Climate change and sexual and reproductive health: impacts and solutions

How family planning can help with tackling climate change

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ABSTRACT

INTRODUCTION

» Global climate change represents a grave threat to the future of human health and our natural environment.

» Progress towards achieving universal access to sexual and reproductive health services, family planning, maternal and neonatal healthcare, is likely to be affected in the absence of urgent and significant action.

» New challenges associated with a changing environment are likely to arise and further impact maternal and infant health outcomes, fertility, rates of sexually transmitted infections and risks of sexual violence.

» At the same time sexual and reproductive health is inherently linked to sustainable population growth, a contributing factor to climate change.

» Maintaining ongoing progress towards improving sexual and reproductive health outcomes, and strengthening existing health services to adapt to climate related changes, offers a dual benefit of improving health outcomes and mitigating one of the key drivers of climate change, population growth.

SUMMARY

This narrative review aims to explore the impact of climate change on sexual and reproductive health. It will discuss how the realisation of sexual and reproductive rights and the advancement of gender equity through voluntary family planning could contribute to sustainable population changes as a part of a comprehensive climate change strategy.

INTRODUCTION

Global climate change has been declared the greatest health threat of the 21st century. Increased frequency of natural disasters, extreme temperatures, pollution, food insecurity and altered distribution of vector borne disease threaten all aspects of human health, including sexual and reproductive health (SRH). New SRH challenges posed by climate change, in combination with ongoing rapid population growth, places strain on existing health services, perpetuates environmental degradation, and impair the ability of communities to adapt to climate change. As such, voluntary family planning has been identified as a strategy to mitigate rapid population expansion and its associated environmental impacts, as part of a broad approach to climate change. This narrative review summarises available evidence regarding the impacts of climate change on sexual and reproductive health. In consideration of these findings, this review discusses how strengthening efforts to achieve SRH outcomes through family planning may offer a dual benefit of improving health whilst assisting with mitigation of and adaptation to climate change.

METHODS

Keyword searches of Medline, CINAHL and Scopus databases were used (searched June-July 2020), supplemented by manual searches of relevant journals and reference lists of primary articles. Keywords included: “climate change”, “sexual health”, “reproductive health”, “maternal health”, “maternal-child health”, “women’s health” and “sexually transmitted diseases”. Studies were included if they detailed the impact of climate change on sexual and reproductive health, population-based strategies and family planning in the context of the environment. Key outcomes included: maternal and child health, fertility, menarche, HIV infections, mother-to-child transmission of HIV, vector borne diseases, access to SRH healthcare and gender-based and sexual violence. All study designs and settings were included to provide breadth to the discussion. The field was narrowed based on publication date after 2007, peer review, English language and relevance. The initial search yielded 181 results. Title and abstract screening identified 91 eligible articles. Full text screening identified 51 articles which were included in the narrative review synthesis.

THE EFFECT OF CLIMATE CHANGE ON SEXUAL AND REPRODUCTIVE HEALTH OUTCOMES

Climate change impacts on SRH through increased frequency of natural disasters, increased average seasonal temperatures, food insecurity, poor air quality and altered geographic distribution of vector borne diseases as described in Figure 1. In the wake of natural disasters, direct damage to healthcare infrastructure threatens existing services whilst human displacement and migration bring many new challenges. Changes to SRH outcomes are also mediated through indirect pathways, including changes in crop yields, distribution of infectious disease, and violent conflict. Consequently, climate change acts as a health-threat multiplier, impacting on health and healthcare systems to broaden already existing health and social inequalities. Due to the close relationship between SRH, gender equity and environmental health, as van Daalen et al suggests, the effects of climate change on health are overwhelmingly negative, with women often bearing
the brunt of both morbidity and mortality. [8] Those living in the low-income and middle-income (LMICs), where SRH outcomes are poorest, currently are, and will continue to be disproportionately affected.[9]

DIRECT HEALTH EFFECTS

MATERNAL AND NEONATAL HEALTH

There is a growing literature base linking environmental changes such as extreme heat and air pollution with poor neonatal and maternal outcomes. A recent systematic review found that temperature extremes adversely impact birth outcomes including gestational length, birth weight, stillbirth and neonatal stress.[11] Heat waves during pregnancy have also been associated with an increased risk of maternal complications such as hypertension, uterine bleeding, eclampsia and incompetent cervix. Exposure to ambient air pollutants including nitrogen oxides, particulate matter and ozone has also been linked to an increase in the risk of hypertensive disorders in pregnancy[15] and exposure to high concentrations of fine outdoor particulate matter has been associated with low birthweight.[14] However, there is insufficient evidence to conclude if air pollution is associated with preterm birth.[14]

There is also a body of epidemiological literature
which supports the contention that experiencing stress during pregnancy from direct or indirect exposure to disasters can adversely affect reproductive outcomes.[11,23,24] A recent systematic review concluded that the major concerns for pregnant women exposed to disasters relate to decreased foetal growth and maternal mental health problems, especially in the most directly exposed women.[23] Given that natural disasters are predicted to occur more frequently and with higher intensity with climate change, poor pregnancy and birth outcomes could increase in accordance.

A mother’s health during pregnancy impacts their future health and birth outcomes, and as such, the effects of extreme heat, air pollution and natural disasters are likely to persist. Growth restriction and prematurity have lasting health implications for the child and significantly contribute to infant morbidity and mortality. This illustrates the potentially long-lasting effect of climate change on maternal and neonatal health. The magnitude of these effects is significant when considering these issues at a population level.

**FERTILITY**

There is mixed evidence regarding the impact of climate change on fertility biology and behaviours. A study utilising US natality files and climate data found no statistically significant impact of heat waves on birth rates, concluding heat waves do not influence fertility decisions.[11] However, this literature review found three other studies which would indicate otherwise. Firstly, a longitudinal household survey utilising climate data in Indonesia observed reduced fertility following abnormally high temperatures, particularly amongst women living on farms.[25] Secondly, a Korean study estimating the effects of temperature on birth rates found that an additional day with a maximum temperature of 30-32°C, relative to 28-30°C, decreased the birth rate 9 months later by 0.24% or 92 babies per month.[26] Finally, a study in the US observed a similar drop in birth rates at 9-10 months, but also found a partial rebound at 11, 12 and 13 months.[27] This study was the only study to include analysis of the underlying cause of reduced fertility. They attributed the reduced birth rates to the high temperatures affecting reproductive health rather than reducing sexual activity. Due to the complex and interrelated nature of fertility behaviour and biology, future studies are necessary to confirm the potential impact of climate change on fertility.

**HIV INFECTION AND MOTHER-TO-CHILD TRANSMISSION (MTCT) OF HIV**

Existing literature acknowledges numerous bidirectional interactions between HIV and climate change. [28] Climate change impacts on the health of HIV patients directly, but also on socioeconomic determinants of HIV transmission, such as migration, gender inequities and poverty. Chersich argues that climate change could undo considerable gains made by programs aiming to prevent MTCT of HIV through reduced access to antiretroviral medications in the aftermath of disasters or due to migration, wastage of heat sensitive medication, and increased liquid requirements for infants during heatwaves resulting in high viral load exposure as a consequence of increased breastmilk consumption.[29]

**MENARCHE**

Menarche, the first occurrence of a woman’s menstrual period, indicates the onset of reproductive capacity and the transition from childhood to womanhood. Age of menarche is associated with a country’s fertility and female mortality rates, and is often delayed by high mortality and fertility rates.[30] Timing of menarche is likely to be influenced by numerous factors, including the environment and therefore may be impacted by climate change. [30] A recent systematic review by Canelón and Boland explored the potential for climate change events to alter the age of menarche by disrupting food availability or via increased toxin/pollutant release.[31] They concluded that perturbations in the timing of menarche secondary to climate change are likely to increase the disease burden for women in four key areas: mental health, fertility-related conditions, cardiovascular disease and bone health.[31] There have been no further studies assessing the impact of climate change on menarche, so further research in this area may identify other risks to women’s health.

**VECTOR BORNE DISEASES**

Vector borne diseases often exhibit seasonal patterns, or year to year variation and are likely to be sensitive to climate change.[32] In particular malaria, dengue and zika pose substantial risks for the pregnant woman, foetus and newborn child. As seen in Figure 1, pregnant women have a higher risk of severe malaria, resulting in anaemia, acute respiratory distress syndrome, hypoglycaemia and coma. Malaria infection during pregnancy is associated with miscarriage, stillbirth and LBW, and it is suspected to be an underreported cause of maternal mortality.[17] Dengue virus during pregnancy is associated with increased risk of caesarean, eclampsia and growth restriction,[19] while Zika primarily poses a risk to the foetus of microcephaly and impaired cognitive develop-
ment. [18] Changing distribution and increased burden of these diseases therefore pose a threat to SRH.

INDIRECT HEALTH EFFECTS

LACK OF ACCESS TO HEALTHCARE SERVICES

Key sustainable development strategies targeting sexual health rely on strengthening existing health-care services, however access to healthcare services is threatened during natural disasters. Lack of access to essential contraceptive and abortion services may increase the risk of unplanned pregnancies, sexually transmitted diseases and unsafe abortion, while reduced access to maternal healthcare impacts on maternal mortality rates. A case study exploring disruption to maternal healthcare during annual flooding in rural Bangladesh found a lack of planning for the management of maternal complications directly impacted on maternal outcomes, with a female to male death ratio of 3:1 and an increase in inadequate antenatal care from 1.3% to 3.9%. [21] Planning for natural disasters in climate change strategies must include SRH services in order to allow provision of essential medical care.

FOOD INSECURITY AND MALNUTRITION

Many LMIC families depend on small-scale rainfed agriculture and livestock systems whose food production will be impacted by environmental changes with climate change. Lack of food availability results in nutritional deficits that disproportionately affect women, impacting on pubertal development, pregnancy outcomes and breastfeeding. [12]

GENDER-BASED AND SEXUAL VIOLENCE

Physical and sexual violence increases following disasters and evidence indicates that the propensity for interpersonal violence may increase in uncomfortably hot temperatures. [20, 22] As such, there is a general consensus that climate change will correlate with increased violence against women. Sexual violence has both short- and long-term consequences on women’s physical, mental, and SRH, including: unwanted pregnancy, abortion, sexually transmitted infections (STIs), HIV/AIDS, recurrent urinary tract infection, pelvic pain, pelvic inflammatory disease and genital injury. [33, 34]

THE IMPACT OF POPULATION ON CLIMATE CHANGE AND SRH OUTCOMES

By 2050, the population is expected to increase to 10.9 billion people, from today’s 7.7 billion, with the expansion primarily taking place in sub-Saharan Africa and South Asia. [35] In these countries, population growth is driven by high fertility rates where women have on average 4-7 children. [36] The effect of rapid population growth is three-fold in resource poor settings. Firstly, rapid population expansion brings unsustainable consumption and production, resource scarcity and places stress on natural infrastructure. Secondly, an increasing number of fertile and pregnant women places strain on already struggling maternal health services; requiring existing strategies targeting maternal mortality to increase in proportion with population growth. Thirdly, population expansion increases vulnerability to climate change and impairs the ability of countries to adapt to climate change. [37] The collision between global warming and rapid population growth has the potential to precipitate a major humanitarian disaster. Yet population dynamics have not been effectively integrated into climate change science. [38, 39]

FAMILY PLANNING AS A COST EFFECTIVE SOLUTION

Integrating family planning (FP) into broader climate policy could offer a dual benefit of assisting with mitigation of climate change and improving SRH outcomes. It will also enhance the capacity of LMIC to adapt to climate change, and in doing so, reduce the risk that climate change poses to SRH.

FP is defined as the ability of individuals and couples to anticipate and attain their desired number of children and the spacing and time of births. FP offers a unique solution among medical interventions as seen in Figure 2. It reduces poverty, maternal mortality and increases community resilience, women’s education and empowerment in addition to mitigating climate change through stabilisation of global populations. [2-6, 39-41] In countries which continue to experience a high fertility rate, there is a high level of unmet need for FP services. [42] Consequently, in their latest report, the Intergovernmental Panel on Climate Change (IPCC), identified voluntary FP as an important climate change mitigation and adaption strategy. [43] FP is also a cost-effective investment. According to the Guttmacher Institute, an investment of $8.56 per person per year would ensure that all women in developing regions receive essential maternal and newborn care and effective contraceptive services. [42]

PRACTICALITIES TO IMPROVE UPTAKE AND EFFECTIVENESS OF FAMILY PLANNING CLIMATE STRATEGIES

COMBINING HEALTH WITH OTHER MESSAGES

Multiple studies have found that combining
health and environmental or economic messages has the potential to reach a wider audience than single sector interventions.

A qualitative study in rural Northern Kenya, where families depend on natural resources found that relating family size to the environment is a compelling strategy to improving support for FP among Samburu men.[45] Another project in eastern Ethiopia combined efforts to promote sustainable land practices, land rehabilitation and modern FP and HIV/AIDS awareness, by inviting professionals from local health facilities to partake in environmental training sessions.[46] By integrating SRH awareness, the project has helped to ensure that the environmental benefits are sustainable, protected from being eroded by rapid population growth and complemented by improved SRH. Further, a community based study in Uganda suggested that promotion of FP to time births according to the most optimal seasonal conditions for pregnancy might also be also be considered as an initiative to enhance perinatal health in the light of a changing climate.[47]

**ENHANCING FEMALE EDUCATION**

The relationship between FP and girls’ education is mutually reinforcing; when girls have access to FP, they have greater access to education and when girls are more educated they desire contraceptive use, further advancing their time in school and economic opportunities.[48] Wheeler found in countries where female schooling rates are particularly low, greater attention to female education increases FP productivity and carbon emissions abatement more rapidly.[49] The argument for female education is strengthened by its documented contribution to resilience in the face of the climate change.[49] From a SRH perspective enhancing female education is associated with positive maternal health outcomes, including reduced maternal mortality, unwanted pregnancy and increased antenatal healthcare usage. Educated and empowered women with improved health, increased financial capacity, and smaller, more prosperous families will also be better equipped to recover from environmental and economic shocks that are likely to increase with climate change.

**INTEGRATION IN GENDERED POLICY**

The impacts of climate change are not the same across genders, and as such Sorensen et al suggest including gender in climate policies is essential to addressing the complex interactions between poverty, gender-based discrimination and climate change.[12] This sentiment is echoed in the UN women’s guidebook “Leveraging Co-Benefits Between Gender Equality And Climate Action For Sustainable Development”, which provides a practical guide to help stakeholders integrate gender equality considerations in climate projects.[50] Given that the relationship between SRH rights and gender inequality is bidirectional and self-reinforcing, efforts to improve gender equality through gendered climate change strategies will inevitably benefit SRH outcomes.

**DISCUSSION**

![Figure 2 Family planning: impacts on fertility rates, maternal morbidity, female empowerment and climate change (Adapted from Marie Stopes International)[44]](image-url)
Although population based approaches are not the only strategies to confronting the climate change challenge, slowing population growth could reduce global emissions by 40% in the long term.[51] FP, integrated with environmental strategies, enhanced by female education and gendered climate policies has the potential to improve SRH outcomes, gender inequality and slow population growth. It therefore acts as both a climate change mitigation and adaptation strategy. Though prior literature has iterated the controversial nature of “population control” as an approach to climate change, [36] this idea undermines the very nature of FP, which is voluntary and rights-based at its core, serving to empower individuals and couples’ control over becoming pregnant and birth spacing. Given that many women cite that they have an unmet need for contraception, it is hard to argue that meeting this need would limit their choice in the matter, particularly in the light of the SRH benefits FP offers.

Challenges limiting the success of population-based climate change strategies and access to FP are complex and often intertwined with social and economic factors. Incorporating health messages with economic and environmental messages, promoting female education and gender equity may assist in overcoming these challenges. Further, recognising that neo-liberalism relies on population growth to maintain wealth and power is instrumental in understanding resistance to effective climate action and population-based strategies.

Additionally, while population growth is occurring more rapidly in developing countries, FP also has a role to play in higher income countries. The richest 10% of the world’s population are responsible for almost half the total lifestyle consumption emissions and amongst the high income countries, up to one third of pregnancies are unintended, hence, ongoing efforts to promote FP in these countries will also contribute to reduced carbon emissions.[4]

Further research is essential to fully understand the impact of climate change on SRH, and population on climate change, and in turn, to evaluate the efficacy of any population-based strategies which are implemented. Areas for future research identified in this narrative review include: the effect of air pollution exposure on neonatal outcomes, the impact of natural disasters on maternal and neonatal health, changes to fertility behaviour and biology secondary to climate change as well as climate related changes to timing of menarche. Merging population and climate data will be vital in this process.[52] Due to the interconnected relationship of many aspects of SRH with behaviour and the environment, confounding factors must be accounted for in future research methodologies. As such, Grace suggests research strategies for conducting micro-level empirical research, expanding on existing social research frameworks, to ensure that research on the links between climate, fertility and reproductive health outcomes in developing countries is an accurate reflection of the situation.[52]

Outside of FP, other strategies to protect SRH will be necessary as environmental shocks and climate change occurs. These include emergency plans for maternal health to address the immediate needs of pregnant women during disasters, contingency plans to ensure access to essential medications such as antivirals, misoprostol and magnesium sulphate, enhancing access to skilled birth attendants and management programs for vector borne diseases.[53] Sorensen et al provides a comprehensive summary of multisectoral solutions to climate change impacts on women's health.[12]

CONCLUSION

Slowing population growth, through voluntary FP, will allow countries vulnerable to climate change to develop appropriate adaptive policies, as well as slow the climate change process. This has positive repercussions on health as well as economic and social impacts due to the interdependence of SRH outcomes, environmental health and gender inequality. Climate change and SRH remain urgent global priorities and merging strategies to combat these issues, may allow the global community to reap multiple benefits, in a way which is cost-effective and human rights focused. The global community will rely on political will, ongoing research efforts and evidence-based policy decisions to mitigate and adapt to climate change to ensure future advances are made towards achieving SRH and rights.

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