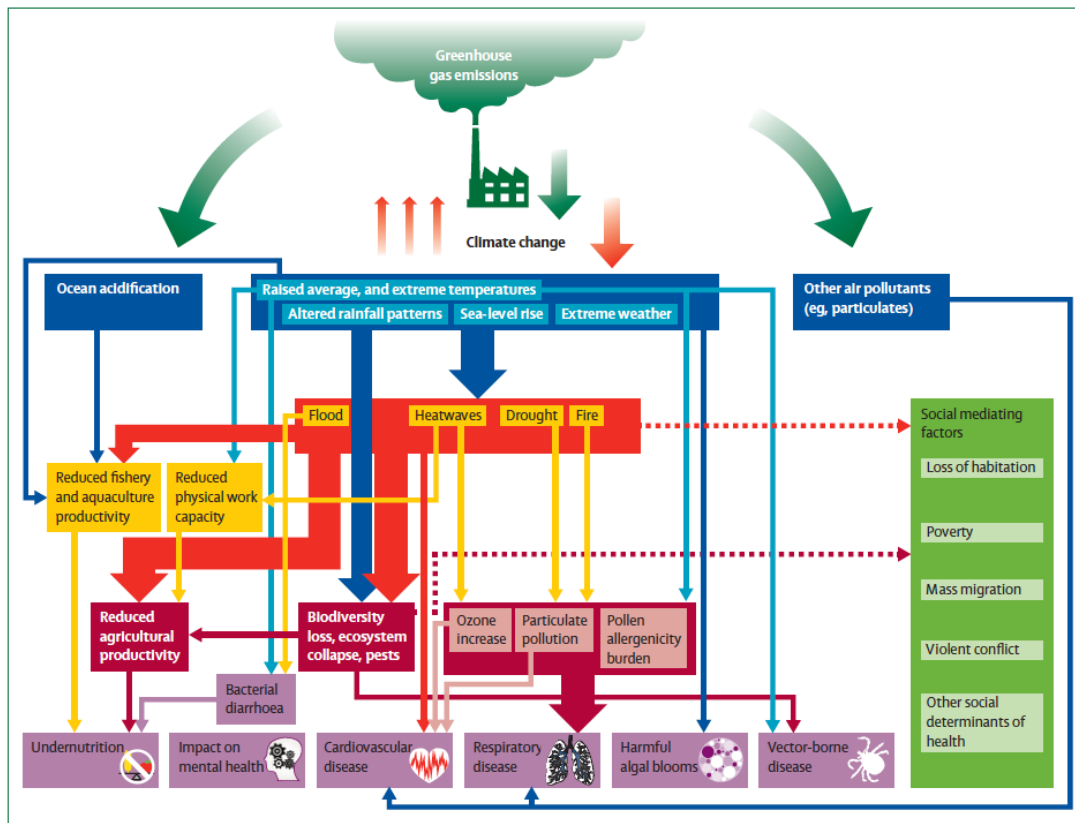


Figure 1. Cause and effect mechanisms between climate change and human health (Lancet Countdown 2015)

climate change is expected to cause approximately 250 000 additional deaths per year'. In addition, floods and storms can create fertile conditions for water-borne disease outbreaks (e.g. cholera, malaria, diarrhea) and can have long-term psychological impacts (e.g. anxiety, depression, post-traumatic stress disorder) on individuals who have lost their property and have been relocated (Lancet 2009). Droughts can lead to malnutrition since reduced levels of agricultural productivity inevitably push up food prices (Lancet 2009). As such, droughts simultaneously exacerbate extreme poverty. Heatwaves negatively impact people's cardiovascular and respiratory systems (e.g. heat stroke, asthma, allergies, lung cancer, bronchitis) and similarly reduce occupational and recreational health (Lancet 2009). More generally, temperature rise can cause vector- and rodent-borne disease outbreaks (e.g. Lyme disease, Dengue fever, Ross river virus) as it extends mosquitoes' (and other pests) geographic

range to higher latitudes (Lancet 2009). Fires, just like fine particulate air pollution, primarily cause respiratory problems, though they can also lead directly to fatalities and indirectly to psychological stress and other disorders (Lancet 2009).

In the IPCC fourth assessment report published in 2007, the health risks were further classified based on the experts' level of confidence in the findings. As such, the authors wrote that there was already emerging evidence that:

...climate change has altered the distribution of some infectious disease vectors (medium confidence); altered the seasonal distribution of some allergenic pollen species (high confidence); increased heatwave-related deaths (medium confidence) (IPCC 2007).

Furthermore, the authors noted the projected trends and asserted with 'high confidence' that there would be increases in malnutrition, infectious diseases, pollution-related cardio-respiratory problems, as well as injuries and fatalities following extreme weather events (IPCC 2007). However, the level of confidence varied greatly depending on which infectious disease was addressed. For instance, the authors estimated with a 'very high confidence' that climate change would expand the geographical range of vectors carrying malaria but were less certain for those carrying the dengue virus (IPCC 2007). There was also only a 'medium confidence' concerning the potential increase of diarrheal diseases (IPCC 2007). In the latest 2018 IPCC report, similar conclusions were reached, but with a 'very high confidence' for most of them. In the context of our study, it will be interesting to explore if journalists at *The Globe and Mail* differentiated climate change impacts on human health based on the degree of scientific certainty and whether those with the highest confidence received greater media attention or not.

1.2. Social Mediating Factors

Moreover, climate change indirectly impacts social processes, as it can notably lead to habitat loss, poverty, mass migration, and violent conflict (Lancet Countdown 2015). By impacting such determinants of health, climate change becomes a major driver of structural health inequity. In the more recent years, these impacts have been commonly classified under ‘social mediating factors’ or ‘socio-psychological impacts’, in part because they could negatively impact people’s mental health in the long run.

1.3. Most Vulnerable Populations

Populations in developing countries are expected to be disproportionately affected by the impacts of climate change (Lancet 2009). However, developed countries will not be spared by the changing climate nor the associated health risks either. In fact, Natural Resources Canada (NRC) published a report in 2007, where it clearly stated that ‘the impacts of climate change [were] already evident in every region of Canada’, from increases in heatwaves to forest fires, storm-surge flooding and coastal erosion. In its 2008 report, Health Canada (HC) identified various individuals and groups most vulnerable to climate change. These included seniors, children, people with pre-existing illnesses, socially disadvantaged individuals, as well as populations living in coastal and urban areas. The report stressed that northern and indigenous communities were particularly at risk, as their livelihoods rely more heavily on the health of their local ecosystems, which are currently threatened by permafrost melt and coastal erosion (HC 2008). Depending on their geographic location and access to healthcare services, some populations could be exposed to various climate and health risks simultaneously.

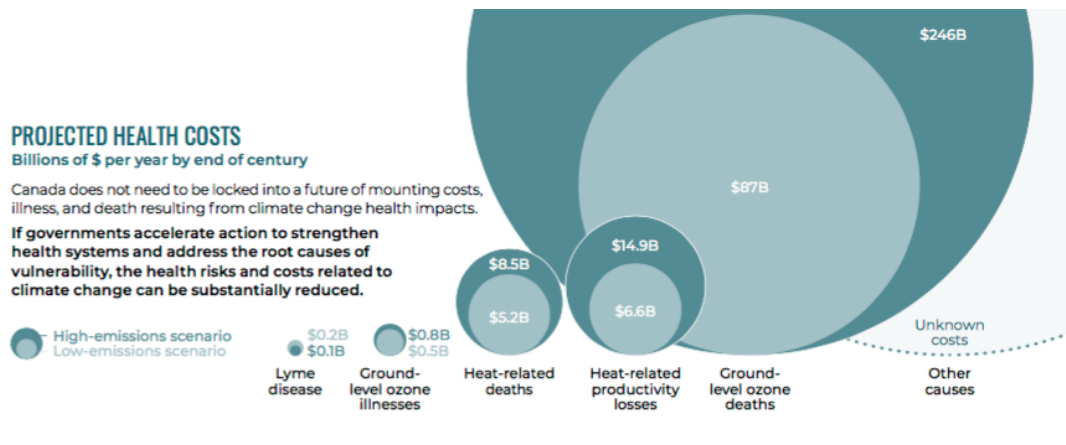


Figure 2. Projected climate change health-related budget expenses (Climate Choices 2021)

These impacts will tremendously increase federal and provincial health expenditure budgets. Experts at the Canadian *Institute for Research on Climate Choices* recently published their second report describing the associated health costs of climate change. Figure 2 above, issued from the report, summarizes their findings.

1.4. Climate Action Health Co-Benefits

Conversely, the implementation of climate policies can have multiple health co-benefits (HC 2008). Often times, experts give the example of active transport (e.g. cycling, walking). The related cause and effect mechanisms were exemplified in the 2015 Lancet Countdown report as follows:

Reductions in emissions (e.g. from burning fossil fuels) reduce air pollution and respiratory disease, whilst safer active transport cuts road traffic accidents and reduces rates of obesity, diabetes, coronary heart disease, and stroke.

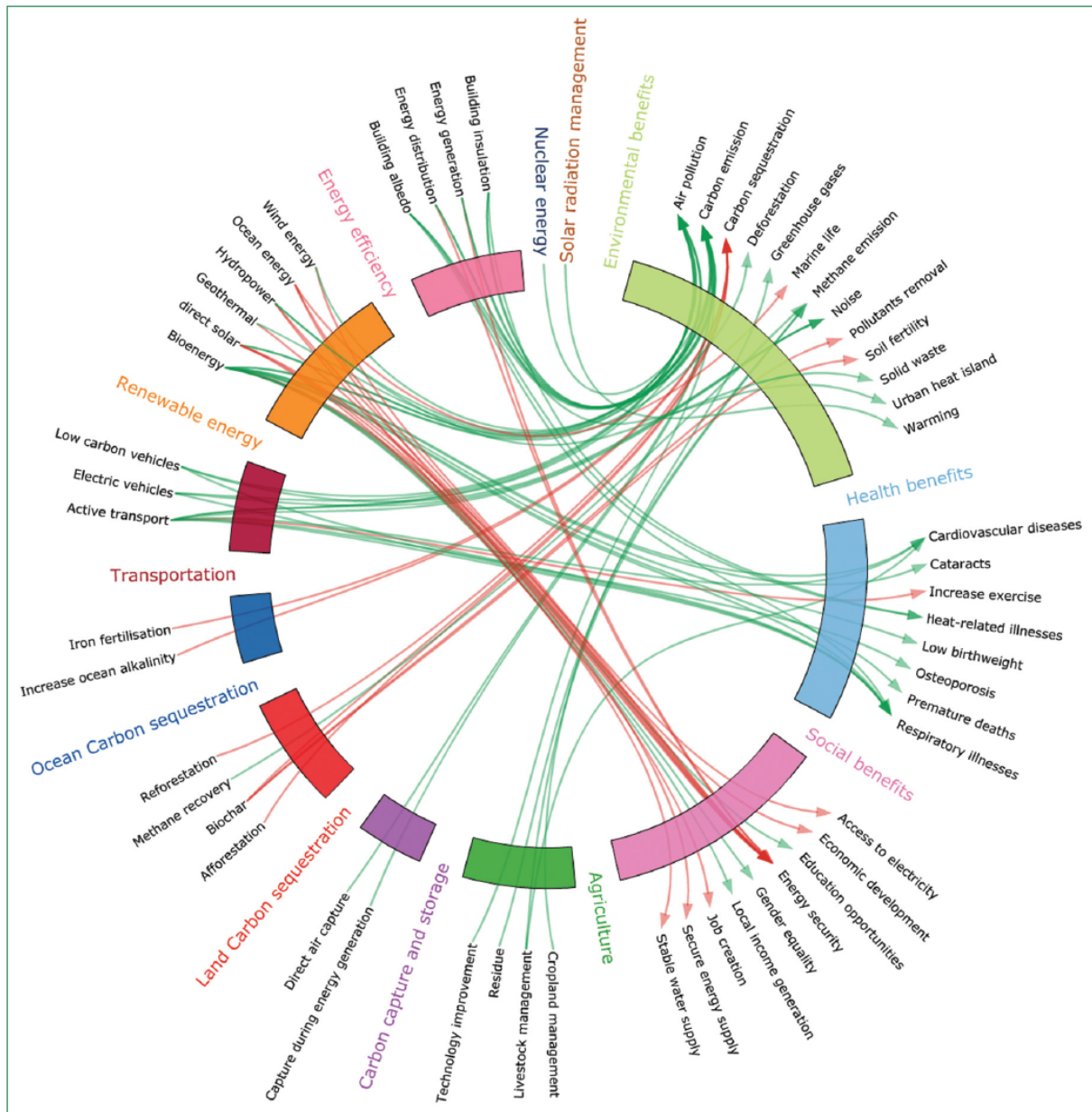


Figure 3. Description of the climate action health co-benefits (Lancet Countdown 2015)

Of course, there exist many more health co-benefits which are less easy to understand. Figure 3 above illustrates the major co-benefits of climate action, including those for human health (Blue ones on the right side), as described in the 2015 Lancet Countdown report. The red arrows indicate negative effects; green arrows indicate positive effects (i.e. reduced risks). The figure notably points out that the greatest health co-benefits lay in efforts from the energy sector,

whereby renewable and efficient sources of energy shall be preferred. Similar to the links between extreme weather events and their impacts on human health, those connecting mitigation strategies and their health co-benefits turn out to be difficult to communicate to the general population.

1.5. Covid-19 Pandemic

As if the climate emergency was not enough, the year 2020 had its own share of challenges. The novel coronavirus pandemic, also known as Covid-19, severely disrupted people's everyday lives across the globe. Later that year, *The Lancet* published its annual report on health and climate change. Interestingly, the authors posited in the editorial that climate change and Covid-19 were two 'converging crises' (Lancet Countdown 2020). Several connections were made. For instance, it was said that 'the causes of both crises share[d] commonalities, and their effects [were] converging' (Lancet Countdown 2020). The argument behind this was that human activity was responsible for the emergence of such zoonotic diseases, as it kept degrading the environment and therefore increased the risk of contact between animals and humans. Moreover, the authors criticized the lack of preparedness to respond to both crises, when neither of them were unexpected. They also highlighted that both crises would disproportionately affect the 'poorest and marginalized people in society' (Lancet Countdown 2020). Given the gravity of the situation, the authors made the alarming observation that 'climate ha[d] slipped from the top of the global agenda' (Lancet Countdown 2020). However, they firmly believed that governments now have a once in a lifetime opportunity to plan a climate-oriented recovery which would ultimately help tackle both crises.

This chapter presented the various ways through which climate change can be connected to health. As with the figures above, the links remain nonetheless extremely complex. In fact, climate change on its own is already difficult to understand in terms of responsibility and damage (Keohane & Victor 2010). For example, it took scientists many years to reach a consensus on whether climate change was human-caused and many individuals remain climate skeptics (Pearce et al. 2017). Uncertainty about the short- and long-term effects of climate change has not disappeared either. Consequently, human health adds another layer of complexity to the matter. The fact that the figures found in the *Lancet* publications remain so complicated demonstrates the tremendous challenge to provide easily understandable information to the public. From a political standpoint, Workman et al. (2018) argued health is rarely embedded in the climate change agenda because Western societies like Canada tend to be profit-driven and short-term oriented, which make them ill-adapted for cross-sectoral and longstanding climate and health policy development. Having provided background information on the topic, we turn to communication theory in the context of climate change and health.

CHAPTER 2: THEORETICAL FRAMEWORK

The dissemination of relevant climate information in the public sphere is key to encourage climate action. Consequently, we must first understand what are the mechanisms influencing social acceptability and policy output. The media, known as the fourth pillar of democracy, play a crucial role in shaping how individuals and policymakers perceive climate change and the need to take action. We must therefore explore the triangular relationship between reporters, policymakers, and the rest of the population.

For the purpose of our study, we build upon two major literatures found in political communication research. The first literature explores media effects known as *agenda-setting*, *priming*, and *framing*. It then discusses the barriers to public and political engagement with climate change previously identified by scholars. Finally, the second literature reviews emergent work on the opportunities provided by a novel public health frame to induce greater behaviour change and policy output.

2.1. Framing Theory and the Role of the Media

Media studies have demonstrated that information processing influences how individuals form attitudes and judgements (Tversky & Kahneman 1973). As most people do not have access to academic literature or expert panels, the media are often their most significant source of information. However, the media present information in a certain way that can impact how people form impressions and so, scholars have developed a framework based on three media effects – agenda-setting, priming, and framing – that enables us to analyze message

construction. Research on media effects first emerged in the 1920s. However, a notable shift took place in the 1970s when scholars argued that these effects were more complex and more influential than previously thought (Scheufele & Tewksbury 2007). From that time forward, research on agenda-setting, priming, and framing became prominent.

Agenda-Setting

Drawing on McCombs and Shaw's work (1972), agenda-setting refers to 'the idea that there is a strong correlation between the emphasis that mass media place on certain issues [...] and the importance attributed to these issues by mass audiences' (Scheufele & Tewksbury 2007). In other words, journalists get to decide what constitutes news and so, what mass audiences *should* care about. Another notable study was the one conducted by Galtung and Ruge (1965) in which they established a list of twelve 'news factors' that make an issue salient. They argued that journalistic practices shape people's awareness about world events.

Priming

In the late 1980s, Iyengar and Kinder (1987) defined priming as 'changes in the standards that people use to make political evaluations'. They showed that mass media suggest what are the salient issues on which the electorate should base its evaluation of governments' performances. To put it another way, while agenda-setting corresponds to the process by which an issue becomes salient, priming occurs when the salience itself becomes the main 'basis for judgement and evaluation' (Moy et al. 2016). Thus, priming is often seen as an extension of the agenda-setting effect.

Framing

Finally, framing can be understood as ‘the process by which people develop a particular conceptualization of an issue or reorient their thinking about an issue’ (Chong & Druckman 2007). It should be noted that scholars have elaborated various definitions to describe the phenomenon, which aren’t necessarily mutually exclusive. Initially, framing can be seen as a useful tool meant to simplify issues so that information can be organized and accessible to a larger audience (Gans 1980). It allows us to basically make sense of our daily reality (Tuchman, 1978).

Chong and Druckman (2007) suggested there were two types of frames: equivalency and emphasis frames. Equivalency frames often present an issue in terms of ‘gains’ or ‘losses’. Such statements sound therefore logically equivalent but can alter preferences based on the way information is phrased. This was illustrated in a study by Kahneman and Tversky (1984) in which they found that, when given two options, people were more inclined to choose the one that was less risky (i.e. where gains were almost guaranteed) rather than the option where there could be potential downsides. By contrast, emphasis frames are efficient to the extent they only highlight certain aspects of a statement. Entman (1993) suggested that this is where resides the power of framing to increase an issue’s salience. Instead of producing a big picture, emphasis frames create what he calls ‘fractured paradigms’.

Snow and Benford (1988) were interested in resource mobilization theory and concluded that framing was key to successfully encourage social mobilization. In the literature, it is commonly referred to as the process of ‘frame alignment’. To be effective, Snow and Benford (1988) identified three core framing-tasks: diagnostic framing (i.e. problem definition), prognostic framing (i.e. the providing of solutions) and motivational framing (i.e. call to action). The

proposed frame must be culturally congruent in order to lead to social mobilization. Frame alignment has four aspects, one of which is frame transformation. This aspect is particularly relevant for the purpose of this study and will therefore be addressed in relation to the role of the public health frame later on.

2.2. Framing Climate Change

Over the last 10 years, experts have incessantly tried to determine how to communicate effectively the risks associated with climate change to induce behavior change. More particularly, previous research provided insights on the volume of news coverage, the frames used and the impacts of certain journalistic practices in relation to climate change.

Issue Salience

First, researchers found that media attention surrounding climate change dramatically increased over time. Ahchong & Dodds (2012), who chose to compare climate change coverage between 1988 and 2007 in two Canadian news outlets, *The Toronto Star* and *The Globe and Mail*, found that both newspapers now paid greater attention to the issue than they used to. They noted that climate change was essentially portrayed as ‘destructive’, causing more problems than providing opportunities. Similarly, Stoddart et al. (2016) observed an overall increase in coverage in *The National Post* and *The Globe and Mail* between 1997 and 2010. However, the increase was non-linear. Other international studies reached similar conclusions and have described this phenomenon as ‘issue-attention cycles’ (McComas & Shanahan 1999; McDonald 2009; Saunders et al. 2018). Stoddart et al. (2016) argued climate change’s salience was notably driven by ‘key national and international turning points in policymaking and scientific knowledge production, rather than ecological or meteorological events’. Along these

lines, Young & Dugas (2011) found that articles in the Canadian national print media were now more oriented around policymaking and solutions rather than ecological events.

Thematic and Competitive Frames

More generally, four thematic frames dominated the media landscape over the years. Each of them emphasized different dimensions of climate change, which shaped public understanding in return. Prior studies demonstrated climate change tended to be mainly framed in ecological terms (e.g. biodiversity loss, extreme weather events) (Bell & Greenberg 2018). Because the issue became extremely politicized, a political frame was also regularly used in the articles, especially those discussing climate policy and solutions (Young & Dugas 2011; Levy & Patz 2015; Stoddart et al. 2016). Another important frame is the economic frame, which emphasized the economic costs resulting from climate action or inaction (Young & Dugas 2012; Levy & Patz 2015; Stoddart et al. 2016). Here, we would find articles talking about green growth for instance. Finally, journalists commonly used a scientific frame to describe climate change, though it may not be the frame that resonated the most with people due to its complexity (Good 2008; Ahchong & Dodds 2012; Levy & Patz 2015; Stoddart et al. 2016; Lachapelle et al. 2021).

Multiple frames can be found in a single article. These frames often compete against one another. Moreover, there exist other frames which were less often used such as the national security, energy, moral, stewardship and public health frames (Levy & Patz 2015). It is worth noting that the four frames most commonly used in the media are those found in influential publications such as the IPCC assessment reports (Boykoff 2011; Young & Dugas 2011). As such, journalists seem to reproduce the frames from the sources they use to inform themselves on the matter.

Communication experts further looked into the journalistic technical aspects of structuring and visualizing stories, which contribute to the effect of framing. They found that journalistic choices such as the article placement, terminology, visuals, storylines and who is given a voice, all impact how climate change is framed. As we shall see, the way such journalistic practices are currently used may not necessarily be the most effective to induce behavior change.

Article Placement

In connection to the thematic frames, a few researchers examined in which sections of newspapers articles addressing climate change are most likely found. Young & Dugas (2011), who analyzed climate change coverage in *The Globe and Mail* and *The National Post* between 1988 and 2008, observed there were four main ‘news pegs’ used to establish the stories. For both news outlets, they found news and editorial pegs were the most common, followed by letter to the editor and feature ones. Yet, international studies have demonstrated it does not necessarily mean the stories were found on the front pages (Nwabueze & Egbra 2016). As such, newspaper sections and page numbers can together help us determine more precisely the issue’s level of salience.

Terminology

When one wants to evaluate climate change news coverage, it is also important to pay attention to the terminology used to describe the phenomenon. In her propaganda media analysis, Good (2008) compared how often newspapers in the United States (US), Canada and other countries would use the terms ‘climate change’ and ‘global warming’. The author concluded that Canadian newspapers were more likely to use the term ‘climate change’ and that the two terms were less often used interchangeably than in US newspapers. Moreover, she found that the stories were more likely to talk about ‘greenhouse gases’ than ‘fossil fuels’ when the causes of

climate change were addressed, independently from where the newspapers originated. Thus, she suspected at the time that the media could be ‘propagating the status quo’, whereby they protect the image of the fossil fuel industry and down play the fact that climate change is anthropogenic (i.e. human-caused). For the purpose of our study, it will therefore be important to take into consideration the diverse terminology referring to climate change, especially for search strings.

Narratives & Emotions

Storytelling plays a key role in shaping a policy’s social acceptability. Prior studies have used a Narrative Policy Framework (NPF) to examine what were the characteristics and influence of climate change narratives. A narrative is usually composed of four major elements (Jones & Song 2014): a setting, characters (e.g. victims, villains and heroes), a plot and a moral. Research demonstrated that narratives about climate change need to be culturally congruent in order to be positively received by the population (Shanahan et al. 2011; McBeth et al. 2014; Jones & Song 2014; Niederdeppe et al. 2015). In their study, Jones & Song (2014) discovered this was particularly true for two groups of individuals classified as ‘egalitarians’ and ‘individualists’. To be effective, the content of the narrative for the two groups must therefore be different. A brief summary is presented below:

Egalitarians: The cause of climate change is overconsumption [...] The villains of this story are profit-driven corporations, governments [...] The heroes of the profligacy story are groups like Eco-defense and Earthfirst [...] The moral of the story is that humankind is doomed if it does not correct for past mistakes (Jones & Song 2014).

Individualists: The individualistic story’s heroes are organizations like the Cato Institute and the *Wall Street Journal*. The cause of climate change for these groups are generally naïve but dangerous idealists (egalitarians) [...] The moral of the story is that markets must operate with minimal interference (Jones & Song 2014).

However, confirmation bias can have pervasive effects, as it can lead to what Taber & Lodge (2006) called ‘attitude polarization’. In other words, people would become more extreme in their own beliefs, making dialogue more difficult. To prevent dead-end negotiations, researchers propose to use frames which will reduce the psychological distance to climate change. For instance, Anspach & Draguljic (2019) found that economic and personal frames are more effective than motivational frames. Economic frames highlight the costs of inaction and play with the notion of economic survival. Personal frames showcase human interest stories and seek to stimulate empathy. By contrast, motivational frames in the study were understood in concordance with the definition given by Snow & Benford (1988), whereby people’s agency to act is emphasized. Moreover, Anspach & Draguljic (2019) observed that frames will be best effective if they can convey emotions of sadness (for the victims) or anger (against the villains). Likewise, O’Neill & Nicholson-Cole (2009) previously argued that fear may not be the most effective tool for climate communication, as it tends to widen psychological distance. Unfortunately, that advice has not been put into practice by all journalists just yet. Always repeating the same stories can also lead to cognitive dissonance, or what has been called ‘issue fatigue’, whereby people become less sensitive to climate change and the need to take action (Norgaard 2011). Bakaki et al. (2019) described it as follows: ‘the more the issue is covered, the more hopeless things look and the more pointless individual action may seem’.

Messengers

Another key element is the storyteller, that is, who speaks for the climate. Those who have a privileged access to the media get to define and frame climate change. Hall et al. (1978) called these individuals the ‘primary definers’. In their study, Young & Dugas (2011) found that Canadian national print media tended to cite predominantly environmental activists and business representatives over the period examined. By contrast, university-based experts and

government employees were now speaking less than they used to. Interestingly, the authors noted that the number of interviewees who had a scientific expert knowledge was declining. Boykoff (2011) found a similar phenomenon taking place in the US news coverage of climate change. He attributed the emergence of environmental activists in the media to the fact that they now regrouped a greater diversity of actors, including celebrities. Young & Dugas (2011) also looked at the international geography of the voices and observed that a greater proportion of articles would now feature Canadian voices. European voices were also well represented, while American voices and those from other places had lost momentum. Based on these findings, it appears as if members of the Canadian civil society without scientific expertise have become the predominant spokespersons for climate change in Canada.

Visuals

Other scholars insisted on the power of visuals in news articles. Hall (1973) believed news photographs ‘add new dimensions of meaning’. Beyond its denotative meaning (i.e. what we see), a photograph can have various connotative meanings (i.e. what it makes us think of), as it will be interpreted differently depending on the reader’s cultural background. Hall (1973) also thought news photographs can reinforce the emotional tone of an article through the depiction of someone’s body language or facial expressions. The captions play a key role as well, since they orient how the photograph should be read. DiFrancesco & Young (2010) explored the ‘visual construction’ of climate change in *The Globe and Mail* and *The National Post* for the year 2008. The visuals were classified into three distinct categories: human imagery (e.g. political, citizen, expert, environmentalist, celebrity), nature imagery (e.g. natural landscape, ocean, animal, plant, ice) and industry imagery (e.g. transportation, oil sands/refinery, green technology). They found that the vast majority of news visuals depicted humans or natural elements. Most importantly, they observed the repeated presence of a ‘narrative disjuncture’,

whereby the text and visual do not emphasize the same dimensions of an issue. They took the example of an article which addressed climate change refugees but which contained pictures of an asteroid, flooding event and wildfire. These chosen visuals then did not make explicit connections to the issue at stake (i.e. human lives). Leiserowitz (2006) was similarly concerned about the US news coverage of climate change and concluded that visuals, especially those widely used of ice melt and polar bears, failed to provide a sense of psychological proximity. Along these lines, Hulme (2007) and O'Neill & Nicholson-Cole (2009) warned that sensational images were great for gathering attention but ineffective to induce behavior change.

The literature on climate communication demonstrates that current climate frames are showing their limits. Up until now, climate change has predominantly been framed in economic or scientific terms. Yet, it has generally failed to encourage attitude change. Although media attention increased, climate change rarely appears on front pages, which may indicate it has lost some of its novelty. Repeated use of a single frame can result in cognitive dissonance and even attitude polarization, which both discourage climate action. The personalized content of narratives coupled with disconnected visuals currently appeal to negative emotions, which make individuals feel hopeless and distant. The banalization of climate change came with the emergence of new spokespersons whose legitimacy may not be as widely accepted as the one of climate experts. As seen in Chapter 1, climate change remains overall a complex issue about which it is difficult to communicate the risks and solutions.

2.3. Reframing Climate Change as a Public Health Issue

Climate communication experts have recently proposed a public health frame as an alternative to current climate frames. They believe this frame could bridge the gap and could more

effectively induce behavior change. We explore below how they have justified their claims. It should be noted that this literature is still emergent and so, less than a dozen of studies have previously examined climate and health news coverage and its associated public reactions. Luckily, one or two studies provided significant Canadian insights, which we will use to compare our findings later on.

2.3.a. Theoretical Advantages

For a few years now, health experts have put forward three main reasons to make health central to climate action. Sauerborn et al. (2009) summarized them as follows:

- (a) The [health] impacts are large, increasing and inequitably distributed;
- (b) The majority of people everywhere are concerned about the protection of their own and their children's health and are hence prepared to support mitigation policies; and
- (c) Certain mitigation policies have significant positive health 'co-benefits', and these should be quantified and promoted to support mitigation arguments.

Public opinion surveys confirmed what health experts foreshadowed. Akerlof et al. (2010) conducted a quantitative study in which they examined a nationally representative survey asking Canadians if they perceived climate change as a potential health threat. They observed that 76% of Canadians viewed their community as being 'definitely or likely vulnerable', and that 'two thirds reported feeling personally vulnerable to the potential health impacts of climate change' (Akerlof et al. 2010). Around the same time, a 2012 influential Yale project on climate communication, *Global Warming's Six Americas*, intended to measure Americans' climate

beliefs. The researchers noted that health was ranked among the top three benefits expected from climate action (Leiserowitz et al. 2012).

Psychological Proximity

Moreover, researchers found that the public health frame was particularly effective with climate dismissive individuals. Maibach et al. (2010) wanted to investigate further how the six segments of the American population identified in the Yale project would react to a short public health-framed essay on climate change. They witnessed a positive reaction across all six segments but most interestingly, they found that people in the ‘cautious’, ‘disengaged’ and ‘doubtful’ groups were more open than usual to discuss mitigation and adaptation strategies following exposure to this frame. The authors posited that this novel frame can help counter the ‘issue fatigue’ and make climate change more personally relevant. Indeed, climate change will exacerbate current health problems with which the population is somewhat already familiar (e.g. asthma, allergies, infectious diseases). It hits home better than discussions surrounding the Arctic for instance. The public health frame therefore allows us to ‘put a human face on climate change’ (Levy & Patz 2015), and hereby lower the risks of attitude polarization (Hart & Nisbet 2012). Petrovic et al. (2014) conducted a study to explore the extent to which political orientation in the US permeates discussions surrounding climate change and if differences were observed when a public health frame was used. They similarly found that conservatives were more inclined to change their behavior when the information was presented in a public health context. The researchers also examined the impacts of terminology. They warned that terms such as ‘fossil fuels’ should be avoided, as it diminishes the effect of the public health frame. For instance, conservatives were less likely to recognize air pollution as harmful when fossil fuel were mentioned.

Medical Leadership

The public health frame also represents an opportunity to better integrate health experts in discussions surrounding climate change. As trusted members of their community with the necessary expertise, they find themselves in a unique position to disseminate information about climate change health risks and climate action health co-benefits (Boykoff 2011; Maibach et al. 2010). Health professionals can educate the public and policymakers with various means, one of them being a close collaboration with the media (Boykoff 2011). It will enable them to simultaneously train journalists who, to date, may not comprehend fully what is at stake.

Positive Emotions

In addition, the public health frame appeals to positive emotions, as opposed to the traditional frames which tended to convey fear, sadness or anger. Feelings of hope related to climate change are especially effective to induce behavior change because it provides a sense of empowerment (Snyder 2002; Swim et al. 2010; Markowitz & Shariff 2012). According to another American study, the public health frame was found to generate feelings of hope even among the most ‘cautious’, ‘disengaged’ and ‘dismissive’ segments of the population (Myers et al. 2012).

In practice, one way to provide such feelings is to address climate action health co-benefits. Going back to the notion of ‘equivalency frame’ put forward by Chong & Druckman (2007), a gain frame can be effective here to encourage prevention behavior, especially when the outcome is perceived as low-risk, safe or easy to do (Rothman et al. 2006; Spence & Pidgeon 2010). In other words, people will be more likely to support mitigation strategies if they know it can prevent future negative impacts, including those on health. As such, various studies consistently found that all six segments of the American population responded even more

positively to statements about climate action health co-benefits than those about climate health risks (Maibach et al. 2010; Myers et al. 2012; Petrovic et al. 2014). The most recent Canadian study (Cardwell & Elliott 2013) showed that the population was largely unaware of the health co-benefits at the time and therefore was unable to describe them as potential incentives to take action without prompts. The latest Lancet Countdown report provides greater emphasis on climate action health co-benefits, which might suggest that people could be more likely to mention them in the recent years. Hence the need to do follow-up studies, now that almost a decade has passed since the last ones were conducted.

2.3.b. Climate & Health in the Media

The literature on climate and health news coverage is still emerging. To date, only seven studies have been published. Four focused on US coverage (Nisbet et al. 2010; Hart & Nisbet 2012; Weathers 2013; Weathers & Kendall 2016), and each of the other ones focused on media outlets either from France (Depoux et al. 2017), Canada (King et al. 2019), or New-Zealand (Harrison et al. 2020). All studies found that, although media attention increased over the years, the public health frame's prominence remained low overall. In fact, all researchers noted that journalists did not apply the public health frame the way the literature recommended it, which made it little effective. We summarize below the mistakes they have made over time.

Public Health Frame vs. Traditional Frames

First, journalists continued to frame climate change mostly in ecological, economic or scientific terms. There was a greater emphasis on the environmental risks rather than on the health ones (Nisbet et al. 2010; Depoux et al. 2017). For instance, in the French study, the articles tended to be published in newspaper sections such as 'Planet', 'Ideas', 'Economy', and 'International'

(Depoux et al. 2017). Most studies observed that the coverage of the health impacts was largely episodic, following either major ecological events (Nisbet et al. 2010), or major climate policy breakthroughs such as COP21 during which climate and health media coverage would peak (Depoux et al. 2017; Harrison et al. 2020).

Personal relevance vs. Sensationalism

Second, the articles addressing climate change and health tended to have an international scope, which resulted in a failure to bring the issue closer to home (Depoux et al. 2017; Harrison et al. 2020). Moreover, there were only a handful of human interest stories (Harrison et al. 2020). Once again, journalists favored sensationalism over personal relevance, which is the opposite of what the public health frame was intended for (Maibach et al. 2010; Levy & Patz 2015). The Canadian findings are however interesting here, since the researchers also looked at the regional distribution of the climate and health news coverage across the country. They found that the publication frequency was highest in media outlets from Northern Territories (King et al. 2019), which is also the region of Canada that is expected to be exposed to the most severe climate change consequences. Thus, there is hope that journalists in Canada may be starting to write stories that are more personally relevant to their readers. This will need to be verified with new studies.

Health Experts vs. Climate Experts

An additional barrier to make the climate crisis more personally relevant was the presence of ‘scientific dense reporting’, which made it difficult to understand without a medical expertise (Weathers 2013; Weathers & Kendall 2016; Harrison 2020). Thus, the health risks were not enough decomplexified. One reason for this may be that health experts lacked media agenda-building strategies and were therefore largely absent from the coverage (Nisbet et al. 2010).

Gould & Rudolph (2015), who conducted semi-structured in-depth interviews with health professionals, reported that the lack of medical leadership was thought to be due to the politicization of climate change, which in turn oriented conversations more towards decisionmakers' and activists' opinions. It is regrettable since health professionals were initially thought to be best equipped to effectively disseminate information (Maibach et al. 2010; Boykoff 2011), which is something other groups have failed to do so far.

Good News vs. Bad News

Finally, journalists paid greater attention to the health risks than to the health co-benefits. In the New-Zealander study, only one third of the articles published in each selected outlet between 2001 and 2015 mentioned climate action health co-benefits (Harrison et al. 2020). In the French study, only 16% of the articles selected from *Le Monde* and published between 1990 and 2015 mentioned them (Depoux et al. 2017). Yet, the literature specifically said addressing the health co-benefits of mitigation and adaption strategies is the most efficient way to induce behavior change, and is particularly effective with dismissive individuals (Maibach et al. 2010; Myers et al. 2012; Petrovic et al. 2014). Additionally, the articles tended to focus primarily on the physical health impacts, and therefore left aside the psychological impacts as well as issues surrounding health inequity in relation to climate change (King et al. 2019; Harrison et al. 2020). For instance, the Canadian researchers found that 64% of the selected articles mentioned infectious diseases (with a focus on the Lyme disease) and 49% mentioned chronic noninfectious diseases (with a focus on asthma and allergies), whereas only 10% mentioned mental health disorders (King et al. 2019). Consequently, by emphasizing only certain aspects, journalists were unable to reflect proportionately the severity of climate change impacts on health.

2.3.c. Climate & Health coverage during the Covid-19 pandemic

After a thorough investigation of the literature, we believe no one has yet published a study on the evolution of climate change and health news coverage during the Covid-19 pandemic. However, we found two studies which give us meaningful preliminary insights on the media attention generally given to climate change in 2020.

Boykoff et al. (2020) published an international longitudinal dataset showing the coverage trends between January 2004 and August 2020. The authors observed that climate change coverage dropped significantly once the Covid-19 pandemic hit (Boykoff et al. 2020). A few Canadian news outlets were considered in the study. For instance, the number of articles addressing climate change in *The Globe and Mail* was cut in half between December 2019 and August 2020 (Boykoff et al. 2020). Similarly, *The Toronto Star* published about 75% less articles on climate change than it used to prior to the Covid-19 pandemic (Boykoff et al. 2020). *The National Post* was the only selected Canadian media outlet which increased its publication frequency related to climate change in 2020 compared to 2019 (Boykoff et al. 2020). Because this was only a dataset and not an article, the authors have not yet offered any sort of explanations for this difference.

The other study (Lyytimäki et al. 2020) specifically looked at the climate change news coverage in Finland during the Covid-19 pandemic. The researchers observed a similar drop in 2020 and proposed various factors that could help rationalize this finding (Lyytimäki et al. 2020). In the Finnish context, they believed that there was a cumulative effect between the cancellation of international climate policy meetings, the lack of national weather anomalies, news competition (i.e. what should get the most attention: climate or coronavirus?), as well as the displaced sense

of urgency from decisionmakers and the rest of the population (Lyytimäki et al. 2020). Nevertheless, the authors appeared confident that climate change would only be ‘muted’ temporarily, and that it would return at the forefront of news stories as soon as discussions surrounding a climate-oriented recovery would take place in the public sphere (Lyytimäki et al. 2020). Last but not least, they noted that about 20% of the articles selected for their study made connections between the Covid-19 pandemic and the climate crisis. Based on their quantitative findings, some articles compared the two crises, stating that the Covid-19 pandemic is nothing compared to what awaits us if we do not take action soon against climate change (Lyytimäki et al. 2020). There were also cross-overs between the two crises when the following topics were addressed: ‘air travel, veganism, car sales, green recovery, and Donald Trump’s 2020 presidential campaign’ (Lyytimäki et al. 2020).

Given the significant drop in climate change international news coverage, it is worth noting that the non-governmental British organization *Climate Outreach* rapidly published a 26-page report containing 10 recommendations to improve climate communication in a pandemic world (Webster et al. 2020):

1. Get the timing right and consider your audience
2. Don’t stop talking about the impacts of climate change – but be aware that public perceptions may be shifting
3. Speak to altruistic community values
4. Embed lifestyle change in the longer term
5. Emphasize resilience, preparedness and support rather than ‘going back to normal’
6. Build efficacy
7. Highlight individual change as a part of wider social change
8. Bring trusted voices to the fore
9. Use narratives around ‘fairness’
10. Show images of real people working together and be careful of protest imagery

Not so surprisingly, we find many recommendations which were previously made in the literature but which journalists failed to put into practice (e.g. the importance of trusted spokespersons and of personal relevance and positive emotions in narratives and visuals).

Altogether, the above literature review showed that climate communication remains challenging. Current climate frames raised public awareness about the issue but largely failed to induce behavior change. The public health frame has therefore been seen as an alternative which could be more effective, to the extent it reduces psychological distance and appeals to positive emotions. Yet, frame transformation has overall been slow. Indeed, it is difficult to introduce a new frame in the public sphere where other traditional climate frames already compete against one another. Nevertheless, the failures in climate communication cannot be solely attributed to journalistic practices. Although previous research demonstrated that reporters had a rather conservative approach to climate and health coverage, it is important to emphasize that health experts failed to collaborate with the media as well. Moreover, let's not forget that, beyond providing information, news media outlets are, first and foremost, profit-driven and tend to naturally favor sensationalism. Previous studies highlighted that climate effects on health add a layer of complexity and have therefore not reached a sufficient level of understanding and salience to appear on front pages just yet. Consequently, climate and health communication research points to a shared responsibility between reporters and health experts who both initially appeared unresponsive to the implementation of a novel public health frame. In our study, it will be interesting to explore whether their attitude has changed in the more recent years.

2.4. Research Contributions

Our study aims at providing primarily a better and more up to date understanding of how the media in Canada connect climate change to its impacts on human health. Indeed, various knowledge gaps were identified in the literature review above, partly because there was a limited number of studies published on the topic.

Our research can be considered two-dimensional. We investigate the evolution of both the public health frame's prominence and content. As such, we first attempt to measure when it is used and in which proportions compared to other traditional climate frames (e.g. ecological, economic, scientific). Given that only one study previously examined climate and health news coverage in Canada, our findings will either help confirm or question what King et al. (2019) first observed between 2005 and 2015. We also hypothesize that the climate and health news coverage may have increased since 2015, in part due to the publications of influential reports by the IPCC, WHO and the *Lancet*. Ultimately, we want to assess whether our findings are consistent with prior studies across the world, especially regarding the public health frame's successes and failures.

Moreover, we use different and additional variables that are more specific than those King et al. (2019) used. For instance, unlike King et al. (2019) and many other studies, we are particularly interested in determining the place held by health experts in climate conversations. Our codebook will therefore reflect this willingness. In addition, our classification of the health risks, social mediating factors, vulnerable populations and climate action health co-benefits is better in line with those described in the Lancet Countdown latest reports. It should enable us

to explore more thoroughly the content of the journalistic narratives around climate change and health than what King et al. (2019) were able to accomplish.

After various consultations, this study may very well be the first of its kind to further examine the repercussions of the Covid-19 pandemic on the Canadian climate and health news coverage. Similar to Lyytimäki et al. (2020), we hope to provide preliminary insights on the ways Canadian journalists may have linked the two crises together. Needless to say, this is only an initial contribution to the post-Covid literature on climate and health communication. A follow-up study is expected to be completed in subsequent years.

CHAPTER 3: RESEARCH METHODOLOGY

In order to answer our research questions, we conducted a quantitative content analysis of *The Globe and Mail*'s coverage of climate change impacts on human health from January 1, 2008 to December 31, 2020. Following Berelson's (1952) definition of a media content analysis, this method was best fitted for our research, as it allowed us to describe the substantive characteristics of the public health frame, while also exploring both the role of the producers of content and the effects on the audiences of content.

The relevant articles were identified using the ProQuest® Canadian Major Dailies database. Because of the complexity of the links between climate change and health, computer coding could have resulted in narrow and incomplete interpretations. Therefore, every selected article was coded manually using Excel sheets. Consistent with previous study methodologies examining climate change media coverage, the full newspaper article was chosen as the unit of analysis (Ahchong & Dodds 2012; Ford & King 2015; King et al. 2019).

The selection of 2008 as the reference start date can be justified by the fact that it coincides with the publication of assessment reports by both Health Canada and the IPCC. The inclination was that the salience of the issue could have potentially increased with these major publications. 2008 is also an important year for international climate policy as it corresponds to the start of the Kyoto protocol's first period of commitment to keep CO₂ emissions below 1990 levels. Moreover, public awareness about climate change at the time had grown significantly with the publication of books, artworks and documentaries such as '*An Inconvenient Truth*' in 2006. People also witnessed the growing occurrence of heatwaves (e.g. European heatwave in 2003),

tropical storms (e.g. Hurricane Katrina in 2005), droughts (e.g. Eastern Africa in 2005) and the melting of ice sheets, which were then all connected to climate change in the IPCC publications. The reference end date is 2020 to allow us to get a sense of whether or not the Covid-19 pandemic was a game-changer in the framing of climate change as a public health issue.

The analysis focused solely on *The Globe and Mail*. Its high circulation, national scope and rather centrist editorial stance were all criteria for its selection. The paper has also frequently been used in previous studies investigating climate change newspaper coverage (Good 2008; DiFrancesco & Young 2010; Rowe 2011; Ahchong & Dodds 2012; Young & Dugas 2012; Stoddart et al. 2016; Barkemeyer et al. 2017).

More precisely, in line with our research questions, the methodology was then divided into three stages. First, we sought to determine the prominence of the public health frame compared to other traditional climate frames. Second, we examined the characteristics of the public health frame, including the climate events and their associated health risks, social mediating factors, most vulnerable populations and climate action health co-benefits most often identified in the articles. Third, we explored whether journalists at *The Globe and Mail* linked the climate crisis to the Covid-19 pandemic and if so, what were the connections made.

3.1. Determining the Prominence of the Public Health Frame

First, we conducted an analysis of longitudinal trends to determine when is the frame used and what proportion of articles addressing climate change use it. To do so, we performed three ProQuest® searches. Each of them accounted for the plurality of terminology used to describe climate change. An overview of the search results is presented in Table 1 below.

Time Period	Annual number of articles published in the newspaper	Annual number of articles addressing climate change or global warming	Annual number of articles linking climate change and health
2008	69 586	6 554	19
2009	49 820	5 618	20
2010	40 339	3 786	17
2011	39 172	2 944	16
2012	38 984	2 657	11
2013	35 358	2 376	13
2014	30 009	2 284	26
2015	31 209	3 168	27
2016	29 825	2 571	27
2017	27 398	1 983	18
2018	27 260	2 726	32
2019	27 406	4 308	57
2020	27 328	3 028	40
TOTAL	473 694	44 003	323

Table 1. An overview of the search results using ProQuest®

The first search in the database was conducted without any keywords to enable us to see how many articles *The Globe and Mail* published each year of the selected timeframe, all topics considered. Between 2008 and 2020, the newspaper published a total of 473 694 articles.

The second search string aimed at identifying articles generally addressing climate change for each year of the selected timeframe and was therefore constituted of the following keywords: [“climate change” OR “global warming”]. In total, 44 003 articles were found in the database (or 9% of all articles published).

To identify the articles addressing climate change impacts on human health for each year of the selected timeframe, the third search string was comprised of two sets of keywords: [“climate change and health” OR “global warming and health”]. In total, 1270 articles were identified in the initial database search and 323 were maintained after the subsequent screening phases where exclusion criteria were applied. Essentially, there were three main exclusion criteria: (a) the

article does not link climate change and health (i.e. two separate issues), **(b)** the article constitutes a copy, or **(c)** the article is found in a format other than a printed news article (e.g. podcasts, blogs). Every types of article (e.g. news articles, editorials, letters to the editors, opinion columns) were however retained. Because only a few articles addressed climate change and health, a decision was made to include both precise and unprecise ones.

Subsequently, we converted the data into percentages to determine **(a)** what proportion of published articles addressed climate change and **(b)** what proportion of articles among those on climate change also addressed its impacts on human health (see Table 2 below). This first step into the research process enabled us to make two preliminary observations. Based on the results from the search strings, we found that the coverage of climate change between 2008 and 2020 was overall non-linear and only received greater attention recently, with a notable peak in 2019 where it was mentioned in 16% of the articles published in the newspaper. Moreover, very few articles linked climate change to its impacts on human health, varying from 0,3% to 1,3% annually.

Time Period	Annual percentage of articles addressing climate change or global warming (%)	Annual percentage of articles linking climate change and health (%)
2008	9	0,3
2009	11	0,4
2010	9	0,5
2011	8	0,5
2012	9	0,4
2013	7	0,6
2014	8	1,1
2015	10	0,9
2016	9	1,1
2017	7	0,9
2018	10	1,2
2019	16	1,3
2020	11	1,3

Table 2. An overview of the search results converted into percentages

3.2. Coding the Characteristics of the Public Health Frame

Based on the data obtained above, we identified four pivotal periods for the public health frame: **2008-09; 2014-15; 2019; 2020**. The first pivotal period (2008-09) represents the study’s reference start date with the publications of major reports by Health Canada and the IPCC. The second pivotal period (2014-15) is important as it corresponds to the years where the frame started to be used more often again after three consecutive years of decline. It is worth noting that the IPCC published another report in 2014 and that the United Nations Climate Change Conference (COP21) was held in Paris in 2015. The year 2019 was identified as another momentum for the frame usage, and it allows us to compare where we were at before entering a pandemic in 2020. The remaining of the study focuses solely on the articles issued from these four pivotal periods (N=189), which were therefore the only ones coded. Table 3 presents the number of articles selected once regrouped by time periods.

Time Period	Number of articles linking climate change and health
2008-2009	39
2014-2015	53
2019	57
2020	40
TOTAL	189

Table 3. Number of articles selected for further analysis

The codebook was created using an inductive approach. The classification of the health risks, social mediating factors, vulnerable populations and health co-benefits was inspired by the *Lancet* publications and previous studies investigating climate change and health news coverage (Nisbet et al. 2010; Hart & Nisbet 2012; Weathers 2013; Weathers et al. 2016; Depoux et al. 2017; King et al. 2019; Harrison et al. 2020). We used a testing sample of about twenty articles with which various attempts were made until the final satisfactory codebook was obtained. The variables described below are condensed as it would have been impossible to

code every single risk identified in medical publications with such a tight timeline to conduct the research. For each variable, we coded (1) if it were present in the article and (0) if it were absent. The variables 1 to 5 noted general information about the articles such as their date of publication, title and author(s). The full codebook is available in Appendix 1.

Issue Frame Competition

The placement of the article in a newspaper is another way to measure the salience of the issue at stake (Lim 2010). An article appearing on a front page can be considered highly salient. If the article does not appear on the front page, then it is worth looking into which section it is found. It can potentially help us determine whether the message is inscribed in other frames than just the public health one (Depoux et al. 2017). To this end, the variables 6 & 7 identified the article's section and its presence or absence on the front page.

References

Other journalistic practices, such as the selection of sources, can shape the public understanding of an issue (Boykoff 2011). We were interested in examining the norm diffusion process from the production of knowledge at the transnational level to its re-appropriation at the national and local levels. Consequently, we added two large sets of variables to determine who speaks for the cause. Variables 8 to 16 looked at the types of publications cited, while variables 17 to 31 looked at the types of individuals cited. For each set, we had variables identifying whether the sources originated from Canada, from abroad or from international organizations. We further broke down the publications according to whether they were produced by the scientific community (i.e. reports from UN agencies, the IPCC, research universities and institutes, and think tanks), governmental agencies (i.e. reports commissioned by federal, provincial, or local authorities) or civil society groups (i.e. reports from climate advocacy groups). Similarly, the

individuals were classified according to their professional background (i.e. government official or member of a civil society group) and their expertise (i.e. medical or non-medical). The main idea here was to determine whether those who produce the knowledge on climate change impacts on health are the same individuals communicating the risks in the media. Figure 4 illustrates the train of thought.



Figure 4. Classification of the quoted individuals, as noted in the codebook

Risks and Vulnerable Populations

The variables 32 to 37 noted which climate risks (e.g. floods, droughts, fires, heatwaves, storms) were identified by the journalists and were thought to generate direct impacts on human health. The variables 38 to 40 noted three additional risks (i.e. pollution, biodiversity loss and inefficient food system) amplified by climate change and which could impact indirectly human health. The variables 41 to 47 measured morbidity through the identification by journalists of specific types of health conditions (e.g. malnutrition, psychological impacts, cardio-vascular diseases, respiratory diseases, infectious diseases) as reported in the *Lancet* publications. Variable 48 measured mortality which was often linked to direct exposure to extreme weather events or fine particulate air pollution. The variables 49 to 54 recorded the presence or absence

of social mediating factors such as the rise of violence or poverty, the loss of labour productivity or cultural identity and population displacement.

The literature on climate change and health news coverage argues that the public health frame has a potential for reducing the population's psychological distance to the climate crisis (Maibach et al. 2010; Levy & Patz 2015). In other words, addressing climate change impacts on human health could bring the issue closer to home, which is something traditional climate frames often fail to do. Intrigued by this finding, we included variables 55 to 57 in order to determine whether Canadians were portrayed as being at risk or not. The variables 58 to 69 assessed which specific individuals were considered most at risk in both Canada and elsewhere due to either their age, gender, income, lifestyle or geographical location. The classification reflects the most vulnerable populations identified in the *Lancet* publications.

Climate Action Health Co-Benefits

Up until now, the health promotion literature emphasized that addressing climate action health co-benefits can be compelling and facilitate behavior change (Maibach et al. 2010, Myers et al. 2012, Petrovic et al. 2014). We want to verify if the journalists at *The Globe and Mail* put it into practice. Variable 70 was used to determine whether the article addressed any health co-benefits or not. If it did, then we desired to know which ones it was specifically referring to. Therefore, using an inductive approach, we added variables 71 to 77 with the health co-benefits that were likely to be cited. These included improved air quality, mental health and well-being, physical wellness, nutrition, stronger immune system and reduced mortality.

3.3. Exploring the Repercussions of the Covid-19 Pandemic

With an emergent literature connecting the Covid-19 pandemic and the climate crisis in various ways (Boykoff et al. 2020; Lyytimäki et al. 2020), we added the variables 79 to 98 to explore whether such connections were similarly made in the news discourse in 2020. More specifically, we wanted to determine **(a)** if the two crises were described as two interwoven problems sharing similar causes (e.g. anthropogenicity, globalization, capitalism); **(b)** if the populations vulnerable to climate change, especially those exposed to rising temperatures and air pollution, were considered additionally at risk for contracting the disease; **(c)** if the sanitary measures to fight Covid-19 were also thought to be beneficial for climate action; and **(d)** if the pandemic was thought to provide an opportunity to build back better by taking into consideration the lessons of the Covid-19 crisis management failures, so that we become better prepared to face future crises (e.g. the climate crisis).

3.4. Research Design Limitations

Ultimately, our study is wholly based on a traditional media content analysis widely used in the related literature. While we remain confident that our methodology is robust enough for an exploratory study in the context of a master's thesis, it had several limitations. For example, such research could benefit from a mixed methods approach whereby interviews with journalists could be conducted, as suggested by Harrison et al. (2020). Insider perspectives could enable researchers to understand better why journalists frame climate change the way they do.

In contrast to previous studies which were able to analyze various news outlets, we solely focused on *The Globe and Mail*. This decision restrained our capacity to generalize our findings. Indeed, the content of this newspaper may not be representative of the broader Canadian news coverage of the issue. For instance, King et al. (2019) noted that Canadian regional newspapers were more inclined to address climate change and its health impacts. Furthermore, our study is unable to take into consideration language differences. Young and Dugas (2012) demonstrated that French-language newspapers in the province of Quebec did not emphasize the same dimensions of climate change as the ones found in English Canada. The same could be true for the public health frame specifically. Future research should try to better address this dimension.

Other concerns regard our search and screening strategy. The timeframe we used, decoupled into four pivotal periods only, could further restrict the scope of our results. The articles' selection may have been potentially biased by the key words used, though multiple attempts were made and the search string leading to the larger number of articles was retained. Noteworthy is the fact that our research was also constrained by the availability of the articles in the ProQuest® Canadian Major Dailies database.

While we recognize that photographs and other types of illustrations can reinforce the emotional or moral tone of a discourse (DiFrancesco & Young 2010), little attention was paid to them in our study, partly because they were not easily available in the selected database. Prior research also failed to analyze the role of visuals. This remains an interesting topic for future work.

Last but not least, it is important to note that we coded only the presence of the variables and not their intensity. Consequently, the unit of analysis used (i.e. full article) was quite broad.

Had we coded the intensity, the paragraph would have been considered more appropriate. Although none of the above limitations necessarily invalidate our findings, they must be taken into account when examining the results.

CHAPTER 4: RESULTS & DISCUSSION

4.1. Temporal Development of the Public Health Frame

Over the period 1 January 2008 – 31 December 2020, there was a non-linear increase in the annual climate change and health coverage in *The Globe and Mail*. As the annual number of articles addressing climate change increased, the proportion of articles among these which discussed the impacts on human health coincidentally rose. The news outlet published a record number of articles on climate change and health in the most recent years, with a notable peak in 2019 when 57 articles were identified. Figure 5 below presents the general trends observed in our study concerning the prominence of the public health frame over time.

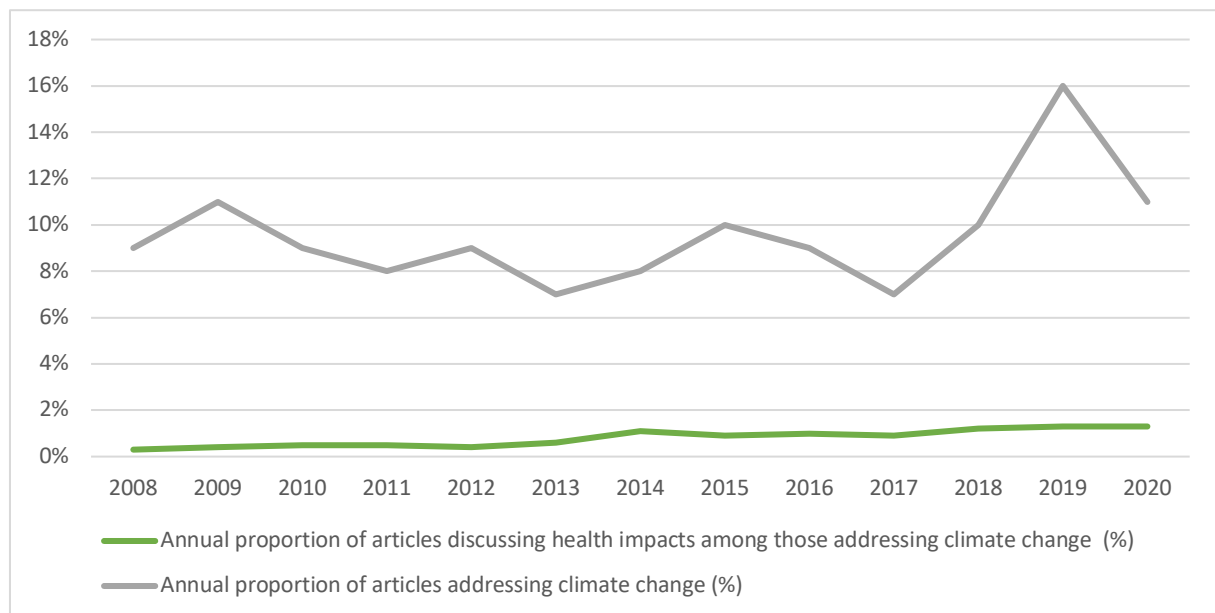


Figure 5. Evolution of the public health frame's prominence over time

While we had reasons to believe that 2020 could encourage journalists to use the public health frame more frequently, it has not been the case. As a matter of fact, the number of articles

addressing climate change in 2020 dropped. They represented only 11% of the total number of articles published that year by the outlet, compared to 16% in 2019. For both years, 1,3% of the articles addressing climate change also discussed its impacts on human health (see Figure 5). Relatively speaking then, the public health frame was used in the same proportions in 2019 and 2020. And while it maintained its relative prominence in the media discourse on climate change, the public health frame did not make the breakthrough climate advocates hoped for, despite the Covid-19 pandemic bringing to the fore diverse discussions surrounding global health.

More generally, our longitudinal study demonstrates that the public health frame was constantly underutilized and continue to be to this day. Indeed, the overall proportion of articles linking climate change and its impacts on health between 2008 and 2020 was 0,7%. Similarly, the annual proportion never exceeded 1,3% (see Appendix 3.1).

As noted before in the methodology section, a total of 189 articles, found within four pivotal periods (2008-09; 2014-15; 2019; 2020), were included for further analysis. A full list of the articles selected is available in Appendix 2. Because no major differences in the content of the public health frame were observed once the four pivotal periods were compared (including inside and outside a pandemic world), a decision was made post-analysis to regroup the data found for each of them altogether. It also allowed us to simplify the presentation of our results. However, when deemed necessary, exceptions to the general trends are noted.

4.2. Reporting Across Newspaper Sections

Of the 189 articles analyzed, only three of them appeared on the front page of the newspaper between 2008 and 2020. It confirmed our suspicions that climate change impacts on human

health tend to be generally overlooked and that the public health frame is often relegated to the backburner. Moreover, the articles were predominantly found in the local and international news section (53%), opinion and comment columns (19%) and business news (12%). Other sections included 'letters to the editor', 'editorial', 'globe life', and 'science'. The writing of articles about the issue seems to have been mainly motivated by either the occurrence of extreme weather events or the publication of major scientific reports, which were both considered news. The fact that so many articles were written by members of civil society could indicate a willingness from the newspaper to either be more inclusive, or potentially to fill in the gap for the journalists' lack of knowledge and competence to simplify the links between climate change and health.

4.3. News Media Bias

Publications From Home

The majority (42%) of the reports cited in the 189 articles addressing climate change and health between 2008 and 2020 originated from Canada. Reports produced by international organizations or foreign groups respectively accounted for only 29% each.

The international publications cited were predominantly issued by either UN agencies (e.g. IPCC, UNCBD, UNESCO, UNFAO, UNICEF, WHO) or the World Bank. These reports addressed multiple social determinants of health which could potentially be threatened by climate change and which will become therefore increasingly costly to protect.

A vast majority (62%) of the foreign publications cited were published by the scientific community. Among these, we found multiple references to studies published in the *Lancet* medical journal. About 38% of the foreign publications cited were produced by governmental agencies, with most of them originating from the United States. More particularly, many articles made references to the US Environmental Protection Agency's (EPA) 2009 finding according to which greenhouse gases, including carbon dioxide (CO₂), endanger public health. Reports produced by the US Center for Disease Control (CDC) were also referenced a couple of times when the rise of infectious diseases was discussed. No reports produced by foreign civil society groups were cited.

Half of the Canadian publications used were published by governmental agencies. These were essentially risk assessment reports produced by either the Public Health Agency of Canada (PHAC), Health Canada (HC), or Natural Resources Canada (NRC). Repeated references were made to the following reports: *Canada's changing climate* (NRC 2007), *Human health in a changing climate* (HC 2007), *Canada communicable disease report* (PHAC 2016), and *Canada's food guide* (HC 2019). About 34% of the Canadian publications used were studies published by the scientific community from various universities across the country. Very few reports (16%) elaborated by Canadian civil society groups were cited.

Featuring Canadian Experts

More than half (67%) of the individuals quoted in the selected articles between 2008 and 2020 lived in Canada. Foreigners accounted for 26%, while representatives of international organizations accounted for only 7%. Figure 6 below summarizes the findings of this section.

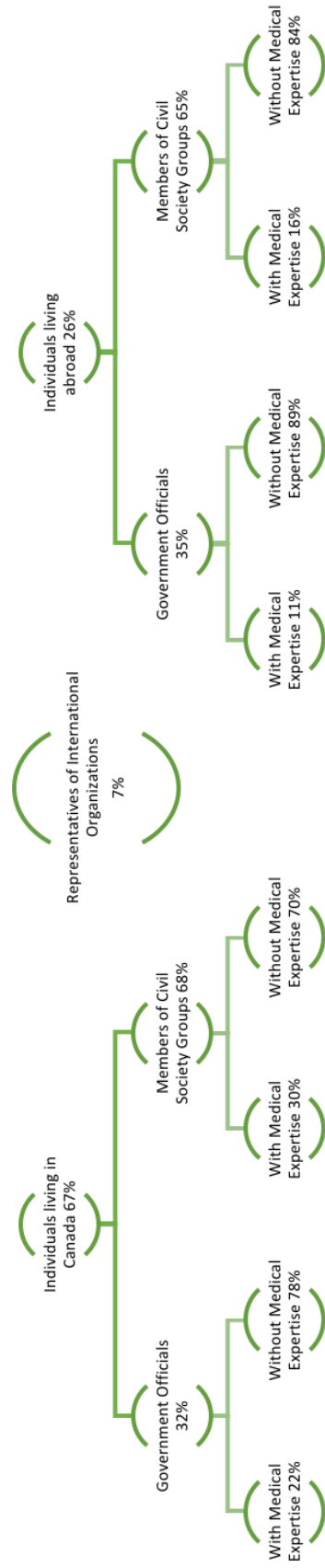


Figure 6. Distribution of the quoted individuals according to their professional background and expertise

Among the quoted individuals who lived in Canada, 68% were members of civil society groups, while 32% were government officials working at either the local, provincial or national level. More interestingly, only 30% of the members of civil society groups and less than a quarter (22%) of the government officials explicitly had a medical expertise.

Similarly, we found that the vast majority (65%) of the quoted foreigners were members of civil society groups while 35% were government officials. Here the findings are even more striking, with only 16% of the members of civil society groups and 11% of the government officials having a medical expertise.

4.4. Climate Change Impacts on Health: Immediate Threats Only

The Weather We Know

Our study looked at which extreme weather events (resulting from climate change) were most often held responsible for the rise of health issues in the 189 articles selected. The rationale behind it was that the links would be more precise and efficient if the cause and effect mechanisms were clearly spelled out. We found that more than half of the articles in fact did not specify them. Between 2014 and 2015, this number even rose to 70% (see Appendix 3.2). When specific extreme weather events were identified, two of them particularly stood out. Indeed, one fourth of the articles identified either floods (resulting from permafrost melt and sea level rise) (24%), or heatwaves and temperature rise (22%) as potential threats to public health. Storms, droughts and fires were less often discussed. The results are summarized in Figure 7.

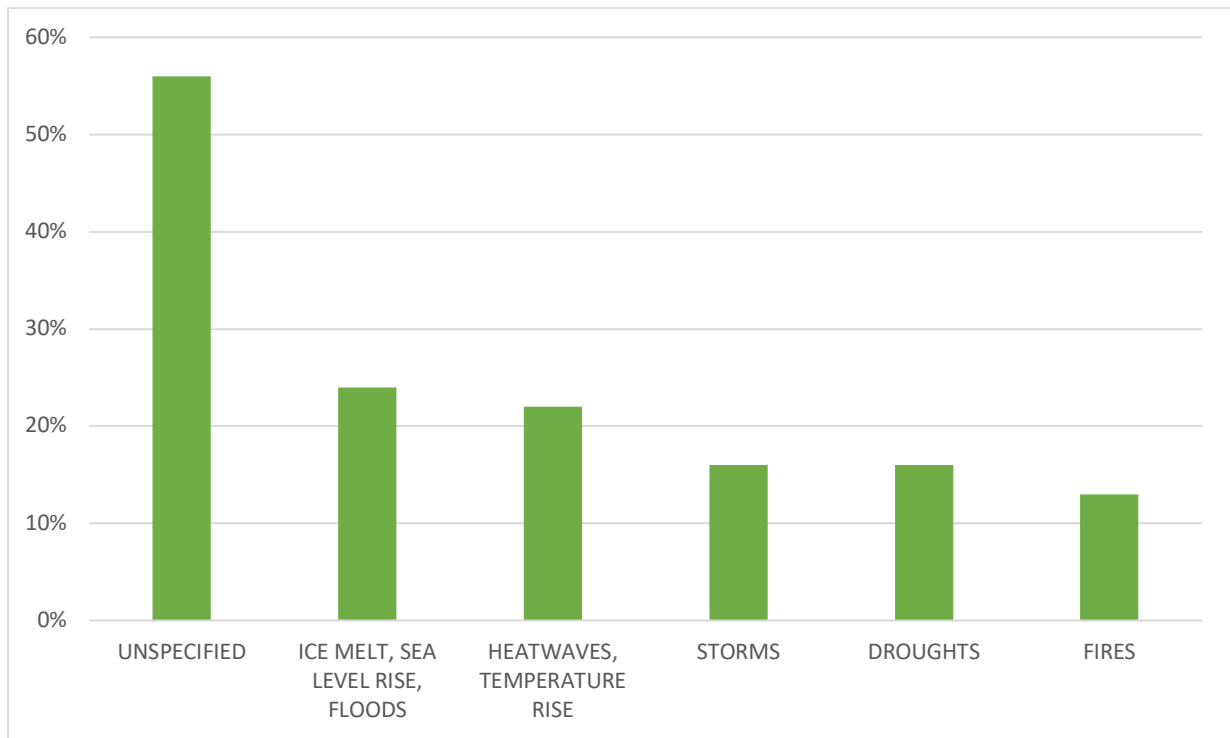


Figure 7. Distribution of the most cited climate risks

Although fires were the least talked about, it is worth noting that their mention tripled over time. Between 2008 and 2009, only 8% of the articles addressed fires while 23% did in 2020. Except fires, all dimensions lost visibility over time. A detailed description of this evolution can be found in Appendix 3.2.

Subsequently, we examined whether the selected articles identified changes in the biosphere or specific human activities which could impact indirectly human health (see Figure 8). About 42% of the articles considered air and water pollution (often related to the burning of fossil fuels). A little less than a quarter of the articles talked about deforestation or biodiversity loss more generally. Only 13% of the articles mentioned the inadaptation of our food systems to climate change. Over the years, all three dimensions however lost visibility (see Appendix 3.3).

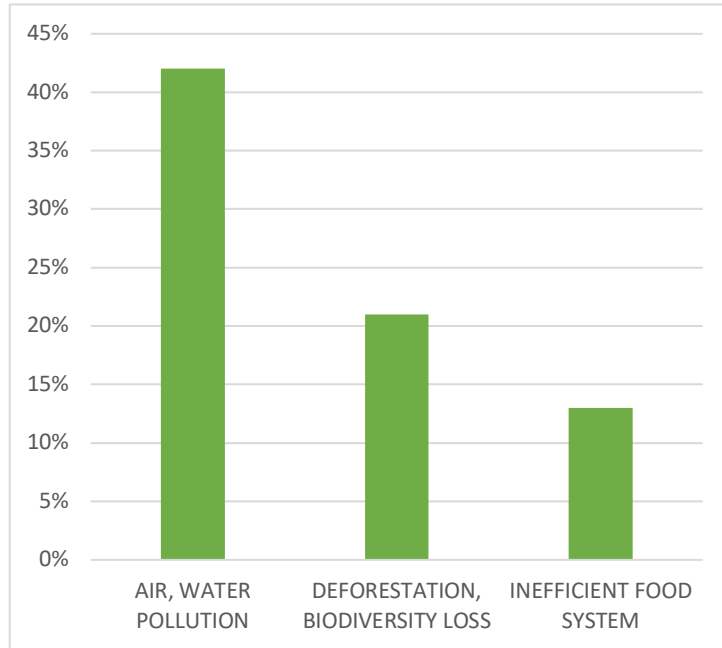


Figure 8. Distribution of the most cited human activities having indirect impacts on health

From the results, it is clear that the most precise articles were those which reported on extreme weather events that had just occurred in Canada or elsewhere. In other words, their precision was directly linked to whether the climate risk already occurred in real life and to whether it was recurrent or not. For instance, the mention of fires skyrocketed every time one would take place in California, Australia or Western Canada. Similarly, the mention of fine particulate air pollution would increase when cities in China, India or here in Canada faced an abnormal level of smog.

Associated Health Risks: They're Already Here

One major objective of our study was to determine which climate change health impacts were most often communicated in news articles. We observed that a non-negligible proportion of the 189 selected articles did not specify which health issues would be engendered by the amplification of both the intensity and frequency of extreme weather events. As shown with the figure below, 31% of the articles remained vague with statements such as “the fight against

climate change is also a health issue” (Jang 2019) or “a visible threat to public health” (GM Editors 2014).

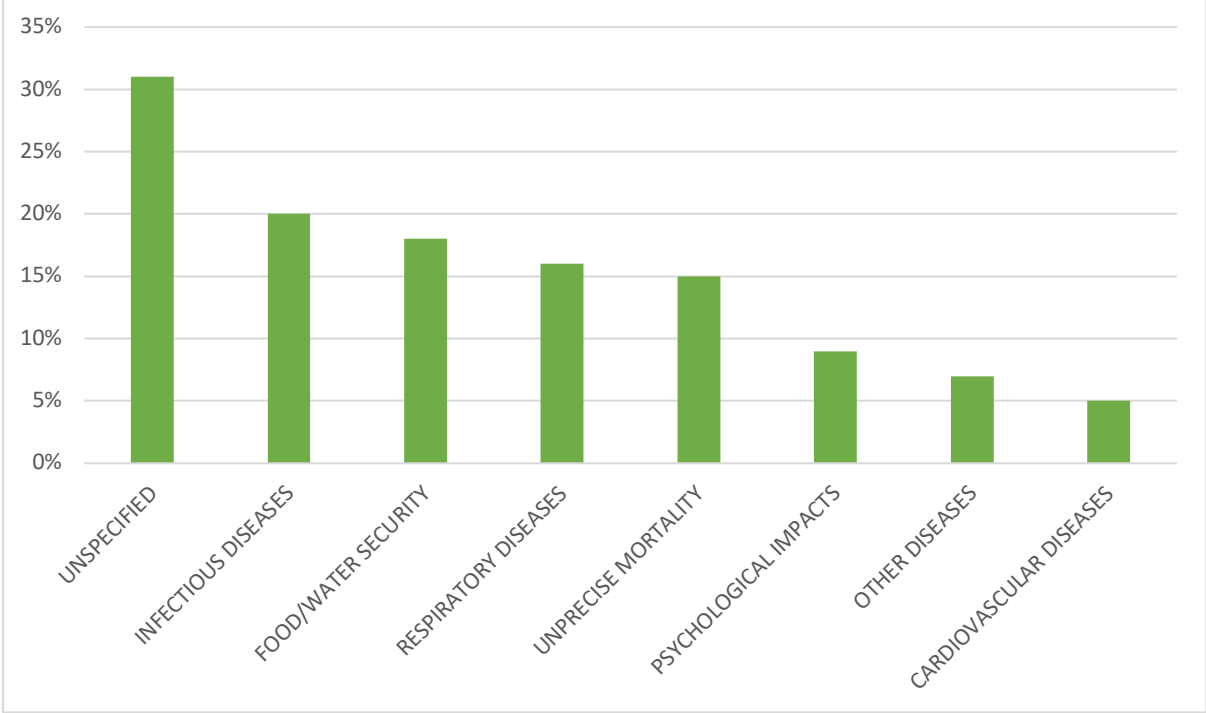


Figure 9. Distribution of the most cited health risks

When specifically identified, three associated health risks were most often discussed. Indeed, 20% of the articles talked about infectious diseases, 18% about food and water security and 16% about respiratory diseases. Lyme disease was the most cited infectious disease. One reason for this could be that the number of Lyme cases across Canada has grown over recent years, with vectors expanding their geographic range as the climate gets warmer. Water-borne diseases represented another concern in areas with water sewage treatment processes ill-adapted to heavy precipitations. Food and water security were described as challenges for areas vulnerable to droughts and floods whereby agricultural productivity would be negatively impacted. Respiratory diseases (e.g. lung cancer, asthma, chronic bronchitis, pneumonia) were often linked to either fine particulate air pollution or smoke from fires.

In addition, the category ‘unprecise mortality’ in Figure 9 presents the meagre proportion of articles (15%) which mentioned fatalities from storm surges and heat-related events. The circumstances of death can vary and are most of the time not clearly stated. Nevertheless, it can help people understand better the severity of climate change which, if not taken seriously, can ultimately lead to the loss of life.

Despite a growing literature on the socio-psychological impacts of climate change, we found that only a weak proportion of articles (9%) mentioned them. More surprisingly, the proportions did not vary much over time (see Appendix 3.4). Between 2008 and 2009, 10% of the articles addressed mental health while 10% did in 2020. The all-time highest proportion was 12% in 2019. Essentially, there were three mental health impacts frequently described. The first was a psychological trauma following the loss of a property or a population displacement. The second was most commonly referred to as eco-anxiety, whereby people constantly worry about or fear environmental destruction. Lastly, climate change was tied to pregnancy risks as it was perceived to potentially affect fetal brain development.

A few articles discussed health issues that were not listed in our codebook. Such issues included for instance kidney stones, altered DNAs, diabetes, skin and eye disorders.

Although cardio-vascular diseases overall represented the least cited health risk associated with climate change, attention to them steadily increased over time (see Appendix 3.4). While none of the articles selected between 2008 and 2009 mentioned cardio-vascular diseases, 10% did in 2020. They were often linked to heatwaves and smoke inhalation or air pollution.

What About Social Mediating Factors?

Next, we examined which social mediating factors were most often discussed in the 189 selected articles between 2008 and 2020. These factors are relevant to the extent they can indirectly impact people's mental health and well-being (Lancet Countdown 2015).

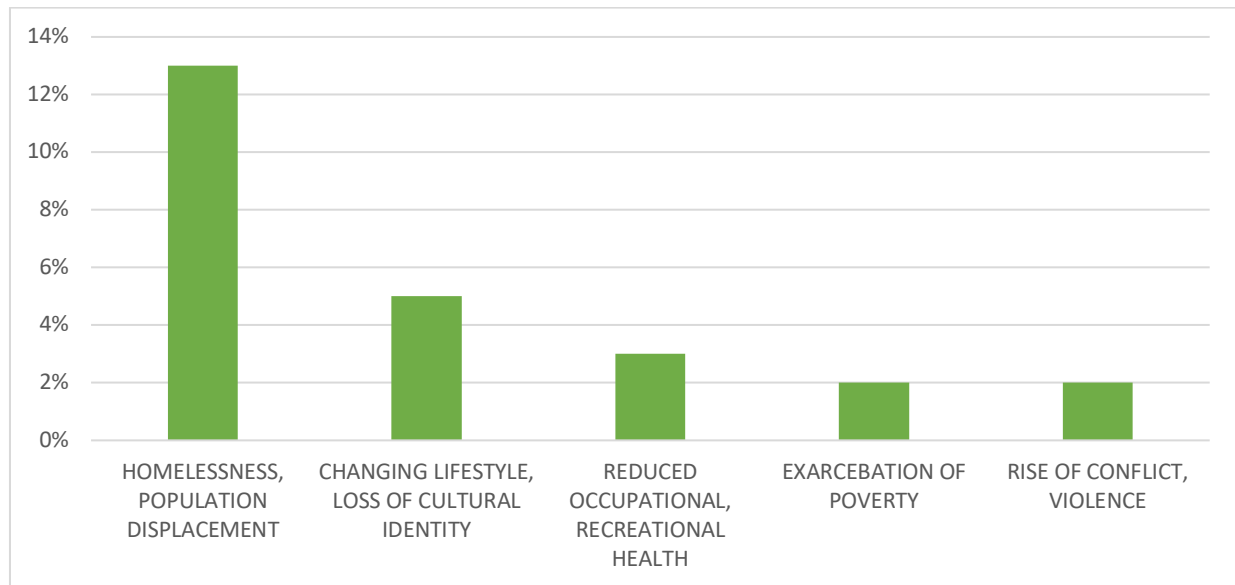


Figure 10. Distribution of the most cited social mediating factors

Our results demonstrated that social mediating factors were largely absent from articles addressing climate change impacts on health. We found that 79% of the selected articles did not identify any social mediating factor. This may explain why we observed earlier that psychological impacts remained mainly overlooked.

Homelessness and population displacement constituted the most likely social mediating factor to be identified (see Figure 10). The loss of property was often connected to the occurrence of storms, floods or fires. In rare cases, it was also linked to droughts which, by causing crop failures, would force farmers to migrate elsewhere to earn their living and to feed their families.

Mentions of reduced occupational or recreational health doubled over the years (see Appendix 3.5). Between 2008 and 2009, 3% of the articles talked about it while 8% did in 2020. It was often associated with the presence of heatwaves, fire smoke or smog.

Similarly, we found that mentions of a changing lifestyle or loss of a cultural identity quadrupled (see Appendix 3.5). Between 2008 and 2009, only 3% of the articles discussed it while 11% did in 2019. This social mediating factor was often cited for indigenous and northern communities whose traditional livelihoods and culture were thought to be particularly threatened by the permafrost melt, sea level rise and biodiversity loss. However, it is worth noting that the proportion of articles mentioning this factor in 2020 dropped to 3%. At this stage of understanding, we believe the Covid-19 pandemic may have temporarily hindered the progress made in the recent years.

Exacerbation of poverty and the rise of conflict or violence were each discussed by less than 2% of the selected articles (see Figure 10). Both were thought to mostly take place in Africa after a natural disaster, when there could be food and water shortages. These arguments inscribed themselves in a more traditional rhetoric whereby climate change is thought to impact primarily under-developed or developing countries. By doing so, it likely widened the psychological distance with the climate crisis, which is not what the public health frame was intended for.

What About People At Risk?

Our study also examined which populations were considered most at risk between 2008 and 2020. Half of the selected articles did not identify any vulnerable population. However, we observed a downward trend over time. Between 2008 and 2009, the proportion of articles

without any population identified was 63%. By contrast, the proportion dropped to 43% for the articles published in 2020 (see Appendix 3.6).

When identified, about 58% of the selected articles perceived the health of Canadians would be threatened by climate change, if not already. A little less than a quarter (22%) of the articles focused on population health outside Canada and 20% did not specify any particular geographic location. This is an important finding in the understanding of the public health frame's capacity to reduce the psychological distance with the climate crisis. Unlike traditional frames (e.g. ecological or economic), the public health frame shows that the health of the populations in developed countries like Canada will not be spared now or in the future, hence the urgency to take action.

Next, we classified the vulnerable populations, both inside and outside Canada, according to those identified in the *Lancet* publications (see Figure 11). Between 2008 and 2020, urban populations and children (including fetuses) were the most often considered at risk. Urban populations, who were identified in about 17% of the selected articles, were often thought to be exposed to air pollution, urban heat island effects or sea level rise. City dwellers were therefore thought to be more at risk for respiratory and cardio-vascular diseases as well as death. Children were mentioned in about 13% of the selected articles and were considered vulnerable to the same risks as urban populations. However, a dozen of articles also stated that children were additionally at risk of malnutrition when droughts would take place.

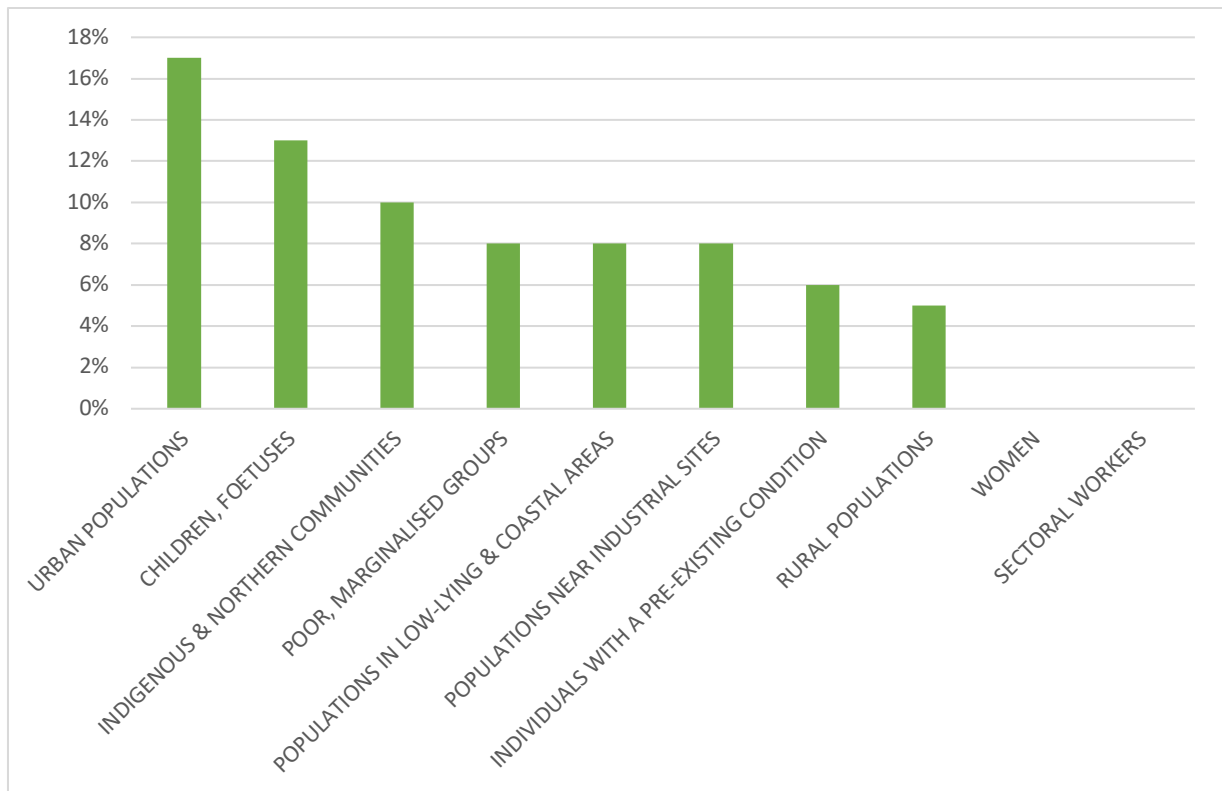


Figure 11. Distribution of the most cited vulnerable populations

Mentions of indigenous and northern communities doubled between 2008 and 2020 (see Appendix 3.6). The same can be said about the mentions of poor and marginalized groups (including homeless individuals) (see Appendix 3.6). In 2020, the two categories were respectively represented in 10% and 13% of the selected articles. Indigenous and northern communities were regularly associated with permafrost melt, which would force them to migrate and to adapt their lifestyle. Poor and marginalized groups were considered greatly exposed to heat-related events, such as droughts in remoted areas or urban heat island effects. This was commonly justified by the fact these people could not afford air conditioning. Both northern and poor communities were thought to face food and water insecurity.

Populations living in low-lying or coastal areas have received a steady level of attention since 2008 (see Appendix 3.6). Except for 2019, the proportion of articles mentioning these

vulnerable populations was 8%. There was a slight increase in 2019 when the proportion rose to 9%. Such populations were more likely to be mentioned when the articles talked about flooding or sea level rise. Associated health issues included but were not limited to infectious diseases, psychological trauma and fatal injuries.

Populations living near industrial sites (e.g. tar sands) represented another non-negligible vulnerable segment of the population identified in the articles. Between 2008 and 2020, nearly 8% of the selected articles discussed the health issues they were facing. In 2019, we observed a peak when the proportion went up to 14% (see Appendix 3.6). We speculate this is strongly correlated with the significant media coverage of the freshly built coal-shipping facility in Metro Vancouver, which rose concerns about air pollution and its impacts on the local residents' health. More generally, populations living near industrial sites were thought to be at risk for infectious diseases through water contamination and food poisoning with chemicals such as mercury.

Individuals with a pre-existing condition were identified overall in less than 6% of the articles. Yet, they were thought to be exposed to the same climate and health risks as children. It is difficult to explain such results. Often times, they would be mentioned when articles reported statements from health officials, asking this segment of the population to stay home.

The identification of rural populations is only a recent phenomenon. Indeed, no article mentioned them between 2008 and 2009 (see Appendix 3.6). By contrast, 13% of the articles written in 2020 did. The increase of coverage has however not been linear over time, going from 8% between 2014 and 2015 to less than 2% in 2019. Interestingly, rural populations were

thought to face the greatest diversity of climate risks, from heatwaves to floods, storms, and droughts. Thus, their health was thought to be endangered in various ways.

Last but not least, non-pregnant women and sectoral workers were never ever mentioned in the 189 articles selected between 2008 and 2020 (see Appendix 3.6). This can probably be regarded as one of the most striking findings of our study. In the transnational discourse, there are three main reasons to consider women's health as particularly vulnerable to climate change. Women are more sensitive to malnutrition because their nutritional needs can rise with menstruation or childbirth (UN Women Watch 2009). In many societies, women also spend a great amount of time in the kitchen with traditional stoves, which can in turn pollute the air they breathe (UN Women Watch 2009). In climate refugee camps, women are likely to experience physical (even sexual) abuse (UN Women Watch 2009). In the articles we analyzed, women were only considered when they were pregnant. Yet, the literature clearly advances that the dangers are not limited to gestation. Similarly, sectoral workers are often mentioned in the literature in relation to heatwaves. For instance, agricultural workers working in the fields during heatwaves are more likely to faint or experience a heat stroke (Lancet 2009). Workers in over-heated indoor workplaces (e.g. glass factory, bakery) can experience these health issues as well (Lancet 2009). Consequently, it is rather alarming to see that both of these populations were absolutely overlooked between 2008 and 2020. Nevertheless, we acknowledge that our corpus was restricted and so, it may be the case that certain articles did mention them in the years other than those we looked at.

Climate Action Health Co-Benefits: Dismissed?

A little less than a quarter (23%) of the selected articles discussed climate action health co-benefits between 2008 and 2020. Despite a growing literature recognizing their ability to induce

behavioral change, the proportion of articles mentioning them did not change much between the reference start and end dates of our study, going from 23% in 2008-09 to 25% in 2020 (see Appendix 3.7). The highest proportion was found in 2019, with 15 articles mentioning them.

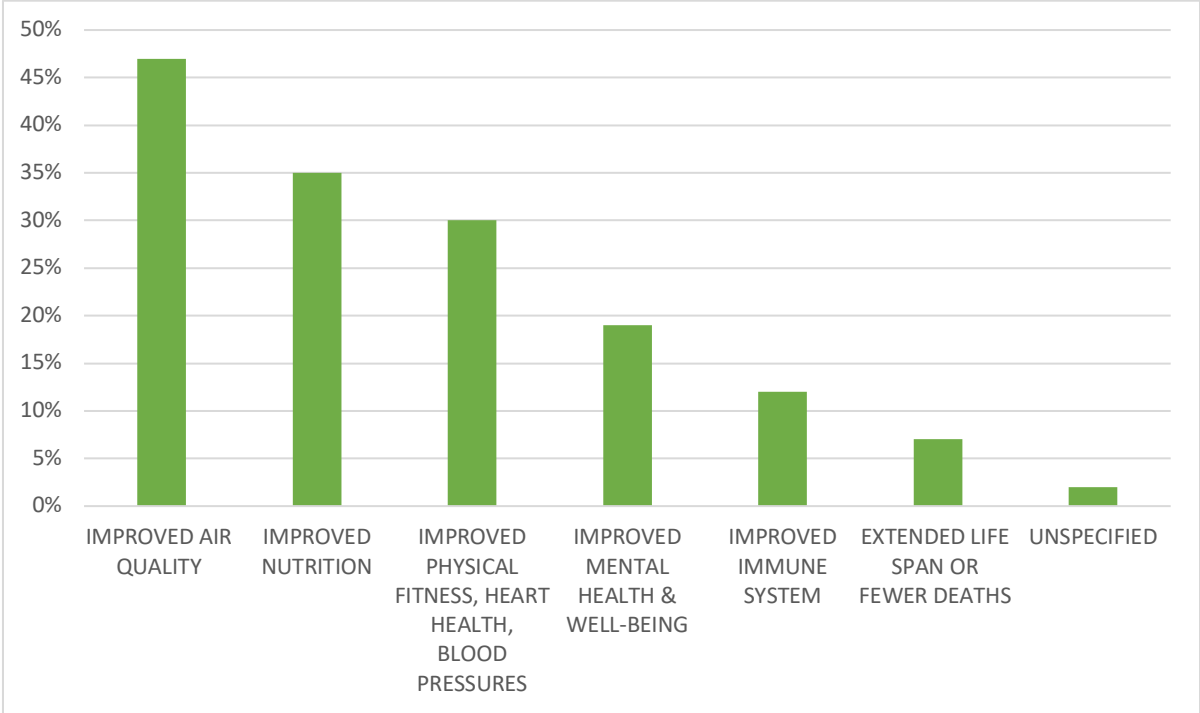


Figure 12. Distribution of the most cited climate action health co-benefits

Improved air quality was cited in nearly half of the articles addressing climate action health co-benefits between 2008 and 2020 (see Figure 12). It was often associated with mitigation strategies aiming at reducing vehicle emissions in urban areas. The emphasis on air quality here may be linked to the fact that respiratory diseases constituted the third most often cited health risk.

Improved nutrition was another health co-benefit repeatedly brought up. It was found in about 35% of the articles addressing climate action health co-benefits between 2008 and 2020. It was essentially connected to mitigation strategies focusing on reducing CO2 emissions from the

agricultural sector. One of the recurrent recommendations was to reduce the weekly consumption of meat because its production is considered carbon-intensive and requires lots of land and water resources as well. Vegetarianism, and later veganism, were both promoted as more nutritious and eco-friendly ways of living.

Improved physical fitness, heart health and blood pressure were cited in 30% of the articles addressing climate action health co-benefits between 2008 and 2020. Often times, the articles would promote active modes of transport (e.g. cycling, walking) which were thought to help mitigate vehicle emissions and prevent sedentary lifestyles. These health co-benefits were also thought to be achieved through recreational activities in green spaces, which have then sparked the debate regarding eco-responsible urban planning.

The articles addressing climate action health co-benefits increasingly talked about improved mental health and well-being in the recent years. Mentions have in fact tripled, going from 11% between 2008-09 to 30% in 2020 (see Appendix 3.8). For once, the increase over time was linear. Generally speaking, there were two ways these health co-benefits could be attained according to the journalists. First, adopting more eco-friendly lifestyles and taking small steps in our everyday lives to reduce individual CO₂ emissions could lower the level of people's eco-anxiety. In other words, it would enable people to obtain a clear conscience. Second, spending time in green spaces, what is commonly referred to as nature therapy or forest bathing, could help lower people's stress levels. Hence the rhetoric behind it encouraging the conservation of these spaces.

Another health co-benefit regularly discussed in relation to forest bathing was the building of a stronger immune system, which could then allow a better resilience to cancers and other chronic

diseases. This is made possible because the forest air naturally contains anti-cancer terpenes (Cho et. al. 2017). It was mentioned in 12% of the articles addressing climate action health co-benefits.

A few articles (7%) mentioned that both mitigation and adaptation strategies (e.g. emergency preparedness systems) would be beneficial, as they could potentially reduce the number of fatalities expected, following the occurrence of an extreme weather event. Such articles provide therefore clear-cut illustrations of the rhetoric according to which taking action now would help prevent future negative impacts (e.g. loss of life). In the literature, it is commonly referred to as a gain frame and was found to be effective at inducing positive attitudes towards climate action (Spence & Pidgeon 2010).

Unlike what we observed with the other dimensions of coverage, we found only one unprecise article which failed to identify which health co-benefits would be generated if action against climate change was taken.

4.5. Covid-19 Pandemic: A Missed Opportunity?

In this section, the analysis focuses solely on the articles addressing climate and health in 2020. Now, it is worth reminding ourselves that the public health frame was not used in greater proportions that year than it was before. Indeed, it was used in only 1,3% of the articles addressing climate change (see Appendix 3.1). Consequently, we have no option but to reject the idea according to which, the Covid-19 pandemic could have paved the way to reframe climate change as a public health issue.

Nevertheless, we found that 19 articles connected the Covid-19 pandemic to the climate crisis in 2020. Among these articles, 37% quoted health professionals to explain how the two crises were related. They were all Canadian experts, except for one article, where American medical researchers were also cited. Essentially, there were three types of health professionals represented: public health officials, university-based medical researchers, and members of the Canadian Medical Association (CMA) or the Canadian Association of Physicians for the Environment (CAPE).

The vast majority (68%) of the Covid-related articles considered the two crises were interwoven. About one fourth did not state a position and only one article perceived them as separate. Based on the variables used in the codebook, we were able to identify three different ways in which the articles connected the two crises.

Shared Causes and Interaction

First, a few articles traced back the origins of both crises and concluded they shared similar causes. About 16% of the Covid-related articles posited that anthropogenicity played a key role in the transmission of zoonotic diseases, from animals to humans. Moreover, almost half of the articles (47%) believed that climate change may have amplified the spread of the Coronavirus disease among humans through temperature increase, heavy precipitations and air pollution.

The article fragment below summed it all:

Climate change, deforestation, rapid urbanization pushing people closer to wildlife and livestock, the exotic-animal trade, conflicts causing mass movements of refugees, poverty and inequality, vast expansion of travel by air and high-speed train – all of these factors contributed to creating the ideal environment for pathogens to flourish (Picard 2020)

Similar Impacts on Human Health

Second, a couple of Covid-related articles stated that the two crises would impact human health in similar ways. Those described above and which addressed air pollution believed that both crises would affect our respiratory system. In addition, one article argued that both crises would negatively impact our mental health. The proportion is weak but could potentially be higher, had we looked at articles written in 2021, when the third wave of Covid was thought to have a serious toll on mental health.

More interestingly, although our codebook was unable to reflect this, many articles thought both crises would exacerbate socio-economic disparities and that the same populations were at risk. One article illustrated this through a poignant story:

The population in Lowndes County is 72 per cent African-American. It has a per capita income of US\$19,491, where more than a fourth of the residents live below the poverty line [...] With climate change becoming even more evident through higher temperatures for longer periods of time, higher water tables and wastewater treatment failures, the pandemic has made the population of Lowndes County and many others in the United States vulnerable for illness and death (Coleman Flowers 2020).

Another fact our codebook could not highlight but is worth mentioning was that a few articles thought sanitary measures, to prevent the spread of Covid-19, could put Canadians more at risk for health issues related to climate change. For instance, they said those who experienced lockdowns in urban areas would do outdoor activities in the woods to unwind, which put them more at risk to contract the Lyme disease (Anderssen 2020). Another example was that public health officials in British Columbia recommended to open the windows in schools to avoid Covid outbreaks, which would paradoxically expose children to fire smoke in turn (Woo 2020). Thus, the articles considered that solutions to solve one problem could open the door to another.

More generally, we found that only 11% of the Covid-related articles argued the sanitary measures positively contributed to climate action. The main argument here was that lockdowns and travel bans reduced CO2 emissions. However, another 21% of the articles believed the effects would only be temporary. The vast majority of the articles did not state a position on the matter.

Similar Crisis Management Failures

Third, numerous articles connected the two crises in terms of crisis management failures. More than half of the Covid-related articles (53%) believed there were lessons to be learned from the failures to prevent the spread of the disease, or that the pandemic could be a foretaste of what the climate crisis could entail. Essentially, the articles recommended to increase the Canadian vaccine production capacity, to improve our emergency response systems, and to solicit greater international collaboration in a timely manner. In brief, the articles endorsed the philosophy of ‘prevention is better than cure’. Others also highlighted that the pandemic is concrete proof that life habits can be quickly changed. For instance, one article quoted a doctor who said:

We don't say people are weird for wearing a mask, we say that's appropriate. It's the same with tucking your pants into your socks when you enjoy the woods – another new normal (Anderssen 2020).

However, only 37% of the Covid-related articles presented the pandemic as an opportunity for a climate-oriented recovery. One article even suggested an extraordinary focus on climate change could prevent us from preparing for other types of crises, such as pandemics (Lomborg 2020). This is the same article which considered the two crises separate. About 68% of the articles did not address the matter.

4.6. DISCUSSION

The pattern of results explored in this study are broadly consistent with the previous literature (Nisbet et al. 2010; Hart & Nisbet 2012; Weathers 2013; Weathers & Kendall 2016; Depoux et al. 2017; King et al. 2019; Harrison et al. 2020).

Just like the prior seven climate and health news coverage analyses, we found that the public health frame somewhat gained prominence over time, though the increase was considered overall minimal and non-linear. Previous studies only examined news coverage up until 2016. Our research brings a significant contribution, as it demonstrates that the public health frame continued to be increasingly used in the next three years. Our longitudinal study further exemplifies that climate and health only received an episodic coverage, dictated by the occurrence of ecological events or climate policy meetings. This is directly in line with the findings of Harrison et al. (2020).

Moreover, we were able to confirm the long-lasting predominance of traditional climate frames, which had already been noted by Maibach et al. (2010) and Nisbet et al. (2010). Based on our analysis of the page numbers and news sections in which the articles were found, we observed that reporters continued to frame climate change in economic and scientific terms. Climate change impacts on health also rarely appeared on front pages, which let us think that it tends to be only a secondary preoccupation.

Whereas past researchers have found that climate and health articles largely had an international scope (Depoux et al. 2017; Harrison et al. 2020), the present study has shown that media outlets gave a non-negligible attention to local health impacts. King et al. (2019), who examined

Canadian news coverage until 2015, argued that regional newspapers were more likely to mention climate change impacts on human health. Future work should assess if the trends we observed in our study are more pronounced in recent regional newspaper coverage. As noted in the literature, it can help make climate change more personally relevant (Maibach et al. 2010; Levy & Patz 2015).

In addition, the results of this study provide evidence that reporters at *The Globe and Mail* tended to favor sources originating from Canada. In fact, the vast majority of the publications and individuals cited were Canadians. With information targeted to the Canadian population, this could help reduce the psychological distance to the climate crisis.

This analysis also found evidence that civil society groups, while having not contributed much to the knowledge production, have taken up the message and have ultimately become the spokespersons for the cause. Most of the quoted members of civil society, inside and outside Canada, belong to environmental non-governmental organizations (ENGOS) or were climate experts. This suggests that simplifying the links between climate change and health remains difficult and that journalists tend to heavily rely on climate specialists to present the information.

Most importantly, we should highlight that individuals with a medical expertise were underrepresented among the people quoted in the articles. Yet, the literature strongly advises that health professionals are best equipped to explain the links between climate change and health (Boykoff 2011; Maibach et al. 2010). The same observation was previously made by Nisbet et al. (2010) and Gould & Rudolph (2015).

In 2007, the IPCC's fourth assessment report indicated with 'a very high confidence' that North America would become more and more inclined to heatwaves, air pollution, floods and fires. In 2019, a report from Natural Resources Canada reiterated that climate change will intensify urban and snow-melt-related flooding, droughts, wildfires and heat-related risks across the country. The results indicate that reporters paid greater attention to the immediate climate and health risks. In other words, the articles emphasized the risks that Canadians already face as of now. Floods, heat-related events and air pollution were the most often cited risks. Yet, our results demonstrated that all climate risks (except fires) lost visibility over time in the articles addressing climate change impacts on health. Contrary to what we expected, the cause and effect mechanisms were therefore increasingly set aside. Past researchers did not pay particular attention to this dimension before.

In regards to the identified climate change impacts on health, our findings are in line with those of the prior Canadian study. In their study, King et al. (2019) similarly found that the articles tended to focus primarily on infectious diseases and what they classified as 'chronic noninfectious diseases'. More specifically, they observed that the Lyme disease, asthma and allergies were the most commonly discussed health risks. Despite the timeframe differences, we noted that these same health issues were still disproportionately represented. Likewise, King et al. (2019) commented that mental health disorders were less likely to be addressed. Nevertheless, our results go beyond previous reports because we used a more specific and decoupled classification of health risks. Not only were we able to observe variations over time, we could also render these risks more intelligible. For instance, we were able to say that respiratory and cardio-vascular diseases got an asymmetrical coverage. Yet, they both constitute what King et al. (2019) categorized as 'chronic noninfectious diseases'. In their

study, such a distinction would not have been noticed. With its higher resolution, our study therefore made several notable contributions to the field.

More generally, our study demonstrated that, most often than not, journalists at *The Globe and Mail* failed to identify social mediating factors. For those who did, they mostly talked about population displacement and the loss of a cultural identity. Interestingly, these factors were not at all considered in previous studies investigating news coverage about climate change impacts on health. Thus, it appears that these elements, though considered essential in the transnational discourse, did not really catch the eye of communication experts. Because they impact health only indirectly, it seems they are perceived at best as a side-show. Nonetheless, we must recognize that social mediating factors appeared to have gained some relative visibility over time.

Our results cast a new light on the most vulnerable populations identified in the climate and health news coverage. Previous research never examined this dimension of the coverage. We showed that one out of two articles failed to specify which segments of the population would be more at risk. However, a great number of articles stated that populations living in Canada would be vulnerable and over time, a greater diversity of people were thought to be at risk, including indigenous and northern communities, marginalized groups, and rural populations. There is still work to do as some categories remain left out of the coverage, such as non-pregnant women and sectoral workers.

We further demonstrated that journalists at *The Globe and Mail* used climate action health co-benefits in a parsimonious way. A similar conclusion was reached by Harrison et al. (2020) in their New-Zealand case-study, where barely one third of the articles in the two news outlets

selected discussed health co-benefits. In the French study, only 16% of the articles selected mentioned them (Depoux et al. 2017). In our study, only one fourth of the 189 articles mentioned them, with no real improvement over time observed. The reduction of greenhouse gases in the transport and agricultural sectors as well as the conservation of green spaces were both thought to generate health co-benefits, especially in terms of air quality, nutrition and physical wellness. Other health co-benefits, including emotional well-being, were less often discussed. Despite the presence of a literature strongly promoting health co-benefits as a mean to induce behavior change, it has apparently not been put into practice by journalists.

Our preliminary results concerning the repercussions of the Covid-19 pandemic on climate communication demonstrate that, journalists have so far missed the opportunity to address the issue from a public health perspective, despite a favorable environment to do so. While Boykoff et al. (2020) and Lyytimäki (2020) observed a drop in the general climate change coverage in 2020, our study provides evidence that the number of articles addressing its health impacts also significantly declined. Nonetheless, some articles did make some interesting connections between the two crises, especially regarding their similar causes, impacts and crisis management failures.

CONCLUSION

This study used quantitative methods to determine the prominence of the public health frame, as well as its main characteristics found in *The Globe and Mail* between 2008 and 2020. Consistent with previous literature, the results from the longitudinal study demonstrate that, despite the growing presence of a newly-constituted physician climate advocacy and the publication of international scientific reports, climate change impacts on human health received overall little news coverage. While we initially expected an increase in the use of the public health frame in 2020 as health became a center-stage topic in the media, the results indicate reporters have so far missed the opportunity to reframe climate change as a public health issue. However, the limited visibility of the public health frame may be after all not so surprising. We argue that, so far, not all the conditions were fulfilled to allow the public health frame to gain prominence. The presence of competitive frames, the journalists' incapacity to make comprehensive links between climate and health as well as the inexistent medical leadership were all factors that undermined the potential greater use of the public health frame.

First, the health effects continue to be neglected in a media environment where traditional climate frames still dominate the coverage. Introducing a new frame which necessitates medical knowledge remains a challenge. It adds another layer of complexity to an issue already difficult to grasp for most people. Moreover, reporters may not be aware of climate change impacts on human health. The health sector and the scientific community have therefore a responsibility to spread a greater awareness about those impacts.

Second, the media representation of the public health discourse was largely inconsistent. A non-negligible number of articles connected climate and health only with broad statements, which

did not specify what were the exact health risks, social mediating factors or populations most at risk. In fact, one out of two articles did not specify who was at risk, and not one article discussed the particular risks faced by non-pregnant women and sectoral workers.

In terms of health risks, there was a greater focus on infectious diseases (especially Lyme disease), food and water security, and respiratory diseases. It is worth noting that these were the health risks for which the scientific confidence was the highest in previously published IPCC reports. Thus, journalists appeared to primarily report information for which there is a long-standing scientific confidence. Meanwhile, mental health disorders and cardio-vascular diseases associated with climate change only started to receive greater attention in the last five years.

Most importantly, this study found evidence that reporters largely ignored climate action health co-benefits, with no improvement over time. As such, there was an overall tendency to emphasize the health risks rather than the health gains associated with climate action. This is regrettable as it was perceived as the greatest strength of the public health frame. In fact, communication experts believed it could convey positive emotions about climate change and enhance the will to adopt mitigation and adaptation strategies.

More generally, what we see here, is that journalists only partially report what the scientific community previously advanced. In addition to dismissing climate action health co-benefits, they focused mainly on the threats Canadians already face and for which there is solid evidence. Yet, not all Canadians will be affected in the same way. There is an urgent need to address both the risks faced by and the health co-benefits available to specific segments of the population across the country. As such, the news media coverage needs to be more targeted. The health

sector and reporters must foster their collaboration in order to communicate the risks better to the general population.

Third, the present study shined a light on the alarming absence of medical leadership. Members of civil society groups without any medical expertise were most often interviewed, whereas health experts only made rare appearances. Yet, according to the literature, the participation of the health sector is essential for the public health frame to be effective. Our study demonstrated that reporters at *The Globe and Mail* importantly relied on climate and health information published at home by either the Canadian scientific community or governmental agencies. This may be a great opportunity to integrate representatives of the Canadian health sector. Indeed, health professionals are perceived by the population as trustworthy and have the necessary expertise to help journalists decoding influential domestic and international publications on climate change and health. Health professionals need to be more proactive and become more visible in the media sphere.

Nevertheless, the findings of this study cannot be generalized due to research design limitations mentioned earlier. Future research should try to address these in order to obtain a more representative portrayal of the climate change and health news media coverage in Canada. For instance, our study focused solely on one nationally circulated newspaper with a centrist stance. It would be interesting to look at regional newspapers and also compare how language differences (i.e. French vs. English Canada) influence coverage. In addition, our results were issued from only four pivotal periods. One could conceive a study which would cover a greater time frame, for example. Instead of coding the presence of arguments like we did, one could code the intensity as well. Visuals tend to be overlooked by most researchers but we recognize they reinforce the frame used in the text. Therefore, future research should try to integrate them.

One of the most important contributions of our work may be that it raises a variety of intriguing questions for future study. Our work uses inferential statistics but other research techniques (including qualitative methods) would be best effective to provide deeper explanations about the current state of climate and health news coverage. Notably, it would be valuable to conduct interviews with various stakeholders, including reporters, in order to understand better the reasons why climate change impacts on health are underreported. Although our findings indicate that the frame has not gained momentum even in the context of the 2020 pandemic, interesting connections between the two crises were made, especially in regards to shared causes, impacts and crisis management failures. As the pandemic continues to unravel itself, it will be interesting to keep an eye on the media content to examine whether these connections will increase with greater distance and hindsight. It may be the case that we have not taken full advantage of the opportunity just yet.

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APPENDIX 1 – CODEBOOK

General Information

- V.1. Year of publication
 - V.2. Month of publication
 - V.3. Day of publication
 - V.4. Title
 - V.5. Author(s) name(s)
-

Position

- V.6. Section in the Newspaper (descriptive)
 - V.7. Presence on the front page
-

Sources

Reports

- V.8. Reports from international organisations
 - V.9. Canadian reports
 - V.10. Reports from the Canadian scientific community
 - V.11. Reports from Canadian governmental agencies
 - V.12. Reports from Canadian civil society groups
 - V.13. Foreign reports
 - V.14. Reports from the foreign scientific community
 - V.15. Reports from foreign governmental agencies
 - V.16. Reports from foreign civil society groups
-

People

- V.17. Leaders of international organisations
- V.18. Canadians
- V.19. Canadian government officials
- V.20. Canadian government officials with a medical expertise
- V.21. Canadian government officials without a medical expertise
- V.22. Members of the Canadian civil society
- V.23. Members of the Canadian civil society with a medical expertise
- V.24. Members of the Canadian civil society without a medical expertise
- V.25. Foreigners
- V.26. Foreign government officials
- V.27. Foreign government officials with a medical expertise

- V.28. Foreign government officials without a medical expertise
 - V.29. Members of the foreign civil society
 - V.30. Members of the foreign civil society with a medical expertise
 - V.31. Members of the foreign civil society without a medical expertise
-

Climate Risks

- V.32. Climate change (unspecified)
 - V.33. Ice melt, sea level rise, floods
 - V.34. Droughts, water shortages
 - V.35. Fires
 - V.36. Heatwaves and temperature rise
 - V.37. Storms and extreme weather events
 - V.38. Air and water pollution (burning of fossil fuels)
 - V.39. Biodiversity loss and deforestation
 - V.40. Inefficient Food System
-

Health Risks

- V.41. Health impacts (unspecified)
 - V.42. Malnutrition
 - V.43. Psychological impacts
 - V.44. Cardiovascular diseases
 - V.45. Respiratory diseases
 - V.46. Infectious diseases (vector-, rodent-, and water-borne diseases)
 - V.47. Other diseases
 - V.48. Loss of life (unspecified)
-

Social Mediating Factors

- V.49. No particular social mediating factor identified
 - V.50. Rise of violence, conflict
 - V.51. Exacerbation of poverty
 - V.52. Reduced occupational and/or recreational health
 - V.53. Changing lifestyle and/or loss of cultural identity
 - V.54. Homelessness, population displacement
-

Psychological Distance

- V.55. Global population (unspecified)
 - V.56. Populations within Canada
 - V.57. Populations outside Canada
-

Most Vulnerable Populations

- V.58. No particular vulnerable population identified
 - V.59. Seniors
 - V.60. Women (non-pregnant)
 - V.61. Children, foetuses
 - V.62. Disabled individuals and/or individuals with a pre-existing condition
 - V.63. Sectoral workers
 - V.64. Populations in low-lying and/or coastal areas
 - V.65. Indigenous and/or northern communities
 - V.66. Poor, marginalised groups (including homeless individuals)
 - V.67. Urban populations
 - V.68. Rural populations
 - V.69. Populations near industrial sites
-

Health Co-Benefits

- V.70. Presence of health co-benefits

 - V.71. Health co-benefits (unspecified)
 - V.72. Improved air quality
 - V.73. Improved mental health and well-being
 - V.74. Improved physical fitness, heart health, and/or blood pressure
 - V.75. Extended life span and/or fewer deaths
 - V.76. Improved nutrition
 - V.77. Stronger immune system (greater resilience to cancers and other diseases)
-

Links with the Covid-19 Pandemic

- V.78. Presence of links between the sanitary and climate crises
- V.79. Quoting health experts to explain the link
- V.80. The two crises are described as two similar problems
- V.81. The two crises are described as two separate problems
- V.82. Unspecified

- V.83. The two crises share similar causes (e.g. human activity, globalization, capitalism)
- V.84. The two crises do not share similar causes
- V.85. Unspecified

- V.86. Climate change affects the transmission of infectious diseases as seen with SarsCov2
- V.87. Climate change does not affect the transmission of infectious diseases as seen with SarsCov2
- V.88. Unspecified

- V.89. Both crises negatively impact mental health
- V.90. Unspecified

- V.91. The Covid-19 pandemic positively contributed to climate action
- V.92. The Covid-19 pandemic delayed climate action
- V.93. Unspecified

- V.94. The Covid-19 pandemic gives an opportunity for a climate-oriented recovery
- V.95. The climate crisis is overrated and prevents us from preparing for other crises
- V.96. Unspecified

- V.97. Presence/Absence of lessons from the Covid-19 pandemic, or perception of the pandemic as a foretaste of what climate change could entail

APPENDIX 2 – LIST OF SELECTED ARTICLES

YEAR 2008

Anderssen, Erin. “The Climatic Costs of Rapid Growth.” *The Globe and Mail*, February 1, 2008.

Moneo, Shannon. “Torching Yard Debris: A Burning Issue in Vancouver Island Town.” *The Globe and Mail*, March 4, 2008.

Boyd, David. “Hey Mr. Harper, What About Our Right to Breathe Clean Air?” *The Globe and Mail*, March 14, 2008.

Unknown. “Global Warming Poses Risk to Public Health.” *The Globe and Mail*, April 8, 2008.

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White, Patrick. “Global Warming to Hit Nether Regions.” *The Globe and Mail*, July 15, 2008.

Roslin, Alex. “A Tough New Row to Hoe.” *The Globe and Mail*, July 19, 2008.

Curry, Bill. “Health Report Gets ‘Low-Profile’ Release.” *The Globe and Mail*, July 23, 2008.

Unknown. “Give them Their Due.” *The Globe and Mail*, July 24, 2008.

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Cormier, Zoe. “Offering Endangered Species a Free Ride.” *The Globe and Mail*, July 26, 2008.

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Kaufman, Joanne. "Are You Carborexic?" *The Globe and Mail*, October 20, 2008.

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Pill, Jaan. "Up in Smoke." *The Globe and Mail*, February 11, 2009.

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Unknown. "White House Reviewing Key Environmental Finding." *The Globe and Mail*, March 24, 2009.

Dhouly, Jennifer. "Greenhouse Gases Endanger Health, EPA Declares." *The Globe and Mail*, April 18, 2009.

Simpson, Jeffrey. "Albertans Are in Need of a Climate Change Reality Check." *The Globe and Mail*, April 21, 2009.

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Homer-Dixon, Thomas. "The Enticement of Green Carrots." *The Globe and Mail*, August 8, 2009.

Unknown. "Sinking Under the Waves." *The Globe and Mail*, October 2, 2009.

Unknown. "Our World, 4 Degrees Warmer." *The Globe and Mail*, October 23, 2009.

Reynolds, Neil. "Only Democracy Can Clean Up the Planet." *The Globe and Mail*, November 20, 2009.

Bettencourt, Michael. "New BMW 5-Series Arriving in June." *The Globe and Mail*, November 26, 2009.

Leeder, Jessica. "Seeds of Salvation, Buried in Ice." *The Globe and Mail*, December 5, 2009.

Reguly, Eric. "U.S. Makes First Move at Copenhagen." *The Globe and Mail*, December 4, 2009.

York, Geoffrey. "In Africa: Not Guilty, But Paying the Price." *The Globe and Mail*, December 9, 2009.

Unknown. "The Cost of Inaction." *The Globe and Mail*, December 9, 2009.

Unknown. "Blunt Instrument on CO(2)." *The Globe and Mail*, December 9, 2009.

Reguly Eric. "U.S. Outlines Dual Path to Cutting Greenhouse Gases." *The Globe and Mail*, December 10, 2009.

Leeder, Jessica. "New Farm Tactics Used to Stem Climate's Impact on Food Supply." *The Globe and Mail*, December 11, 2009.

Allemang, John. "High Anxiety: What We Can Learn From Our Year of Fear." *The Globe and Mail*, December 19, 2009.

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McCarthy, Shawn, and Ivan Semeniuk. "Go Slow on Fracking, Scientists Warn." *The Globe and Mail*, May 1, 2014.

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Ragan, Christopher. "To Ensure Prosperity, Canada Needs 'Ecofiscal' Policies." *The Globe and Mail*, November 5, 2014.

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Unknown. "Yes This Is a Really, Really Big Deal." *The Globe and Mail*, November 13, 2014.

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Beck, Leslie. "Veggie Might: the Man Who Revolutionized Our Diets With the Glycemic Index Now Wants Us to Go Vegan. The Reasons? Not as Simple as You May Think." *The Globe and Mail*, February 23, 2015.

Mortished, Carl. "Why the Saudis Will Continue to Undercut Oil Prices." *The Globe and Mail*, June 5, 2015.

McCarthy, Shawn. "Scientists Call For Halt of New Oil Sands Developments." *The Globe and Mail*, June 11, 2015.

Bernstein, Alan, Dan Treffer, and Ted Sargent. "Canada – Renewables Superpower ? »" *The Globe and Mail*, June 22, 2015.

McGinn, Dave. "Big Tent: Camping Isn't What It Used to Be. While We Still love the Outdoors, We Aren't as Fond of Sleeping on the Bumpy, Wet Ground. Today, Dave McGinn Finds Parks and Campgrounds Are Coaxing Us From Our Homes – and Away From Hotels – With Promises of Luxury Tents, Yurts, Cabins and Even Stone Lodges." *The Globe and Mail*, June 23, 2015.

Unknown. "Obama Sparks Industry, State Ire With Plans to Cut Carbon." *The Globe and Mail*, August 4, 2015.

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Andrew-Gee, Eric. "The Journey to COP21: in the More Than 40 Years Since World Leaders Met in Stockholm to Discuss Environmental Issues, the Road to Tackling the Biggest Challenge – Reducing Greenhouse Gas Emissions – Has Been a Bumpy One, Writes Eric Andrew-Gee. Meanwhile, Global Temperatures, CO2 Emissions and Sea Levels Are Rising, and Extreme Weather Events, From Droughts to Flooding, Show No Sign of Abating." *The Globe and Mail*, November 30, 2015.

Pomeroy, John, Bob Sandford, and James Bruce. “Looking For Leadership on Water: Canada Has Fallen Behind the Rest of the Developed World in the Management of Its Most Important Natural Resource.” *The Globe and Mail*, November 30, 2015.

McCarthy, Shawn. “Great Lakes on the Mend, But New Threats Loom: a Concerted 30-Year Effort Has Seen Substantial Improvement in the Health of the Largest Freshwater Habitat on earth, But Persistent and Emerging Problems Exist, Prompting Calls For Further Investment, Legislation, and Long-term Planning, Shawn McCarthy Reports.” *The Globe and Mail*, December 2, 2015.

Hurley, Adèle. “An Issue of National Security: The Effects of Climate Change Are Highlighting the Strategic Importance of Our Largely ‘Hidden Treasure.’” *The Globe and Mail*, December 4, 2015.

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York, Geoffrey. “Droughts Tied to El Nino Devastate Africa: Ethiopia Facing Worst Drought in 50 Years as ‘Super-Charged’ Weather Pattern Wreaks Havoc Across Continent.” *The Globe and Mail*, December 15, 2015.

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Yakabuski, Konrad. “The Jig Is Up For Our Meat and Dairy Lobbies: By Folding Food Groups Into New ‘Protein’ Umbrella, Canada’s Nutrition Guide Can Finally Bust Industries’ Grip on How We Eat.” *The Globe and Mail*, January 10, 2019.

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APPENDIX 3 – COMPLEMENTARY DATA

Pivotal Period	Proportion of articles addressing health impacts among those on climate change (%)
2008-2009	0,3
2014-2015	1
2019	1,3
2020	1,3

1. Representation of the public health frame among articles addressing climate change

Pivotal Period	Unprecise climate change (%)	Ice melt, Sea level rise, Floods (%)	Droughts (%)	Fires (%)	Heatwaves, Temperature rise (%)	Storms (%)
2008-2009	49	31	31	8	33	23
2014-2015	70	19	11	9	15	8
2019	51	25	12	14	25	23
2020	53	25	13	23	18	10

2. Representation of the climate risks associated with health impacts over time

Pivotal Period	Air, Water pollution (%)	Deforestation, Biodiversity Loss (%)	Inefficient Food System (%)
2008-2009	49	31	21
2014-2015	60	15	11
2019	23	28	12
2020	38	10	8

3. Representation of human activities associated with indirect health impacts over time

Pivotal Period	Unprecise health impacts (%)	Food, Water security (%)	Mental health (%)	Cardiovascular diseases (%)	Respiratory diseases (%)	Infectious diseases (%)	Other diseases (%)	Unprecise mortality (%)
2008-2009	21	28	10	0	15	33	8	18
2014-2015	43	11	4	4	11	17	6	8
2019	26	23	12	5	18	14	5	18
2020	33	8	10	10	18	18	10	18

4. Representation of the climate change impacts on human health over time

Pivotal Period	No social mediating factor identified (%)	Rise of conflict, Violence (%)	Exacerbation of poverty (%)	Reduced occupational, recreational health (%)	Changing lifestyle, Loss of cultural identity (%)	Homelessness, Population Displacement (%)
2008-2009	85	5	3	3	3	10
2014-2015	89	2	2	0	4	9
2019	74	2	2	4	11	14
2020	68	0	3	8	3	20

5. Representation of the social mediating factors over time

Pivotal Period	No vulnerable population identified (%)	Seniors (%)	Non-pregnant women (%)	Children, fetuses (%)	Disabled individuals, Individuals with a pre-existing condition (%)	Sectoral workers (%)	Populations in low-lying or coastal areas (%)	Indigenous, Northern communities (%)	Poor, marginalized groups (%)	Urban populations (%)	Rural populations (%)	Populations near industrial sites (%)
2008-2009	63	8	0	8	8	0	8	5	5	15	0	0
2014-2015	36	4	0	11	4	0	8	8	8	19	8	23
2019	60	4	0	16	5	0	9	14	9	14	2	2
2020	43	5	0	15	10	0	8	10	13	20	13	5

6. Representation of the most vulnerable segments of the population over time

Pivotal Period	Proportion of articles mentioning health co-benefits (%)
2008-2009	23
2014-2015	17
2019	26
2020	25

7. Evolution of the proportion of articles mentioning climate action health co-benefits

Pivotal Period	Unprecise health co-benefits (%)	Improved air quality (%)	Improved mental health, well-being (%)	Improved physical fitness, heart health, blood pressure (%)	Extended life span or fewer deaths (%)	Improved nutrition (%)	Improved immune system (%)
2008-2009	0	44	11	33	11	56	0
2014-2015	11	44	11	22	11	33	33
2019	0	33	20	40	7	47	7
2020	0	70	30	20	0	10	10

8. Representation of the climate action health co-benefits over time