

# Climate change and women's health: A scoping review

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## Abstract

Climate change is a significant global health threat that is underpinned by the existing issue of gender inequality. A scoping review was conducted to better understand the relationship between climate change and women's health. We found a notably higher proportion of existing studies focused on low- and middle-income countries (LMIC). Most of the studies included were published after 2010, with predominantly qualitative study designs. Four key themes were identified, including women's exposure to climate change risks, the impacts on women's health, factors contributing to the vulnerability, and responding strategies in addressing climate change. The scoping review indicates that women's health is at higher risks due to the vulnerable to climate change, especially in LMIC. Meanwhile, it is beneficial to have insights from women in terms of adaptation and mitigation strategies to build stronger resilience. Mixed methods are strongly recommended to support evidence-based policy making in responding to climate change.

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2 **Climate change and women's health: A scoping review**

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10 **Key points:**

- 11 • Women's health is at higher risks due to the vulnerable to climate change, especially in
- 12 LMIC.
- 13 • The societal, cultural, and economic factors could contribute to the vulnerability. It is
- 14 beneficial to have a gender aspect in responses.
- 15 • Mixed methods incorporating quantitative and qualitative assessments are needed.
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**ABSTRACT**

Climate change is a significant global health threat that is underpinned by the existing issue of gender inequality. A scoping review was conducted to better understand the relationship between climate change and women’s health. We found a notably higher proportion of existing studies focused on low- and middle-income countries (LMIC). Most of the studies included were published after 2010, with predominantly qualitative study designs. Four key themes were identified, including women’s exposure to climate change risks, the impacts on women’s health, factors contributing to the vulnerability, and responding strategies in addressing climate change. The scoping review indicates that women’s health is at higher risks due to the vulnerable to climate change, especially in LMIC. Meanwhile, it is beneficial to have insights from women in terms of adaptation and mitigation strategies to build stronger resilience. Mixed methods are strongly recommended to support evidence-based policy making in responding to climate change.

## 1 INTRODUCTION

Climate change is a significant global health issue that has rapidly and urgently become a priority on the global health agenda (Duncan 2006, Levy 2015). It's detrimental effects to Earth's ecosystem has led to increases in natural disasters, vector borne diseases, poor air quality and extreme variance in climatic temperatures, all of which directly and indirectly affect human health (Duncan 2006, Rylander, Odland et al. 2013). Abundant research has confirmed its relationship with endangering human health, highlighting poverty, food insecurity, geographic isolation and degrading societal norms as key factors which accelerate the negative effect of climate change (Langer, Meleis et al. 2015, Jerneck 2018).

Globally, approximately 1.3 billion people in low-and middle-income countries (LMICs) live below the poverty line, with 70% of those being female (Sorensen 2018). Climate change exacerbates women's distinct health needs, particularly during pregnancy where maternal health and nutrition is vital to the developing foetus and infant (Rao 2011, Watt 2011, Rylander, Odland et al. 2013, Franco-Orozco 2018, Sorensen 2018). In addition to this, women in LMICs generally have a domestic role in the household, exposing them to poor air quality through inappropriate gases used during cooking and poor ventilation of the cooking area (Duncan 2006, Pinkerton 2013, Tirado 2013, Rosenthal 2018, Bhallamudi and Lingam 2019, Mazorra 2020). In terms of social and cultural issues, women often have less access to ownership of land, education and paid labour, all of which increases their vulnerability to climate change (Langer, Meleis et al. 2015, Jerneck 2018). Women are often faced with unequal access to economic and technical resources after natural disasters and climate-change related extreme weather events (Langer, Meleis et al. 2015, Jerneck 2018). There exists a complex relationship between climate change and women's health that is underpinned by the existing issue of gender inequality (World Health Organization. 2014, Sorensen 2018, United Nations 2020).

The role of women in tackling climate change in general has been made a priority as part of many recent global goals, such as the Sustainable Development Goals (SDGs), Paris Agreement on Climate Change and the United Nations Framework Convention on Climate Change, which acknowledge the relationship between climate change and women's health (Haque 2011, Langer, Meleis et al. 2015, Maurice 2015, United Nations 2015, Amoroso 2018, Collantes 2018, Manandhar, Hawkes et al. 2018, Sorensen 2018, United Nations 2020). The World Health Organization (WHO) has also highlighted the importance of gender, health and climate change and offered mitigation strategies to address the issues present (World Health Organization 2014). In addition to these, there has been an increase in the number of published literatures that identify this relationship and highlight the need for sustainable solutions to address this issue (Watts, Amann et al. 2018). These solutions are based on themes of women empowerment and advocacy for gender equality, through community-led strategies, national policies and global resilience (Paavola 2008, Dulal 2009, Engelman 2010, Page 2010, The Lancet. 2015, Sen Roy 2018).

Despite this issue being identified as an increasing global concern, no single study has been able to identify the breadth of literature available around this topic and explore all aspects of the relationship between climate change and women's health. The study aims to fill in the gap in

literature by conducting a scoping review to better understand climate change and women's health to support the development of climate change strategies and actions.

## 2 METHODS

As defined by Arksey and O'Malley, a scoping review aims to map the key concepts that underpin a research topic and highlight main sources and various types of evidence available (Arksey and O'Malley 2005). A scoping review was preferred over a systematic review as we wanted to assess the current breadth of available evidence that explores the relationship between climate change and women's health. The methodological framework by Arksey and O'Malley was adopted for the review.

A systematic search of literature was undertaken using four databases, including MEDLINE, EMBASE, CINAHL and SCOPUS. Key words and search strategies were developed and are outlined in Table 1. The set search strategy was developed after initial search on each database to identify relevant topics and MeSH terms. The same search strategy was adopted for each of the four databases to identify literature present and exported to EndNote for further analysis. Citation chaining was also utilised to identify further literature that was not indexed in the databases selected.

**TABLE 1 – Key words and search strategy\***

Keywords	Terms Used
Climate change/variability/extremes	(Climate w/1 change* OR variab* OR extrem*) OR "global warming" OR "greenhouse effect"
Gender/women	Gender OR wom?n OR "wom?n's health" OR female* OR (gender w/1 role* OR perspective* OR perception* OR disparit* OR equalit*)
Health	Health* OR "health outcome*" OR wellbeing OR wellness OR "quality of life" OR "health effect"
Maternal Health	(Maternal w/1 health OR mortality OR morbidity OR welfare OR wellbeing) OR "maternal health outcome*" OR "maternal health impact"
Mitigation and Adaptation	Sustain* OR mitigat* OR adapt*

\* The above search strategy is modified for the SCOPUS database.

Database search was conducted between the months of March and May in 2020, with the last search being conducted on 10/05/2020. The studies retrieved from the databases were exported onto EndNote program for further analysis. Duplicates were removed and the initial title and abstract screening was completed by one reviewer (ZD). After this initial screening, the references selected for full text screening were exported onto a Microsoft Excel spreadsheet. The spreadsheet was organised to extract data from each article including the authors, publication year, publication title, location, population demographics, study design, findings, and limitations. Both reviewers (ZD

and YZ) independently performed the full text analysis and extracted relevant data. Discrepancies were resolved by discussion amongst the reviewers.

The set inclusion and exclusion criteria aided in selecting relevant studies for the scoping review. Studies were included if the full text was available, in English language, and published before 31/03/2020. Research that focused solely on air pollution and women's health was not included due to abundance evidence on this topic unless the relationship between air pollution and climate change was also discussed. Moreover, although children's health is closely related to maternal health and women's health in general, studies that only focused on children's health were not included as they were beyond the scope of this review.

### **3 RESULTS**

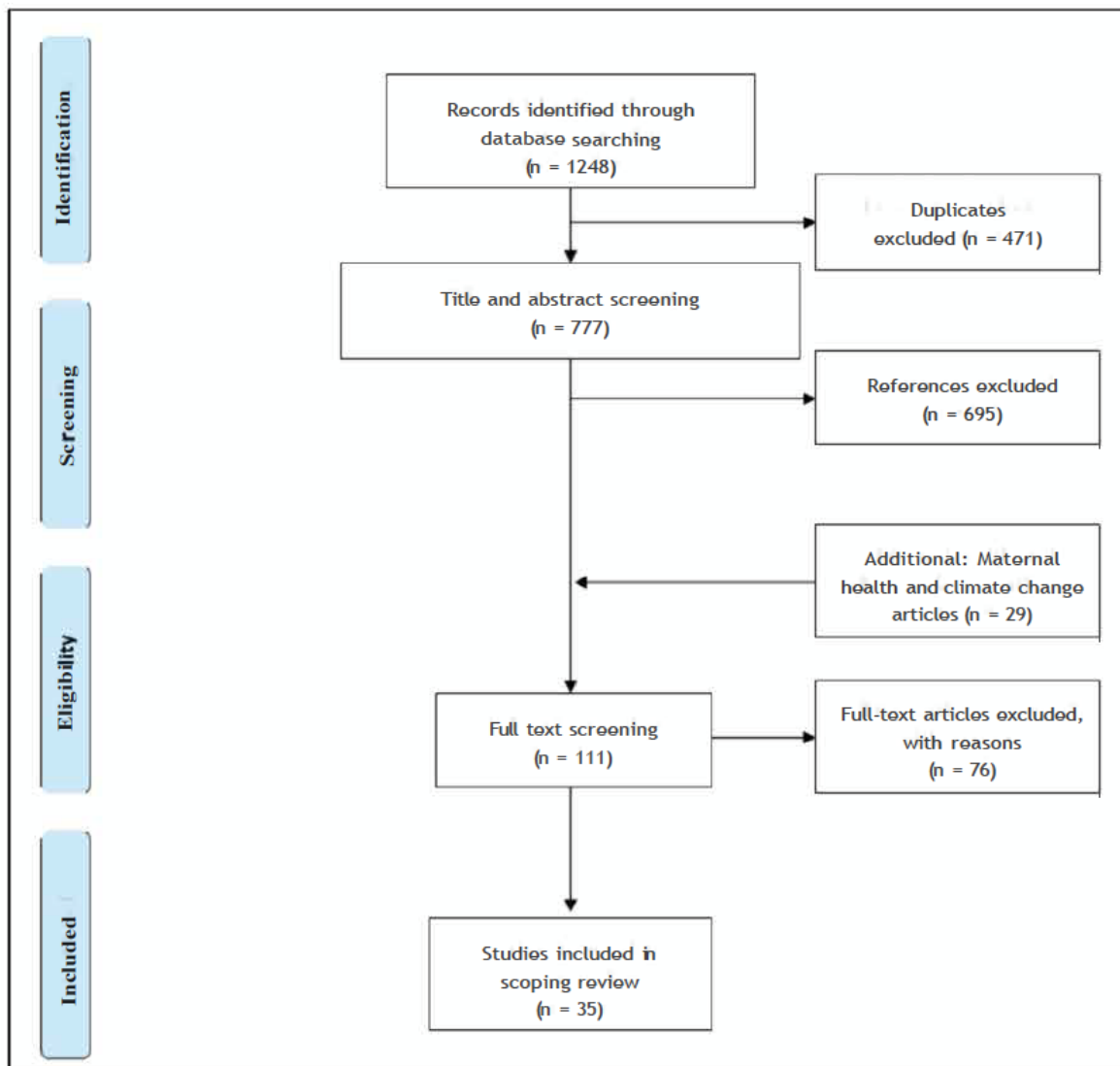
Initial searches on the databases yielded a total of 1,248 citations (see figure 1), which were exported to EndNote for further analysis. After the removal of duplicates (n=471), title and abstract screening was performed on the remaining unique articles (n=777). The majority of these publications (n=695) were irrelevant to the topic of the scoping review and were excluded at this stage. Full-text analysis was performed for the remaining publications (n=82). It was during this process that 'maternal health' was identified as a relevant topic to 'women's health' and search incorporating 'maternal health' and 'climate change' was performed again on the databases to identify further publications relevant to the topic. After removal of duplicates and title and abstract screening for articles relevant to climate change and maternal health, a total of 29 articles were further identified for full text analysis. Further publications were identified through citation chaining of reference lists and these were again reviewed independently by the two researchers for inclusion in the scoping review. In all, a total of 35 articles were included in the scoping review.

#### **3.1 Literature characteristics**

Of all the articles included in the scoping review (n=35), the studies mainly explored the relationship between climate change and women's health in LMICs (n=27). Most of the studies included were published after 2010 (n=32), with only a few being published before this time period (n=3). Most of the articles employed a qualitative study design (n=18). There were a smaller number of quantitative studies (n=11) and even fewer studies which utilised a mixed-methods study design (n=6). The qualitative study designs obtained responses through individual in-depth, semi-structured and structured interviews, focus group discussions, observations, case scenario analyses or a combination of these methods. Quantitative studies utilised cross-sectional surveys, regression modelling and time-series study designs to report relevant data. Studies that incorporated a mixed-methods approach combined a survey or randomised and non-randomised controlled design with qualitative methods such as use of in-depth interviews and focus group discussions to further explore research issues. The studies included in the analysis were based in different countries and regions, with notably higher proportion exploring LMICs (n=22). Broadly, the studies focused on topics of climate change exposures and risks, health outcomes, risk factors to vulnerability and mitigation and adaptation strategies that addressed the relationship between climate change and women's health. Most articles had findings across two or more of these

142 themes, however, only three articles were identified to have findings across all four  
143 themes.(Denton 2002, Beaumier 2010, Bunce 2016) A summary of the articles included in the  
144 analysis and their literature characteristics is outlined in Table 2.

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147 **Figure 1 PRISMA Flow Diagram**



148 **TABLE 2 – Summary of literature included in the scoping review**

Author, Year	Region	Study Design	Findings			
			Climate change exposures and risks	Health outcomes	Risk factors to vulnerability	Mitigation or adaptation strategies
Abdullah et al., 2019	Rural Bangladesh	Qualitative	X	X		
Alhassan et al., 2019	Ghana	Mixed methods	X	X	X	
Asamoah et al., 2018	Ghana	Quantitative	X	X		
Balehey et al., 2018	Afar, Ethiopia	Qualitative		X	X	
Beaumier et al., 2010	Canada: Igloolik, Nunavut	Qualitative	X	X	X	X
Bunce et al., 2016	Canada: Iqaluit, Nunavut	Qualitative	X	X	X	X
Carranza et al., 2019	Kenya, Uganda and Senegal	Qualitative			X	
Cil et al., 2017	Unites States of America	Quantitative	X	X		
Denton, 2002	Global	Quantitative	X	X	X	X
Drolet, 2012	British Columbia, Canada	Mixed methods	X			X
Granderson, 2017	Tonga Island, Vanuatu	Mixed methods				X
Khan et al., 2011	Bangladesh	Mixed methods	X	X		
Khapung, 2016	Western Nepal	Qualitative		X	X	X
Koehler, 2018	Global	Qualitative		X	X	X
Larson et al., 2018	Brazil, Cameroon, Indonesia, Peru, Tanzania and Vietnam	Quantitative			X	X
Leipert et al., 2005	Northern British	Qualitative	X		X	X

	Columbia, Canada					
MacVicar et al., 2017	Uganda	Qualitative	X	X	X	
Marí-Dell’Olmo et al., 2019	Barcelona	Quantitative	X		X	
Mason et al., 2015	Baguio City, Philippines	Quantitative	X		X	X
Masson et al., 2019	Chad	Quantitative			X	X
Mazorra et al., 2020	Casamance Natural Subregion, West Africa	Qualitative		X	X	X
McCall et al., 2019	Leipzig, Germany	Quantitative	X			X
Ortega-Egea et al., 2014	Europe	Mixed methods			X	X
Patrick e al., 2011	Victoria, Australia	Qualitative				X
Poudel et al., 2020	Lamjung district, Nepal	Qualitative	X	X	X	
Powers et al., 2012	Australia	Quantitative				X
Roy et al., 2002	India	Qualitative			X	X
Sanchez et al., 2012	Benin, West Africa	Qualitative	X			
Seidel et al., 2014	Global	Qualitative			X	X
Shanthi et al., 2017	Tamil Nadu, India	Qualitative			X	X
Scheelbeek et al., 2016	Coastal Bangladesh	Quantitative	X	X		
Shodieva et al., 2014	Uzbekistan	Qualitative			X	X
Singh et al., 2018	Karnataka, South India	Mixed methods	X		X	X
Tirado et al., 2013	Nigeria	Qualitative	X	X		X
Zhang et al., 2018	Australia	Quantitative	X			

*Note: ‘X’ indicates that the finding was observed in the article.*

## 3.2 Findings

### 3.2.1 Women's exposures to climate change risks

Weather changes as a result of climate change and/or natural disasters, such as floods, hurricanes, increases in heat waves, droughts, poor air quality and increased salinity of water, were by reported twenty articles in relation to women's health (Denton 2002, Leipert 2005, Beaumier 2010, Khan, Ireson et al. 2011, Drolet 2012, Sanchez 2012, Tirado 2013, Mason 2015, Bunce 2016, Scheelbeek, Khan et al. 2016, Cil and Cameron 2017, MacVicar, Berrang-Ford et al. 2017, Asamoah, Kjellstrom et al. 2018, Singh 2018, Zhang 2018, Abdullah, Dalal et al. 2019, Alhassan 2019, Mari-Dell'Olmo 2019, McCall 2019, Poudel 2020). Floods, hurricanes, heat waves and droughts were found to impact the agricultural industry where women worked as primary labourers, retrieved food for daily consumption and relied upon heavily for household incomes (Denton 2002, Drolet 2012, Alhassan 2019, Poudel 2020). Women were found to be more affected by temperature extremes such as heat waves which put them at a higher risk of poor maternal health, hypertension and heat exhaustion (Cil and Cameron 2017, MacVicar, Berrang-Ford et al. 2017, Asamoah, Kjellstrom et al. 2018, Singh 2018, Mari-Dell'Olmo 2019, McCall 2019). Decreases in temperatures in the most northern parts of the world increased likelihood of heavy snowfall and blizzards, which affected women's ability to find and collect food for their family, as part of their primary caretaker roles in the communities (Leipert 2005, Beaumier 2010, Bunce 2016). Melting of ice glaciers due to climate change decreased seafood available in the northern regions, which resulted in food insecurity for women in those communities (Bunce 2016). The rise in sea-level due to climate change has also increased salinity of water in surrounding sources whereby some communities collect water and has been found to be linked with maternal health in terms of complicating pregnancy by higher risk of hypertension and gestational diabetes (Khan, Ireson et al. 2011, Scheelbeek, Khan et al. 2016). Only one identified study reported that there was no difference found between the impact of climate change on women and men (Sanchez 2012). Another study that examined suicide as a health outcome of climate change found that male suicides increased with higher temperatures (Zhang 2018).

### 3.2.2 Impacts on women's health

The relationship between climate change and women's health outcomes was analysed by sixteen studies included in the review (Denton 2002, Beaumier 2010, Khan, Ireson et al. 2011, Tirado 2013, Bunce 2016, Khapung 2016, Koehler 2016, Scheelbeek, Khan et al. 2016, Cil and Cameron 2017, MacVicar, Berrang-Ford et al. 2017, Asamoah, Kjellstrom et al. 2018, Balehey 2018, Abdullah, Dalal et al. 2019, Alhassan 2019, Mazorra 2020, Poudel 2020). Women were more affected by nutritional deficiencies, such as malnutrition and anaemia, due to food insecurity reasons (Denton 2002, Beaumier 2010, Tirado 2013, Koehler 2016). This was found to be more common in female-headed households compared to male-headed households (Alhassan 2019). Women in rural areas were also more likely to be at risk of vector-borne diseases because they are likely to be in close proximity to wells, rivers and ponds when they collect water supplies (Denton 2002, Bunce 2016, Poudel 2020). A strong relationship was also identified between climate change and maternal health (Denton 2002, Khan, Ireson et al. 2011, Tirado 2013, Khapung 2016, Koehler 2016, Scheelbeek, Khan et al. 2016, Cil and Cameron 2017, MacVicar, Berrang-Ford et al. 2017, Asamoah, Kjellstrom et al. 2018, Abdullah, Dalal et al. 2019). Pregnant women were more likely to experience

hypertension, exhaustion, miscarriages and stillbirths with higher temperatures and food insecurity (Khan, Ireson et al. 2011, Tirado 2013, Scheelbeek, Khan et al. 2016, Cil and Cameron 2017, MacVicar, Berrang-Ford et al. 2017, Asamoah, Kjellstrom et al. 2018). This was more common in women who worked as manual labourers in the agricultural industry (MacVicar, Berrang-Ford et al. 2017, Abdullah, Dalal et al. 2019). Women developed more respiratory conditions, particularly in rural areas where renewable energy was not available, and women used hazardous gases to cook foods leading to inhalation of toxic pollutants (Mazorra 2020).

### *3.2.3 Factors contributing to the vulnerability*

Twenty-two articles explored the risk factors to vulnerability in relation to women's health and climate change (Denton 2002, Roy 2002, Leipert 2005, Beaumier 2010, Ortega-Egea 2014, Seidel 2014, Shodieva 2014, Mason 2015, Bunce 2016, Khapung 2016, Koehler 2016, MacVicar, Berrang-Ford et al. 2017, Shanthi 2017, Balehey 2018, Larson 2018, Singh 2018, Alhassan 2019, Carranza 2019, Mari-Dell'Olmo 2019, Masson 2019, Mazorra 2020, Poudel 2020). Climate change exacerbated existing gender and social inequalities faced by women, especially in rural and remote communities (Beaumier 2010, Bunce 2016, Khapung 2016, Balehey 2018, Alhassan 2019). Women in rural areas were found to have decreased social networking and employment opportunities in order to increase their income (Leipert 2005, Beaumier 2010, Mason 2015, Khapung 2016, Alhassan 2019, Masson 2019, Poudel 2020). In very remote areas, patriarchal nature of the communities enhanced gender discrimination and violence against women when natural disasters destroyed agricultural crops and decreased household income (Roy 2002, Leipert 2005, Masson 2019). They were identified as often being the last members to eat in the household, allowing the males in the family and the children to eat first (Leipert 2005, Ortega-Egea 2014, Bunce 2016, Masson 2019). The studies overall reported that women in general had very limited rights in owning land, wealth and were often excluded from inheritance (Denton 2002, Roy 2002, Leipert 2005, Beaumier 2010, Shodieva 2014, Mason 2015, Koehler 2016, MacVicar, Berrang-Ford et al. 2017, Shanthi 2017, Balehey 2018, Singh 2018, Carranza 2019, Masson 2019). Women's health and their role as caregivers are significantly affected by their lack of human rights, exclusion from decision making in society, and financial dependence on males who earn income in their households (Roy 2002, Ortega-Egea 2014, Singh 2018, Masson 2019, Poudel 2020). Accessing education is considered a superior privilege for women in rural communities, who are not given opportunities to build careers which may enable them to improve their current socio-economic status (Beaumier 2010, Seidel 2014, Shodieva 2014, Shanthi 2017, Larson 2018, Mari-Dell'Olmo 2019).

### *3.2.4 Responding strategies*

Twenty-two articles included in the review discussed mitigation and adaptation strategies to address the negative effects of climate change on women's health (Denton 2002, Roy 2002, Leipert 2005, Beaumier 2010, Patrick 2011, Drolet 2012, Powers 2012, Tirado 2013, Ortega-Egea 2014, Seidel 2014, Shodieva 2014, Mason 2015, Bunce 2016, Khapung 2016, Koehler 2016, Granderson 2017, Shanthi 2017, Larson 2018, Singh 2018, Masson 2019, McCall 2019, Mazorra 2020). Community-based strategies to increase women empowerment were reported as mitigation strategies to address women's lack of access to education, health care and employment opportunities (Beaumier 2010, Tirado 2013, Mason 2015, Larson 2018, Mazorra 2020). Strategies to enhance local adaptive capacity to climate change were also mentioned, with more input from

women's perspectives regarding management at household levels (Roy 2002, Patrick 2011, Drolet 2012, Mason 2015, Larson 2018, Masson 2019). Utilising humanitarian resources to provide women with education around using renewable resources was noted as a solution to decreasing women's exposure to hazardous air pollutants during cooking times (Mazorra 2020). Encouraging women to develop resilience, advocate for their rights, freedom of speech and equal involvement in decision making at a national level was also a reported mitigation strategy (Denton 2002, Drolet 2012, Seidel 2014, Khapung 2016, Koehler 2016, Granderson 2017, Shanthi 2017, Singh 2018). Policy initiatives, taking into consideration the existing gender disparity, were highly recommended to improve societal conditions and women's access to health care services, especially maternal health care (Masson 2019). Government assistance to women living in areas prone to extreme climatic effects, such as droughts, was found to mitigate health impacts of climate change on women in high-income countries (HICs) (Powers 2012). Women were noted to have higher resilience during times of distress, which was also reported as an adaptive strategy to address implications of climate change on women's health (Leipert 2005, Powers 2012, Bunce 2016, Masson 2019).

#### **4 DISCUSSION**

The scoping review has identified a strong but complex relationship between climate change and women's health. Most of the studies included in the review report findings from LMICs through qualitative study designs. The results identify robust evidence of the impact of climate change on women's health in LMICs, where currently most gender disparities exist (Powers 2012, Bunce 2016, Khapung 2016). It is even more interesting to note that the small number of studies which were conducted in HICs were done so in rural and remote areas. This general finding indicates that gender inequality varies from rural to urban areas, but also highlights the need for more studies to analyse how women living in urban areas are affected by climate change.

Of the studies conducted in LMICs, it has been well established that climate change has triggered natural disasters and weather extremes that directly and indirectly affect women's health (Denton 2002, Leipert 2005, Beaumier 2010, Khan, Ireson et al. 2011, Drolet 2012, Sanchez 2012, Tirado 2013, Mason 2015, Bunce 2016, Scheelbeek, Khan et al. 2016, Cil and Cameron 2017, MacVicar, Berrang-Ford et al. 2017, Asamoah, Kjellstrom et al. 2018, Singh 2018, Zhang 2018, Abdullah, Dalal et al. 2019, Alhassan 2019, Mari-Dell'Olmo 2019, McCall 2019, Poudel 2020). Directly, women are more negatively affected by droughts and heat waves due to their roles in society and nutritional and physiological requirements during periods of menstruation and pregnancy (Denton 2002, Beaumier 2010, Tirado 2013, Koehler 2016). Women are already considered vulnerable populations globally due to societal conditions and the results from the scoping review indicate that this vulnerability also extends to the effects of climate change. Their role as manual labourers in the agricultural industry, being responsible for performing domestic housework duties and be primary carers for children present a scenario where women are mostly homebound and unable to deal with the effects of natural disasters socially and physically. This indicates that there is potential for employment of capacity building strategies to help women in these settings to overcome barriers to vulnerability.

The impact of climate change on maternal health has also been reported in the articles included in the scoping review. This relationship is very important because it is very closely related with paediatric health, and therefore overall population outcomes. Whilst pregnancy makes women physically vulnerable, they are also more sensitive to changes in temperature and likely to have a weaker immune system, making them physiologically more vulnerable to acquiring infectious diseases, especially vector-borne diseases which has been well reported in the review (Denton 2002, Bunce 2016, Poudel 2020). Complications in maternal health result in infants that are also more vulnerable, compromised in terms of health and have higher medical resource requirements. This has the potential to implicate negative health outcomes in the overall population in terms of utilising already scarce medical resources and decreases sustainability of medical health resources. This effect is likely to have a greater impact on population health in LMICs compared to HICs, where health care services and resources are more readily available. Women in HICs have more access to health care services, employment and education opportunities, that enables them to be independent financially and possibly mitigate effects of climate change on their health. Mixed methods that incorporate both quantitative and qualitative assessments are strongly recommended to support evidence-based policy making in responding to climate change.

The review also identified factors which make women more vulnerable to climate change than men in terms of social, economic and cultural issues. Gender inequality is present in both HICs and in LMICs (Powers 2012, Khapung 2016). Women's lack of access to education, limited employment opportunities and minimal involvement in economic decision making further intensifies their vulnerability. These basic human rights allow distribution of equal power in the society; if women are not presented with these opportunities, they have little power in advocating for change. If women do not have access to education, they may not have access to information that may increase their awareness and understanding of climate change effects, which is an important enabling factor for change at an individual and even societal level. This is especially important for women living in rural and remote areas where they already have limited access to resources and information. Globally, women predominantly face inequity in health care access due to societal and cultural factors (Masson 2019, Mazorra 2020). This calls for health care initiatives to identify and address these barriers as part of providing holistic health care for women to ensure that this gap is reduced.

Adaptation and mitigation strategies have been discussed in majority of the included articles. Current societal conditions are identified as being the root cause of the vulnerability and negative health impacts that women face (Roy 2002, Beaumier 2010, Alhassan 2019, Masson 2019). Strategies are outlined at an individual, community, national and global level in order to address the issue. At an individual level, building resilience to climate change effects is outlined as a strong approach that has the potential to underpin strategies at a national and global level (Leipert 2005, Mason 2015). Community-led strategies are also found to be effective and involved having women-only focus groups in order to share innovate ideas and management strategies at the household level (Roy 2002, Beaumier 2010, Bunce 2016). Due to their primary role as caretakers, women tend to care more about environmental change and adverse effects of climate change on future generation (Denton 2002, Ortega-Egea 2014, Mason 2015, Granderson 2017, McCall 2019). Building on this, it is beneficial to have insights from women in terms of adaptation strategies because they

are more likely to provide perspectives on long-term sustainable solutions. Women need to be empowered to participate in policy making process, especially when concerning use of natural resources such as energy and water. Policy makers need to have a gendered approach to climate change policy making and acknowledge that the needs of men and women differ, and therefore need to adapt policies to ensure that those needs are met. HICs that have made progress in achieving this outcome need to share their knowledge and perspectives in helping reduce the gender inequality present in LMICs, where they may not have resources to support women to achieve change. Complex interactions of social, cultural and economic factors that exist in today's society make climate change a gendered issue, by disproportionately impacting women's health. It is also noted that whilst adaptation and mitigation strategies were addressed in the studies, there is limited insights into barriers of implementing such policies and strategies, or assessment of community acceptance, feasibility of policies or cost implications.

There are a number of limitations present in the current scoping review. Firstly, the scoping review excluded dissertations, theses, and books that may have provided further insights into the evidence in literature. Most studies have employed a qualitative study design which allowed insights into perspectives of different communities. However, there is always the potential risk of bias when analysing qualitative data. There is scope for more quantitative and mixed methods approaches to help fill in the gaps present in literature. The scoping review also did not assess the quality and strength of evidence presented in the articles included. Of the articles included, they were mainly based on data from LMICs, which may limit generalisability to HICs. This indicates that a gap in literature exists when assessing the impact of climate change on women's health in HICs.

## **5 CONCLUSION**

The scoping review conducted on climate change and women's health indicates that the relationship between the two concepts is complex due to the nature of environmental, societal, cultural, and economic factors. Whilst most of the studies reported this relationship in the context of LMICs, it highlights the need for further research to be conducted in HICs setting to allow a more comprehensive understanding of the scenario. Broadly, the themes of women's exposure to climate change risks, impacts on women's health, vulnerability and responding strategies are heavily underpinned by gender inequity issues. Identification of these may have provided the effectiveness and feasibility of the suggested strategies from a societal perspective, which would have ensured sustainability of the change being implemented. Mixed methods are strongly recommended in future research to assist policy making in responding to climate change. When considering implementation of climate change policies and strategies, it is important to acknowledge that the existing issue of gender inequity exacerbates the effects of climate change on women's health. Policies and strategies need to have a holistic approach and develop interventions according to different gender aspects.

358 **Acknowledgement**

359 This review paper did not analyse any new data. Only results published in identified previous  
360 studies were used. The 35 included studies were listed in Table 2 in the paper and in the reference  
361 list.

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