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IMPACT OF CLIMATE CHANGE ON REPRODUCTIVE HEALTH OF WOMEN OF CHILDBEARING AGE

BY

Prof. Innime Righteous & Dr. Umasom Eromoni-John

Pioneer Dean Faculty of Medical and Allied Health Sciences, Federal University of Environment and Technology, Koroma/Saakpenwa, Ogoni

Orchid ID: 000-0002-0909-6024

Abstract

The issue of climate change and environmental crisis has taken another dimension that affects reproductive health status. This paper provides an insight on the impact of climate change on the reproductive health, maternal and child health, of the women of childbearing age in contemporary society. It was reported that risk of climate change on pregnant women were increasing leading to early labour, miscarriage, fetal deformation, stillbirths, preterm birth an poor maternal health among others. Climatic changes results in environmental crisis which exposes women of vulnerable (pregnant women) to different types of pollutants and heavy substances that directly and indirectly impacted their reproductive health. The needs to preserve and promote good reproductive health is paramount by understanding the climate change and carry out public health intervention and education for the vulnerable group and society in general. Organized, advocacy and collaborative effort from government, donors, non-profit organization, non-government and agencies towards the promotion and maintenance of health should be considered.

Keywords: Climate change, maternal and child health, reproductive health, women of childbearing age.

Introduction

Pregnant women are particularly at risk due to climate change, facing increased risk of miscarriage, early labor, and pregnancy complications that could lead to illness, injury or death. Adolescent girls experience increased risk of SGBV, child marriage, early sexual debut and pregnancy. The climate crisis impacts sexual and reproductive health and the ability to realize fundamental human rights. Realizing sexual and reproductive health and rights (SRHR) contributes to reducing inequalities and increases individuals and communities' resilience to climate change to help ensure no one is left behind as climate impacts intensify (United Nations Population Funds, 2021). Climate change is a major threat to the vision of human-centred sustainable development as outlined in the International Conference on Population and Development (ICPD) Programme of Action and reinforced by the Nairobi Summit on ICPD25. Climate change is a multiplier of existing health vulnerabilities, including through insufficient access to safe water and sanitation, food insecurity, and impacts on access to health care and education. Climate-related displacement and livelihood impacts are challenging both the protection and the realization of human rights. We know that realizing SRHR is crucial to achieving gender equality, and it must also, therefore, be a central component of gender-responsive adaptation to climate change. Health consequences of extreme climate-related events are classified as direct or indirect (Beniston 2002) Direct effects relate to the physiologic impacts of heat or cold and the cellular and organismal responses to pollution, water contaminants, or disruption of services. Indirect impacts relate to vectors and pathogens, whose increases or distribution are ultimately a result of climate change. Migration and civil conflict may be the result of both direct and indirect climate events. Epidemiologic evidence supports the direct impact of climate change on fertility, prenatal outcomes, mental health, sexual health and reproductive rights, and survival (Casey, et al 2019; Women Deliver, 2021). Depending on the disaster, communities have experienced post-traumatic stress, suicides, and

adverse pregnancy outcomes in those who survive (Hilmert, et al, 2016). Likewise, epidemiologic research has shown the susceptibility of women to these indirect shifts in vector prevalence and distribution. Within under-resourced countries, access to adequate health care, including reproductive health needs like contraceptives and abortions, or pre-pregnancy, prenatal, and maternity health care is already lacking, and any disaster that limits access will further exacerbate outcomes. In a systematic review, Hartville et al (2010) found that disasters have the potential to impact maternal mental health and perinatal outcomes.

Segal and Giudice (2022) asserted that climate change is a major risk factor for overall health, including reproductive health, and well-being. Increasing temperatures, due mostly to increased greenhouse gases trapping excess heat in the atmosphere, result in erratic weather patterns, wildfires, displacement of large communities, and stagnant water resulting in vector-borne diseases that, together, have set the stage for new and devastating health threats across the globe. These conditions disproportionately affect disadvantaged and vulnerable populations, including women, pregnant persons, young children, the elderly, and the disabled. This review reports on the evidence for the adverse impacts of air pollution, wildfires, heat stress, floods, toxic chemicals, and vector-borne diseases on male and female fertility, the developing fetus, and obstetric outcomes. Reproductive health care providers are uniquely positioned and have an unprecedented opportunity to educate patients and policy makers about mitigating the impact of climate change to assure reproductive health in this and future generations.

Fan and Zlatnik, (2023) identify these changes affect food and housing security, vector-borne illnesses, and access to clean air and water, all of which influence human health There are a number of adverse health outcomes linked to heat, air pollution from wildfires, stress from natural disasters, and other elements of climate change. Pregnant people are especially vulnerable to the health harms resulting from climate change, namely, preterm birth, small for gestational age, hypertensive disorders of pregnancy, and other adverse reproductive health and birth outcomes. Strategies to minimize these harms include mitigation and adaptation. Healthcare professionals are in a unique position to protect the health of pregnant persons and children by advocating for policy changes that address climate change and providing clinical recommendations for patients to protect themselves from the health impacts of climate hazards.

Impact of Climate change on Maternal and Child Health

Climate change directly and indirectly impacts maternal health, making pregnancy less safe and worsening neonatal health outcomes.

Direct Impact: Heat worsens maternal and neonatal health outcomes, an increase of one degree Celsius in the week before delivery corresponds with a six per cent greater likelihood of stillbirth (Kuehn and McCormick, 2017; He, Jian Rong et al., 2016).Global heating impacts the patterns of vector- borne diseases, such as malaria, with negative maternal and child health outcomes such as maternal illness and low birth weight (WHO, 2017). Climate change worsens global inequity in maternal nutrition (Lancet, 2020). Air pollution is linked to poor maternal health outcomes such as stillbirth, preterm birth and low birth weight. (Bekkar et al., 2020). Global heating increases water salinity and drinking salinated water is also linked to poor maternal health outcomes (Khan et al., 2011) Climate change is also associated with the increased spread of vector-borne diseases (such as malaria, dengue etc), as temperature and precipitation rates affect the survival and spread of these diseases (Campbell-Lendrum, D., et al., 2015) Significant evidence shows that vector-borne diseases, such as malaria, dengue etc can increase the risk of spontaneous abortion, premature delivery, stillbirth, low-weight births, eclampsia, and cesarean delivery for pregnant women (Asian-Pacific Resource & Research Centre for Women, 2015; Sorensen, et al, (2018). Pregnant women are disproportionately susceptible to mosquito-borne diseases, including Zika virus, dengue, and malaria. This is in part due to their closer proximity to standing water as they spend time and performing domestic tasks, such as cooking and those related to water, sanitation, and hygiene (Selby, 2015). Estimates suggest that approximately 507 women and girls die every day as a result of complications from pregnancy and childbirth in

regions affected by conflict, displacement, and natural disasters (UNFPA, 2015)

Indirect Impact: Climate-related emergencies cause major disruptions in access to health services and life-saving commodities, including contraception (Behrman & Weitzman, 2016) Increased poverty and food insecurity driven by climate-related loss of livelihoods negatively affects maternal health etc (Lancet, 2021). Similarly, macro- and micronutrient deficiencies caused by food insecurity and under nutrition among pregnant women can affect pregnancy, nursing, and newborn outcomes and lead to low weight births, miscarriages, and perinatal mortality (Center for Climate Change and Health; Sorensen, C., et al., 2018; Asian-Pacific Resource & Research Centre for Women). Dehydration during pregnancy can be especially devastating to both mother and child, as it can affect fetal growth, release labour-inducing hormones, cause preterm births, and increases the maternal risk of anaemia and eclampsia (Sorensen, et al., 2018). Climate-related emergencies cause

Impact of Climate Change on Child Marriage

Pressure on families due to floods, droughts, disasters and other climate impacts exacerbate drivers of early, forced and child marriage (Alston et al., 2014; CARE UK, 2015; HRW, 2015; Ahmed et al., 2019; McLeod et al., 2019) In circumstances where there are not enough resources to support the family, marriages can be seen as a way to reduce financial pressures and secure resources for the family or the child (HRW, 2015; Ahmed et al., 2019; Tsaneva, 2020)Actual or threatened sexual violence in post disaster settings is linked to early, forced and child marriage, with marriage used by families to protect their child and their family honor (Alston et al., 2014; HRW, 2015; Ahmed et al., 2019). Disruption of education due to climate-related disasters is linked to increases in child marriage (HRW, 2015; Ahmed et al., 2019). Early and child marriage is sometimes linked with female genital mutilation and other harmful practices (Karumbi et al., 2017) In Nepal and Bangladesh, research found that young girls may be pulled out of school and into a marriage to alleviate financial hardship caused by extreme weather events (Mian & Namasivayam, 2018). Four million girls in low- and lower-middle income countries will be prevented from completing their education because of climate-related events (Malala Fund, 2021) In underdeveloped country like Malawi, it was estimated that 1.5 million girls are at risk of becoming child brides due to the impacts of extreme weather events caused by climate change, making it harder for families to afford to feed and house their own children (Chamberlain, G., 2017)

Impact of Climate Change on Family Planning

Climate-related emergencies cause major disruptions in access to life-saving commodities including contraception (various sources of evidence) Access to family planning enables couples to bmake decisions that best reflect their personal circumstances and is a fundamental aspect of SRHR Unsafe abortion is the cause of at least nine per cent of maternal deaths worldwide. The literature suggests that this rate is likely to be much higher in emergency settings (Chukwumalu, K., et al., 2017).

Climate crisis impacts sexual and reproductive health

The climate crisis impacts sexual and reproductive health and the ability to realize fundamental human rights. Realizing sexual and reproductive health and rights (SRHR) contributes to reducing inequalities and increases individuals and communities' resilience to climate change to help ensure no one is left behind as climate impacts intensify. Climate change is a major threat to the vision of human-centred sustainable development as outlined in the International Conference on Population and Development (ICPD) Programme of Action and reinforced by the Nairobi Summit on ICPD25. Climate change is a multiplier of existing health vulnerabilities, including through insufficient access to safe water and sanitation, food insecurity, and impacts on access to health care and education. Climate-related displacement and livelihood impacts are challenging both the protection and the realization of human rights. We know that realizing SRHR is crucial to achieving gender equality, and it must also, therefore, be a central component of gender-responsive adaptation to climate change.

Climate change has direct implications for SRHR. Increases in air pollution and rising temperatures worsen maternal and neonatal health outcomes. An

increase of one degree Celsius in the week before delivery corresponds to a six per cent greater likelihood of stillbirth (Kuehn, McCormick et al., 2017; He at al., 2016; Bekkar et al., 2020). Increased poverty and food insecurity driven by climate-related loss of livelihoods is also impacting maternal health as decreased yields impact nutrient intake of the poor through a decrease in the availability and supply of highly nutritious crops (Thompson et al., 2012; Lobell and Burke, 2010; IPCC AR5, 2014).

Sexual Maturation and Fertility

In recent years, the global average age for menarche has been declining (Canelón & Boland, 2020). Importantly, CECs could alter the age of menarche by disrupting food availability, nutritional factors, or through increased toxin/pollutant release (Canelón & Boland, 2020). Perturbations in the timing of menarche may further affect mental health, fertility-related conditions, cardiovascular disease, and bone health (Šaffa, et al 2020). Moreover, an inverse association between mortality and the timing of menarche has been suggested.6 The significant amount of pollutants discharged into the environment due to increasing industrial and agricultural activities is a serious threat for human health. Moreover, several of these synthetic chemicals with long half-life times are classified as potential endocrine-disrupting chemicals (EDCs) and can affect women's reproductive health (Guillermina and Andrew, 2022).

In addition to the impact of CECs on diet and nutrition, exposure to EDCs has also been associated with early menarche (Canelón & Boland, 2020). These reproductive toxicants in air pollution can also cause defects during game to genesis leading to impaired fertility (Canelón & Boland, 2020). Air pollution may further aggravate asthma, which is associated with difficulties in conception (Esfandiari, et al 2020). EDCs may also adversely affect the ovarian reserve in women and high levels of EDCs have been linked to a decline in ovarian function, infertility, and earlier menopause (Casey, et al, 2019).

Pregnancy Outcomes of Climate Change

Pregnant women have been included among the groups most vulnerable to heat stress as the physiological and anatomical changes that occur during pregnancy pose particular challenges to thermoregulation (Bekkar, et al, 2020). A recent systematic review including a total of almost 33 million births found a significant association between heat, and adverse pregnancy outcomes, preterm birth (PTB), low birth weight (LBW), and stillbirth in the United States.12 It has also been reported that pregnant women who are exposed to higher air pollution levels may be at greater risk for miscarriage, gestational diabetes, PTB, and stillbirths (Bekkar, et al, 2020; Tan, et al 2017) Maternal metabolites and metabolic pathways, perturbed by air pollution exposures, may also lead to adverse pregnancy and birth outcomes; thus, they can be considered mediators in the causal pathways.

Moreover, prenatal maternal stress (PNMS) has an impact on pregnancy outcomes and the offspring's development and lifelong health, and natural disasters contribute to PNMS.15 PTB and neuropsychiatric disorders in the offspring have been associated with PNMS,15 and it is now recognized that maternal stress may be passed on, both intergenerationally and transgenerationally through epigenetic mechanisms (Franklin, et al 2010). Pregnant women have been included among the groups most vulnerable to heat stress as the physiological and anatomical changes that occur during pregnancy pose particular challenges to thermoregulation.11 A recent systematic review including a total of almost 33 million births found a significant association between heat, and adverse pregnancy outcomes, preterm birth (PTB), low birth weight (LBW), and stillbirth in the United States (Franklin, et al 2010).

It has also been reported that pregnant women who are exposed to higher air pollution levels may be at greater risk for miscarriage, gestational diabetes, PTB, and stillbirths.12,13 Maternal metabolites and metabolic pathways, perturbed by air pollution exposures, may also lead to adverse pregnancy and birth outcomes; thus, they can be considered mediators in the causal pathways. Moreover, prenatal maternal stress (PNMS) has an impact on pregnancy outcomes and the offspring's development and lifelong health, and natural disasters contribute to PNMS.15 PTB and neuropsychiatric disorders in the offspring have been associated with PNMS,15 and it is now recognized that maternal stress may be passed on, both intergenerationally and transgenerationally through epigenetic mechanisms. Esfandiari, et al

CECs also affect the distribution of arthropod-borne, foodborne, and waterborne diseases. Arboviral infections transmitted by mosquitoes, such as dengue, chikungunya viruses, and Zika, may have detrimental effects during pregnancy and may contribute to PTB.17 Zika virus has also been associated with congenital fetal brain abnormalities, including microcephaly (O'Kelly & Lambert, 2020). Moreover, increased temperatures and rainfall increase the length of the transmission season for parasites with deleterious effects in pregnancy such as Plasmodium falciparum. Pregnant women infected with malaria show not only higher rates of miscarriage, intrauterine fetal death, PTB, LBW neonates, and neonatal death, but also have a higher risk for severe anemia and maternal death (Schantz-Dunn, & Nour, 2009). Higher temperatures may further increase the risk of cholera and other infections caused by Vibrio bacteria as well as leptospirosis with negative clinical consequences.

Impact of climate change on Lactation and Breastfeeding

In contrast with infant formula, which has a standardized composition, human milk composition changes dynamically throughout the day and throughout gestation. Importantly, Pajewska-Szmyt, et al (2019) put up that human milk can contain environmental pollutants and pollutants with lipophilic properties may have serious effects when absorbed in the neonate digestive track; the presence of heavy metals in human breast milk has been associated with abnormal immune function in the neonate and allergy, endocrine disorders, neurodevelopment delay, and neuropsychiatric disorders later in life (Samiee, et al 2019). However, it is important to note that the American Academy of Pediatrics and World Health Organization still recommend breastfeeding for at least the first 6 months of life. Breastfeeding is not only beneficial for the mother and neonate but also for the environment, minimizing the impact on the earth's resources. Specifically, breastfeeding uses less water or land resources, produces no carbon emissions, and generates minimal or zero waste. To put things in perspective, breastfeeding for 6 months saves an estimated 95–153 kg CO_2 equivalents per baby compared with infants fed with formula (Karlsson, et al 2019). In the United Kingdom alone, the carbon emission savings gained by supporting mothers to breastfeed has been equated to taking between 50,000 and 77,500 cars off the road each year (Joffe, et al 2019).

Impact of climate change on Menopause

CECs increase the exposure of women to EDCs resulting in a decline in ovarian function and earlier menopause (Patel, et al 2020). Specifically, individuals with higher levels of EDCs experience menopause 1.9–3.8 years earlier than women with lower levels of these chemicals (Grindler, et al 2015). EDC-exposed women are also up to six times more likely to be menopausal than nonexposed women of same age (Grindler, et al 2015). Interestingly, CECs may also affect menopause by exacerbating and increasing the duration of symptoms, specifically hot flashes (Smith, et al, 2020)

Recommendations

In regards to the trending issues of the impact of climate change on reproductive health, the following recommendations were raised:

1. climate adaptation and resilience policies, objectives and financing must support action to end GBV and harmful practices.
2. climate adaptation needs to ensure meaningful youth engagement in climate policy design and implementation as well as providing financial support to youth innovation on climate change adaptation responses, including aspects related to human rights, gender equality, and sexual and reproductive health.
3. Advocacy from stakeholders, donors to provide support and social welfare package such as low cost healthcare services for families with low socioeconomic status.
4. Provision of health care service and electronic health delivery at the books and crannies of the community to ensure intermittent intervention are performed
5. Government should police the rural and urban areas of the community generated waste are disposed properly and scientifically in order to reduce environmental crisis.

References

Ahmed K., Atiqul Haq S.M., & Bartiaux F. (2019). The nexus between extreme weather events, sexual violence, and early marriage: a study of vulnerable populations in Bangladesh. Population and Environment. Mar 1;40:303–24.

Alston, M., Whittenbury, K., et al. (2014). Are climate challenges reinforcing child and forced marriage and dowry as adaptation strategies in the context of Bangladesh? Women's Studies International Forum. Vol. 47, Part A, 137-144 https://doi.org/10.1016.

Behrman, J., and Weitzman, A. (2016). Disasters and Health - Effects of the 2010 Haiti earthquake on women's reproductive health. Studies in Family Planning, 47(1), 3–17.

Bekkar B, Pacheco S, Basu R, DeNicola N. Association of air pollution and heat exposure with preterm birth, low birth weight, and stillbirth in the US: A systematic review. JAMA Netw Open 2020;3:e208243.

Bekkar B., Pacheco S., Basu R., and DeNicola N. (2020). Air pollution and heat. Association of Air Pollution and Heat Exposure With Preterm Birth, Low Birth Weight, and Stillbirth in the US: A Systematic Review. JAMA Netw Open. 2020;3(6):e208243. doi:10.1001

Beniston M. (2002). Climatic change: possible impacts on human health. Swiss Med Wkly. 2002; 132: 332- 337.

Campbell-Lendrum, D., et al. (2015). Climate change and vector-borne diseases: What are the implications for public health research and policy? Philosophical Transactions: Biological Sciences 370, no. 1665.

Canelón S. P., & Boland, M. R. (2020). A systematic literature review of factors affecting the timing of Menarche: The potential for climate change to impact women's health. Int J Environ Res Public Health 2020;17:1703. Crossref, Google Scholar

CARE UK. (2015). To Protect Her Honour: child marriage in emergencies, the fatal confusion between protecting girls and sexual violence. CARE. (2015). Rapid

Casey G, Sahyagh S, Moreno-Cruz J, Bunzl M, Galor O, Caldeira K. The impact of climate change on fertility. Environ Res Lett. 2019; 14:054007. 10.1088/1748-9326/ab0843

Chamberlain, G. "Why climate change is creating a new generation of child brides." The Guardian. November 26, 2017

Child Marriage in Bangladesh. IPCC 2018 Changes in impact

Esfandiari N, Nesbit C, Litzky J, et al. High prevalence of allergy in patients undergoing in vitro fertilization and embryo transfer. J Assist Reprod Genet 2020;37:311–320

Fan, W., & Zlatnik, M. G. (2023). Climate Change and Pregnancy: Risks, Mitigation, Adaptation, and Resilience. Obstetrical & gynecological survey, 78(4), 223–236. https://doi.org/10.1097.

Franklin TB, Russig H, & Weiss IC, (2010). Epigenetic transmission of the impact of early stress across generations. Biol Psychiatry 2010;68:408–415.

Grindler NM, Allsworth JE, Macones GA, Kannan K, Roehl KA, Cooper AR. Persistent organic pollutants and early menopause in U.S. women. PLoS One 2015;10:e0116057

Guillermina, G., & Andrew A. B., (2022). Effects of Climate and Environmental Changes on Women's Reproductive Health, *Journal of Women's Health, 31*(6) doi. 10.1089.

Harville E, Xiong X, Buekens P. Disasters and perinatal health: a systematic review. Obstet Gynecol Surv. 2010; 65: 713- 728.

He, Jian-Rong et al. (2016). HEAT "Ambient Temperature and the Risk of Preterm Birth in Guangzhou, China (2001-2011)." Environmental health perspectives vol. 124,7: 1100-6. doi:10.1289

Hilmert CJ, Kvasnicka-Gates L, Teoh AN, Bresin K, Fiebiger S. Major flood related strains and

pregnancy outcomes. Health Psychol. 2016; 35: 1189- 1196.

IPCC 2018 Changes in impacts of climate extremes: human systems and ecosystems. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC). Cambridge University Press, Cambridge, UK, and New York, NY, USA, pp. 231-290.

Joffe N, Webster F, Shenker N. Support for breastfeeding is an environmental imperative. BMJ 2019;367:l5646.

Karlsson JO, Garnett T, Rollins NC, Röös E. The carbon footprint of breastmilk substitutes in comparison with breastfeeding. J Clean Prod 2019;222:436–445.

Karumbi, J., Gathara, D., & Muteshi, J. (2017). Exploring the association between fgm/c and early/child marriage: a review of the evidence. https://www.popcouncil.org/uploads/ pdfs/2017RH_FGMC-ChildM

Khan, A.E., Ireson, A., & Kovats, S., (2011). Salinated water - Drinking Water Salinity and Maternal Health in Coastal Bangladesh: Implications of Climate Change. Environ Health Perspect 119:1328–1332 . Available at: https://doi.org/10.1289/ehp.1002804

Kuehn, L., & McCormick, S. (2017). HEAT Heat Exposure and Maternal Health in the Face of Climate Change. Int J Environ Res Public Health;14(8):853. doi:10.3390

Kuehn L., McCormick S. (2017). HEAT Heat Exposure and Maternal Health in the Face of Climate Change. Int J Environ Res Public Health;14(8):853. doi:10.3390/ijerph14080853

Kumar M, Sarma DK, & Shubham S, (2020). Environmental endocrine-disrupting chemical exposure: Role in non-communicable diseases. Frontiers in Public Health 2020;8:553850.

Le Quéré C, Jackson RB, Jones MW, et al. Temporary reduction in daily global CO2 emissions during the COVID-19 forced confinement. Nat Clim Chang 2020;10:647–653. Crossref, Google Scholar

Liang Z, Ma H, Song Q, et al. Joint associations of actual age and genetically determined age at menarche with risk of mortality. JAMA Netw Open 2021;4:e2115297. Crossref, Medline, Google Scholar

McLeod, C., Barr, H., & Rall, K. (2019). Does climate change increase the risk of child marriage: A look at what we know and what we don't with lessons from Bangladesh and Mozambique. Columbia Journal of Gender and Law, 38(1), 96-146.

Mian, L.H., & Namasivayam, M. (2017). Sex, rights, gender in the age of climate change. Kuala Lumpur: Asian-Pacific Resource & Research Centre for Women. https://arrow.org.my/publication/sex-rights-genderage-climate-change

O'Kelly, B, & Lambert JS. Vector-borne diseases in pregnancy. Ther Adv Infect Dis 2020;7:2049936120941725. Crossref, Google Scholar

Pajewska-Szmyt M, Sinkiewicz-Darol E, Gadzała-Kopciuch R. The impact of environmental pollution on the quality of mother's milk. Environ Sci Pollut Res 2019;26:7405–7427.

Patel S, Zhou C, Rattan S, Flaws JA. Effects of endocrine-disrupting chemicals on the ovary. Biol Reprod 2015;93:20

Šaffa G, Kubicka AM, Hromada M, Kramer KL. Is the timing of menarche correlated with mortality and fertility rates? PLoS ONE 2019;14:e0215462. Crossref, Medline, Google Scholar

Samiee F, Vahidinia A, Taravati Javad M, Leili M. Exposure to heavy metals released to the environment through breastfeeding: A probabilistic risk estimation. Sci Total Environ 2019;650(Pt 2):3075–3083

Schantz-Dunn J, & Nour, N. M. (2009). Malaria and pregnancy: A global health perspective. Rev Obstet Gynecol 2009;2:186–192.

Segal, T. R., & Giudice, L. C. (2022). Systematic review of climate change effects on

reproductive health. Fertility and sterility, 118(2), 215–223. https://doi.org/10.1016/j.fertnstert.2022.06.005

Selby, D. (2015). "Climate Change: Reorienting the Development Agenda.." In From the Local to the Global (3rd edition): Key Issues in Development Studies, edited by G. McCann and S. McCloskey, 113–131. London: Pluto Press. doi:10.2307

Smith JN, van Daalen KR, Venkatraman R. Climate change and its potential impact on menopausal hot flashes: A commentary. Menopause 2020;27:816–817.

Sorensen, C., et al. (2018). Climate change and women's health: Impacts and policy directions. PLoS Med 15, no. 7: e1002603, doi.org/10.1371.

Tan Y, Yang R, Zhao J, Cao Z, Chen Y, Zhang B. The associations between air pollution and adverse pregnancy outcomes in China. Adv Exp Med Biol 2017;1017:181–214.

United Nations Population Fund. (2015). Shelter from the Storm: A transformative agenda for women and girls in a crisis-prone world. State of the World Population. New York: United Nations Population Fund,

WHO Fact Sheet (2018) https://www.who.int/news-room/fact-sheets/ detail/climate-change-and-health.

Women Deliver. The link between sexual and reproductive health and climate change: an evidence review. January 2021. Accessed August 29, 2021