



Global Public Health

An International Journal for Research, Policy and Practice

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/rgph20

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To cite this article: Daniel H. Pope, Heather McMullen, Angela Baschieri, Anandita Philipose, Chiagozie Udeh, Julie Diallo & David McCoy (2023) What is the current evidence for the relationship between the climate and environmental crises and child marriage? A scoping review, *Global Public Health*, 18:1, 2095655, DOI: [10.1080/17441692.2022.2095655](https://doi.org/10.1080/17441692.2022.2095655)

To link to this article: <https://doi.org/10.1080/17441692.2022.2095655>



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Published online: 20 Nov 2022.



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What is the current evidence for the relationship between the climate and environmental crises and child marriage? A scoping review

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ABSTRACT

Environmental crises such as climate change threaten the realisation of sexual and reproductive health and rights. In this scoping review, we examine the evidence for the relationship between environmental crises and child marriage. We conducted a search of Google Scholar, Scopus and MedLine from their origin to 4th June 2021 for both peer-reviewed academic literature and 'grey' literature. A total of 24 relevant articles were identified, including both quantitative and qualitative work. While there are limitations of the current evidence base such as its narrow geographical scope, we find that environmental crises worsen known drivers of child marriage, pushing families to marry their daughters early through loss of assets and opportunities for income generation, displacement of people from their homes, educational disruption, and the creation of settings in which sexual violence and the fear of sexual violence increase. Local socio-cultural contexts such as bride price or dowry practices further shape how these factors affect child marriage. Given many of the areas with the highest current rates of child marriage face the gravest environmental threats, action to tackle child marriage must take account of the link identified in this review.

ARTICLE HISTORY

Received 23 August 2021
Accepted 24 June 2022



KEYWORDS

Child; early or forced marriage; climate change; environment; female genital cutting/mutilation

Introduction

Environmental crises such as climate change pose a major threat to the vision of human-centred sustainable development outlined in the International Conference on Population and Development (ICPD) Programme of Action, with significant impacts on sexual and reproductive health and rights. Within this context, the effects of environmental crises on harmful practices such as early, forced or child marriage and female genital cutting are coming under increasing scrutiny.

Child marriage is defined as a formal marriage or informal union in which at least one of the parties is under 18 years (UNFPA, 2020). While boys may also be a party to child marriage, overwhelmingly it is girls who are most affected (UNFPA, 2020). Globally 21% of girls are married before their 18th birthday, with 12 million girls under 18 married every year (UNFPA, 2020; UNICEF, 2020). Rates of child marriage are highest in Sub-Saharan Africa and South Asia, where 35% and 30% of girls are married before the age of 18, respectively (UNICEF, 2020).

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The negative effects of child marriage are multiple and significant. Girls who are married as children are denied their human rights, including their rights to make reproductive choices. Girls married as children often have earlier first pregnancies with a concomitantly higher risk of complications for both mother and child including fistula, haemorrhage, obstructed labour, low birth weight and prematurity (Ganchimeg et al., 2014; Irani & Roudsari, 2019; Olamijuwon et al., 2017; UNFPA, 2012; UNFPA 2015; Girls not Brides 2021; UNFPA 2021a; WHO, 2021). Maternal complications are the leading global cause of death for girls aged 15–19 (WHO, 2016). Child marriage is associated with higher rates of STIs including HIV, entrenches gender norms (Asadullah & Wahhaj, 2019), and can enable other forms of gender-based violence including intimate partner violence, domestic abuse and boy child preference (Glynn et al., 2001; Irani & Roudsari, 2019; Jensen & Thornton, 2003; Nour, 2006; Olamijuwon et al., 2017; UNFPA, 2020). Girls married as children frequently face reduced access to education or employment, with each year of marriage under 18 associated with a 6% decrease in the probability of literacy and secondary school completion (Amin et al., 2017; Glinski et al., 2015; Lloyd & Mensch, 2008 UNFPA, 2020). Child marriages are often virilocal, meaning the girl resides with the husband's family, potentially isolating her from her previous support networks (UNFPA, 2020).

Child marriage can be associated with other harmful practices, including female genital mutilation (FGM) in some countries. FGM involves partial or total removal of female external genitalia or other injury to female genital organs for non-medical reasons and is internationally recognised as a human rights violation (UNFPA, 2021b). It is mostly carried out on girls between infancy and age 15 (UNFPA, 2020).

Links between FGM and child marriage are multiple and complex but include how FGM can be seen to improve a girl's marriageability or can be a prerequisite for marriage (Karumbi et al., 2017). Social and cultural norms that underpin the control of women's sexuality are common to both FGM and child marriage, and many of the driving factors behind FGM and child marriage are similar, including socio-economic status, level of parental education, and gender inequality (Fagbamigbe et al., 2021; Karumbi et al., 2017).

The decision for a child to marry is shaped by a web of intersecting factors that may include social pressures, gender norms, household economics, dowry and bride price practices, harassment and intimidation, sexual violence, and pregnancy or fear of pregnancy (Amin et al., 2017; Asadullah & Wahhaj, 2019; Avogo & Somefun, 2019; McLeod et al., 2019; Spencer, 2015). In particular, lack of access to resources is a key driving factor for child marriage, with girls whose families' incomes fall in the lowest quintile more than twice as likely to marry before the age of 18 than those whose families' incomes are in the highest quintile (UNFPA, 2012). In contrast, education is protective; girls with a primary education are twice as likely to experience child marriage as those with a secondary or higher education (UNFPA, 2012).

Evidence from humanitarian settings suggests that rates of child marriage can also be heavily influenced by environmental disasters. In the 5 years following the 2007 cyclone Sidr in Bangladesh, for example, 62% of all child marriages occurred within the first 12 months after the cyclone (Myers, 2013). Schools were used as emergency shelters, meaning they stayed closed for months after the cyclone. The government of Bangladesh reported that the loss of the academic year meant it became 'very common' for adolescent girls to be married without their consent (Myers, 2013).

Following the 2004 Asian tsunami, there were cases of forced marriage of girls under the age of 18 reported in Indonesia (Felten-Biermann, 2006). In refugee camps in Sri Lanka, there were multiple reports of sexual harassment, violence and rape; in this context, child marriage was seen by some families as a way of protecting against sexual violence (Felten-Biermann, 2006).

Child marriage and climate change

The effects of climate change are already evident and will worsen over the coming decades (IPCC, 2021). Direct effects of climate change such as natural disasters, drought, and decreasing crop yields,

as well as indirect effects, such as impoverishment, displacement and conflict will have huge implications for sexual and reproductive health and rights (Hsiang et al., 2013; IPCC, 2014). Notably, the IPCC notes that 1.5°C warming could force millions of people into extreme poverty and most severely in Sub-Saharan Africa and South Asia, the two regions with the highest current global rates of child marriage and FGM (IPCC, 2014; UNICEF 2013; UNICEF, 2021; UNFPA 2021b). In the context of a changing and unstable climate, there has been increasing focus on how environmental crises may affect rates of child marriage and FGM. While there have been multiple recent reviews of the driving factors and possible programmatic responses to child marriage (Malhotra & Elnakib, 2021; Plesons et al., 2021; Psaki et al., 2021; Raj et al., 2018), to date none have looked directly at how environmental crises affect child marriage.

In this scoping review, we describe the current evidence for the relationship between climate change and child marriage. We also consider the relationship between other related environmental and ecological crises and child marriage. For the remainder of the text we use the term ‘environmental crises’ as an umbrella term to include all forms of environmental breakdown, including the climate crises, biodiversity crises and challenges to sustainable development that centre on environmental factors. Finally, we also describe the evidence for the relationship between environmental crises and FGM, a practice that can be linked to child marriage.

Methods

We conducted a search of Google Scholar, Scopus and MedLine from their origin to 4th June 2021 for both peer-reviewed academic literature and ‘grey’ literature that examined the relationship between environmental crises and child marriage and FGM. The full search strategy and inclusion and exclusion criteria are presented below. Titles and abstracts were reviewed for the first 1000 search results. Full texts of potentially relevant articles were assessed for relevance to the review topic. Reference lists of key articles were reviewed for any further relevant articles.

Search Strategy:

- (early OR forced OR child) AND marriage
- OR (female genital mutilation OR FGM OR female genital cutting OR FGC OR female circumcision)
- AND (climate change OR environment OR drought OR famine OR disaster OR flood OR sea level rise OR salination OR pollution OR biodiversity OR ecology OR (environment* AND crisis))

Inclusion Criteria:

- Primary or secondary research
- Describes an aspect of how environmental crises (climate crises, biodiversity crises, ecological crises, etc.) are related to early, forced or child marriage and/or FGM
- Published in peer-reviewed academic journals or as ‘grey’ literature (e.g. government reports, non-governmental organisation reports, academic reports, working papers)

Exclusion Criteria:

- Not in the English language
- Does not describe an aspect of how environmental crises are related to early, forced or child marriage or FGM

Results

A total of 24 relevant articles or reports were identified for inclusion in this review. Eight used quantitative methods to assess the link between environmental crises and child marriage or FGM, while 16 used qualitative methods (see Table 1). Eleven of the 24 articles were published in peer-reviewed academic journals. The geographical focus of the current evidence base was South and South-East Asia (12 articles), particularly Bangladesh (8 articles), and Sub-Saharan Africa (13 articles). Across the reviewed studies, multiple types of environmental crises were included; most commonly drought (12 articles) and floods (8 articles).

The existing evidence on the relationship between environmental crises, child marriage and FGM includes quantitative work examining the correlation between local meteorological data and child marriage survey data, and qualitative work from interviews, surveys and focus groups with girls and women who have been married as children, their families, and workers in non-governmental organisations (NGOs). Driving factors that link environmental crises with child marriage were identified through thematic synthesis and the results are presented according to these themes: lack of resources, dowry and bride price practices, displacement and migration, education, sexual violence, bereavement/loss of support network, child marriage laws, and FGM. It is important to note that these themes are not neatly bounded, but instead overlap considerably. For example, access to resources and education are closely linked in multiple ways, such as through costs associated with school books and materials, and perceived short-term economic benefits of children working rather than attending school. Other similar overlaps occur across thematic areas.

Loss of resources, environmental crises and child marriage

Child marriage takes place worldwide but is more common amongst those with the least access to resources and opportunities for generating income, particularly those in rural areas who are most dependent on the local environment for their livelihoods (UNFPA, 2020). In the current literature, the negative effect of environmental crises on household resources is overwhelmingly cited as a key driver that links these crises with increased rates of child marriage.

Quantitative findings

Tsaneva (2020) combined annual rainfall data with 5 rounds of Demographic Health Survey (DHS) data in Bangladesh from 1999 to 2014, finding that a higher number of dry months (1 standard deviation below the long-term precipitation average) were associated with an increased risk of child marriage in rural areas (hazard ratio 0.0142, standard error 0.0066). During these dry periods, they found that household wealth decreased, especially for those engaged in agriculture.

Table 1. Summary of study characteristics for all studies included in this scoping review.

Study type	Academic	11 (46%) ^a
	Grey	13 (54%)
Methodology	Quantitative	8 (33%)
	Qualitative	16 (67%)
Location(s) studied	South Asia	11 (46%)
	South East Asia	2 (8%)
	Sub-Saharan Africa	13 (54%)
	Rest of World	0 (0%)
Environmental crisis type	Cyclone	2 (8%)
	Flood	8 (33%)
	Drought	12 (50%)
	River Erosion	1 (4%)
	Earthquake/Tsunami	1 (4%)
	Extreme Heat	1 (4%)

^aNote one study (Ainul & Amin, 2015) is an academic paper that has not undergone formal peer review. All others had undergone formal peer review.

Furthermore, the effect of drought on child marriage was greatest in the poorest areas, suggesting household economics is fundamental to how environmental crises affect rates of child marriage. Interestingly, they found no effect of drought at 1 or 3 years after the drought, suggesting child marriage is used as a short-term coping mechanism in response to a climate-related income shock rather than the consequence of long-term budget constraints. In this study, extreme temperatures (1 standard deviation above long-term average) were not associated with any increased risk of child marriage.

Asadullah and colleagues (2020) did not find a significant association between drought and likelihood of child marriage in Bangladesh but did find an association between extreme heat and increased rates of child marriage. Women and girls aged 11–23 years were significantly more likely to marry in the year of or calendar year immediately following moderate or severe heat waves. In years with 30 days or more of extreme heat, girls aged 11–14 years were twice as likely to marry relative to baseline years, while girls aged 15–17 were 30% more likely to marry (Asadullah et al., 2020). While it is unclear why there is a discrepancy between Asadullah et al. and Tsaneva's findings on drought, both provide evidence consistent with child marriage as a short-term economic coping mechanism in response to environmentally driven income shocks.

Dewi and Dartanto (2019) used survey data from 40,157 women in Indonesia married between 2008 and 2013, of which 4832 were child marriages. Combining this with village-level data from the same time period on natural disasters (earthquake, tsunami, flood, storm, landslide, eruption, drought, fire, flash flood and tide) in a regression model, they found disasters were associated with a significant increase in the likelihood of child marriage. Strikingly, higher relative poverty (surrounding areas are wealthier than the village being studied) increased the probability of girls in those villages becoming child brides, potentially implicating local economic inequality as a driving factor for child marriage in response to disasters.

Pasten and colleagues (2020) used a structural equation model to examine the effects of climate change on child marriage in 180 countries. The model included 4 key variables: ND-GAIN index (a compound measure of a country's exposure, sensitivity and ability to adapt to the effects of climate change), Gross Domestic Product (GDP) per capita/poverty rate, United Nations Development Programme (UNDP) gender equality index, and child marriage rate. Their model found that increased 'climate vulnerability' as described by the ND-GAIN index was associated with both a direct increase in child marriage, as well as indirect increases in child marriage due to increased poverty and increased gender inequality (with increased gender inequality driven primarily by increased poverty). However, given that climate vulnerability is heavily influenced by national economics, it's conceivable that poverty could be the driving factor behind both child marriage and climate vulnerability itself. Using 'climate exposure' (a variable based solely on the biophysics of climate change) in place of climate vulnerability, they found the same results, suggesting there is an effect of climate change on child marriage beyond the fact that its effects are projected to be most significant in areas of the world with less capacity to adapt. This suggests that the directionality of their model (that climate change affects child marriage predominantly through effects on access to resources and income) is correct.

Qualitative findings

The quantitative evidence linking environmental crises to child marriage is supported by evidence from interviews, surveys and focus group discussions. Alston and colleagues (2014) found that the vast majority (91%) of their survey participants in Bangladesh felt that climate change causes financial hardship. Furthermore, 45% reported that 'girls were now being forced into child marriages as a direct result of climate events and subsequent poverty', a view reinforced by their interview and focus group findings.

In a study using 114 individual or group interviews in Bangladesh, families frequently described lack of access to resources as a key driving force in deciding when daughters should marry, with one mother commenting 'because of our financial problems after cyclone Aila, I got my daughter

married [at age 14] while another said 'I don't have enough money to feed my daughters – that's how I decide when I should marry them' (HRW, 2015, p. 43).

Ahmed et al. (2019) interviewed 120 household heads in Bangladesh about child marriage and environmental changes. Many reported large family size to be a burden, a problem felt more acutely following extreme weather events which exacerbate poverty through injury and loss of assets and livelihoods. Many considered early marriage to represent a means to reduce that burden and transfer costs to the groom's family. For example, one male household head reported

we face crises brought about by floods and cyclones and we lose our crops, sources of income, and work opportunities. We understand that poverty becomes severe during extreme weather events. Having more daughters is burdensome and we find it more worrisome than having sons. So we try to find a groom and marry off our daughters at an early age because this is the only way we can transfer our burden. (Ahmed et al., 2019, p. 13)

Similarly, a female household head reported that 'floods make us poor. When these situations worsen we consider early marriage for our daughters against poverty ... If we marry off our daughters, it means we need to feed and clothe less people [sic]' (Ahmed et al., 2019, p. 11).

The view of child marriage as a possible solution to desperate economic circumstances is similarly described by an NGO worker in Malawi:

there is a link between climate change and early marriage, which is a coping strategy ... Girls get married earlier as a way of taking off excess members of the family. If there are three girls in the family, they believe that if these girls get married earlier, that means the mouths, the number of people to be fed in that house will decrease. (Chamberlain et al. 2017)

Reflecting a similar conception of the link between environmental crises and child marriage, Ntonya (aged 15, married age 13) described how

the floods took all our harvest ... I tried to negotiate to tell my parents that I wasn't ready, that I didn't want to get married but they told me that I had to because that would mean one mouth less at the table. I had to get married because they didn't have enough to feed the whole family. (Chamberlain et al. 2017)

One respondent, Agnes, directly draws the link between climate change and her own marriage aged 14:

I got married early because my parents are farmers. They grow tobacco and during the last growing season they harvested very little. If my father had harvested enough, he would have let me continue to go to school. But because he harvested little, he said he would marry me off. I have accepted that climate change has affected my life and brought me [to] where I am now ... my parents tried their best but it failed because of climate change. (Chamberlain et al. 2017).

In Masvingo province in Zimbabwe, a CARE International report found that compounding environmental shocks year after year meant parents turned to child marriage as a coping strategy in response to drought-related failed harvest, hunger, and financial stress (Otzelberger, 2014). Similarly, in an interview with a journalist in Kenya, the parents of a 15-year-old girl described how economic difficulties due to annual droughts drove them to accept a marriage proposal for their daughter (Wadekar, 2020). In a focus group discussion in Kenya, one male participant described how there had been a decrease in child marriage when water was plentiful (Camey et al., 2020). As families had enough water and food, they didn't feel the need to marry their daughters to alleviate economic strains.

A study in a flood-prone region of Zimbabwe using surveys of 480 school children, school focus group discussions and interviews with 20 key informants (e.g. headteachers, councillors) concluded that child marriage is used as a coping strategy in response to flooding (Mudavanhu, 2014).

Finally, interviews with families in Mozambique and Malawi again found household economics to be a key means through which environmental challenges result in child marriage (Chamberlain, 2017). One father directly links his daughter's marriage with reductions in the amount of fish he has been able to catch due to a changing environment. His daughter describes how 'if [her] father had

kept doing well with the fishing, he wouldn't have accepted the proposal because then he could afford [her] education, school fees and books' (Chamberlain, 2017).

Poverty is a well-known driver of child marriage (UNFPA, 2020). Environmental crises cause economic shocks, particularly for rural populations who are most dependent on the environment for their livelihoods. Child marriage is perceived as a potential means to secure the family's economic future in the face of such crises.

Dowry, bride price, environmental crises and child marriage

Dowry is paid by a bride's family to the groom, while the bride price is paid by the groom or his family to the bride's family. Dowry practices are most common in South Asia, while bride price practices predominate in Western, Central and Eastern Africa (UNFPA, 2021a). Younger girls often require smaller dowries or command higher bride prices (HRW, 2015; UNFPA, 2020). Such practices are therefore believed to act as an economic incentive to child marriage as parents with less resources may justify marrying girls early to secure the family's economic future (UNFPA, 2020). The pattern of either dowry or bride price practices is identified as a key socio-cultural lens through which the impoverishing effects of environmental crises can influence rates of child marriage.

Quantitative findings

In one study of 1250 individuals in Tanzania, 81% of the cohort confirmed a bride price was paid (Corno & Voena, 2016). Combining DHS data with meteorological data, they found that local rainfall shocks (significant deviation above or below the long-term average) during teenage years were associated with increased likelihood of child marriage for girls, but found no effect for boys. The association between rainfall shocks and child marriage was strongest in villages where historically bride price payments were higher.

Trinh and Zhang (2020) investigated the effects of rainfall shocks on child marriage in India (where dowry is common) and Vietnam (where bride price is common). In both countries, greater deviation in rainfall from baseline was associated with a decrease in household expenditure. In India, decreased expenditure was then associated with a decreased likelihood of child marriage, while in Vietnam decreased household expenditure was associated with an increased likelihood of marriage before the age of 18. They posit that marrying a daughter is used in Vietnam as a coping strategy of consumption smoothing for short-term economic shocks due to changes in rainfall patterns, whereas in India dowry practices mean marriage cannot be used in this way, with dowry costs prohibitive for families affected by economic shocks.

Similarly, Corno and colleagues (2020) used DHS data from 400,000 women born between 1950 and 1989 in India and 31 Sub-Saharan African countries. Combining this with local rainfall data, they showed opposing effects of climate-related shocks on child marriage depending on whether dowry or bride price is predominant. In Sub-Saharan Africa where bride price is common, drought is associated with a 3% increase in the annual hazard of child marriage and a 4% increase in the annual hazard of having a child before the age of 18. In contrast, in India where dowry practices are prevalent, drought is associated with a 4% decrease in the annual hazard of child marriage and has no effect on early fertility.

Within the group of 31 Sub-Saharan African (SSA) countries, Corno and colleagues find some degree of heterogeneity, again divided by whether dowry or bride price is predominant. For example, unlike many of the other SSA countries, dowry is prevalent in Eritrea and their findings suggest that here drought has a negative effect on child marriage similar to that seen in India.

As well as geographical variation, there is temporal variation in dowry and bride price practices, with consequent effects on child marriage rates. For example, Tsaneva (2020) find heterogeneity within their cohort of Bangladeshi women. Women born in the 1950s and 1960s were the subgroup with the strongest correlation between dry spells and child marriage, and smaller or zero

correlation in more recent generations. Dowry practices have become more prevalent in Bangladesh in the last 60 years, and Tsaneva posits this as a possible explanation of the changing effects of dry spells on child marriage rates; the dowry cost acts as a barrier that protects against child marriage after climate-related economic shocks.

Qualitative findings

The effects of dowry and bride price are also cited in qualitative work investigating how environmental crises affect child marriage. In Uganda where increased rates of child marriage were linked to long droughts, girls' families were found to benefit financially both through receiving a bride price and by reducing the number of people to support in the household (Camey et al., 2020). Similarly, a Maasai human rights advocate reports that

the impact of climate change is worsening the situation of child marriage among the Maasai. The prolonged droughts are causing many families into desperate situations of hunger and young girls (as young as 12) are being given away as brides in exchange for cattle. (MRGI, 2019, p. 84)

In Mozambique where bride price practices are prevalent, one report found child marriage was used as a strategy to raise income and reduce the number of dependents after the El Niño-induced drought (Fischer, 2016).

Interestingly in Bangladesh where dowry is more common, one household head reported that 'marriage during a flood or after a cyclone requires less money [from the bride's family]' (Ahmed et al., 2019, p. 13). Reductions in dowry costs after disasters would minimise the economic burden associated with marriage, removing a potential barrier to child marriage.

Dowry and bride price practices are a lens through which the economic effects of environmental crises influence child marriage rates. Bride price acts as an incentive for child marriage in the aftermath of environmental crises. Inversely dowry may represent a disincentive, though this may be minimised by reductions in dowry costs in times of crisis.

Displacement, migration, environmental crises and child marriage

Child marriage has been shown to increase during humanitarian crises, with higher rates of child marriage amongst displaced populations (Islam et al., 2021; Lemmon, 2014; UNFPA, 2020). A frequent and significant effect of environmental crises is displacement of people from their local area, with some evidence of links between displacement and child marriage.

Quantitative findings

Ainul and Amin (2015) examined the effects of natural disasters on child marriage using a cohort of 9000 girls aged 12–19 in Bangladesh. They found no significant association of cyclones, river erosion, water logging or saline intrusion with child marriage rates. However, they did find that girls living in abasan communities (low-cost housing provided by the government for rural populations who have been displaced, largely due to environmental changes) were twice as likely to enter into child marriage than those living in non-abasan communities. Displacement due to environmental changes appears to drive increases in child marriage. Furthermore, given the local nature of their disaster data, it is possible that this displacement could explain the non-significant association of disasters and child marriage; those adversely affected by these environmental changes migrate to abasan communities away from the area originally affected by the disaster, meaning the child marriage rate in the area they have left is apparently unaffected by disasters as the children who have been married as a result of the disaster have moved to a different area.

Qualitative findings

Ahmed et al. (2019) identify some evidence that child marriage may be associated with pre-emptive or anticipatory migration away from areas at high risk of disasters. One Bangladeshi

mother described how ‘I feel happy when I give my daughters in marriage to a rich family in an area with no floods as I know they will be in a safe place and can lead a happy life after the marriage’ (Ahmed et al., 2019, p. 12). Similarly, a report in Bangladesh finds families arranging marriages proactively in anticipation of impending disaster, particularly river erosion, a gradual and predictable catastrophe. The parents of one 13-year-old explain to her that ‘if the river takes our house, it will be hard for you to get married so it’s better if you get married now’ (HRW, 2015, p. 43).

An NGO worker in Bangladesh describes another aspect of how environmental crises affect child marriage through displacement, highlighting how a family’s perceived social status can be significantly affected by crises such as floods:

families think that if their house goes [due to river erosion], they’ll have to go to another place and it will take time to get established and find a husband and meanwhile the girl is getting older and dowry is going up. Also when they have a house before it is taken [by the river], the in-laws think the family owns a house which gives them more importance. After [the house is swept away] they might rent and that makes them less important and means less status for the girl. (HRW, 2015, p. 42)

Displacement brought on by environmental crises may result in increases in child marriage, with marriage used as a tool to relocate girls to safer areas and marriages arranged in anticipation of environmental crises.

Sexual violence, environmental crises and child marriage

Actual or threatened sexual violence in the aftermath of disasters is another frequently described driving factor for child marriage. Families perceive marriage as a means to protect both their daughter and their ‘family honour’ from the effects of sexual violence (Spencer, 2015).

Qualitative findings

In a 2011 report, an NGO worker in Bangladesh described how ‘post-disasters are always chaotic and fertile times for abuse’ (Swarup et al., 2011, p. 17). Shelters are often not felt to be sufficiently safe, lack privacy, and have long distances to toilets and showers, while structured systems for reporting abuse are often lacking (Swarup et al., 2011).

In Ahmed et al.’s (2019) interviews in Bangladesh, sexual violence was described not only in terms of its effects on victims but also in how it affects family honour and the chances of other siblings marrying. One mother described how

during the floods when we were in the primary school as a shelter house, my youngest girl was grabbed by a younger man who also regularly followed her when she went to take a bath or to the toilet. And so the longer the flood periods last the more my worries about the possible sexual violence on my girl increase. Last year after the flood I arranged the marriage of my 15-year-old girl as I had no way of protecting her reputation and that of the family. (Ahmed et al., 2019, p. 14)

Another mother described the devastating psychological effects on one of her daughters who was subject to sexual violence while they were staying in a shelter, going on to comment that ‘the occurrence of floods creates a fear of sexual violence that forces parents to pursue the early marriage of their girls’ (Ahmed et al., 2019, p. 15).

In Bangladesh, an NGO worker commented that ‘parents who are better off who get their daughters married [young] usually do so because of sexual harassment. Poorer parents do it for financial reasons’ (HRW, 2015, p. 56).

Based on interviews, surveys and focus group discussions in Bangladesh, Alston and colleagues (2014) write that ‘because of eve-teasing and the threat of violence and dishonour, there is increasing pressure on families to marry their daughters to protect them and to maintain the standing of the family in the community’ (Alston et al., 2014, p. 4).

In the aftermath of environmental crises, sexual violence and the fear of sexual violence may result in increases in child marriage, particularly for those displaced to temporary shelters, as families seek to protect their daughters and their 'family honour'.

Education, environmental crises and child marriage

Education is widely understood to be protective against child marriage. Education and access to resources are strongly linked, with many families facing financial barriers to education even in countries with universal free education (e.g. transportation, books, uniforms). Environmental crises disrupt education both directly (e.g. destruction of school infrastructure) and indirectly (e.g. worsening poverty, displacement of families and lack of educational provision in temporary shelters), with consequent effects on child marriage.

Quantitative findings

In Trinh and Zhang's (2020) study of 886 girls in India and Vietnam, both parental education and child school enrolment were protective for child marriage, even while controlling of the household's economic situation. Similarly, Dewi and Dartanto (2019) found that secondary education was protective against child marriage after natural disasters in Indonesia. Strikingly, Dewi and Dartanto (2019) also find that urban location and the presence of disaster early warning systems are protective against child marriage, though the mechanism behind these associations remains unexplored.

Conversely, disruption to education is often described as a driving factor for child marriage. Highlighting the link between climate change and education, Alston et al. (2014) found that 19% of their survey respondents in Bangladesh report taking their children out of school as a strategy for adapting to the effects of climate change. In a government report after the 2015 floods in Malawi, the effect of floods on destabilising the educational system is cited as having increased the risk of early marriage, child labour and human trafficking (Government of Malawi, 2015).

Qualitative findings

The links between access to resources, education and child marriage (e.g. inability to pay for schooling as a result of economic effects of environmental crises) are described in many of the quotations in the above sections. In a further example from Ahmed et al.'s (2019) interviews, one Bangladeshi mother commented that

when there is flooding, water surrounds us. People sit around without doing any work. The poor get poorer during this period. Children are also idle at home as many of them, especially girls, stop going to school ... As the girls are inactive they receive many marriage proposals. Though we tried to ignore the proposals, as the crisis stretched on we choose to marry our girls at an early age. (Ahmed et al., 2019, p. 12)

The prioritisation of male education is another aspect described in a report on child marriage in Bangladesh. In one example, Sifola (age 13) is taken out of school and a marriage arranged for her because her parents are struggling with poverty and wanted to pay for her brother's schooling (HRW, 2015).

Environmental crises frequently disrupt education, both directly and indirectly. In doing so, they remove a factor that is protective against child marriage. Such disruption may have intergenerational effects with level of parental education also seen to be protective against child marriage.

Bereavement & loss of support network

Bereavement due to environmental disasters can leave children without parents or guardians and lacking a support network. Rute, a Malawian 16-year-old who was married at 14, describes how such a loss led to her marriage:

the 2015 floods changed everything. The floods took away both my parents ... Staying in the camp [after the floods] was difficult because I was alone ... I met my husband after 4 days ... I was all by myself and that's what prompted me to accept when he came to ask my hand in marriage. (Chamberlain et al. 2017)

Child marriage laws

Enforcement of laws that prohibit child marriage is addressed in two of the articles included in this review. McLeod et al. (2019) used case studies of Bangladesh and Mozambique to examine how the relationship between climate change and child marriage is reflected in those two countries' laws and policies. They find that in general, the two countries' laws do not acknowledge any link between climate change and child marriage. However, McLeod et al. (2019) highlight Uganda's National Adaptation Programme of Action (NAPA) as it notes that 'famine marriage' is used as a coping strategy where 'in times of food crisis, some parents distressfully marry off their daughters to secure dowry [bride price] for survival ... This fuels early marriages, drop out of schools, and exposure to STIs and related reproductive complications' (Government of Uganda, 2007, p. 45). While such an example of national climate policy including reference to how environmental crises can affect child marriage is a positive example of how laws and policies should reflect our growing understanding of this area, action requires more than writing down policies and passing laws. It requires the enactment of policy and enforcement of those laws.

Gaps in enforcement of laws prohibiting child marriage are identified in a Human Rights Watch report on child marriage in Bangladesh, with interviewees suggesting legal barriers such as the presentation of birth certificates at wedding ceremonies can be circumvented and sanctions avoided, including with the knowledge of marriage leaders (HRW, 2015). In the context of environmental crises potentially increasing the likelihood of child marriage, work to close these gaps in enforcement of existing child marriage law represents an urgent area of action.

FGM

Despite well-established links between child marriage and FGM in countries where FGM is practiced (Karumbi et al., 2017; UNFPA, 2020), there is a relative dearth of work on how environmental crises impact FGM practices.

One Maasai human rights advocate describes how

girls who have undergone FGM attract a higher bride price than those who are uncut. It is also important to note that the girl who undergoes FGM is in essence being prepared for marriage, so the impact of climate change increases the risks of both child marriage and FGM. (MRGI, 2019, p. 84)

In Kenya, one journalistic project highlights links between recurrent droughts and a plague of locusts, and child marriage and FGM, with economically devastated families 'pulling their daughters from school, sending them across international borders for coming-of-age "cutting" ceremonies, and marrying them off in exchange for [bride price] money' (Wadekar & Swanson, 2020).

However, a 2011 news article reports that in the immediate aftermath of drought in Kenya, FGM practices were interrupted, with families displaced by the droughts and their focus wholly on obtaining food and medical supplies (Khalif, 2011). In these temporary relief camps 'families do not have the resources to plan circumcisions'. One mother who 'really wanted [her 2 daughters] to undergo [FGM] so they can be prepared for marriage' reports that 'we cannot perform the rite here [in temporary relief shelters] due to lack of food and proper accommodation that will enable the girls to recuperate'.

The sole peer-reviewed article that addresses how environmental crises affect FGM used interviews and focus group discussions with the Maasai of Kajiado county in Kenya, an area with high rates of both child marriage (47% of girls are married before the age of 18) and FGM (Esho et al., 2021; UNICEF, 2017). It highlights how unpredictable rains and periodic droughts led to crop

failures and lack of pasture and water for cattle, pushing these pastoralist communities to travel further in search of water and greener pastures, including having to send girls to herd cattle rather than attending formal education. Such increased labour demands due to droughts are identified as contributing to child marriage with one administrative chief describing how ‘families with elderly parents pay dowry for girls to be married in order to help with house work which includes walking longer distances in search of water and to take care of the older parents’ (p. 5). Similarly, one mother described how her son ‘had to marry’ a child bride so that the bride could help around the house and look after the mother-in-law while her son travelled great distances searching for greener pastures for their cattle. Eliciting the link to FGM, she described how ‘in this community uncut girls cannot be accepted’ (Esho et al., 2021, p. 5).

Loss of livelihoods due to drought is described as a driving factor for both child marriage and FGM, with one administrative chief reporting

the FGM prevalence has gone down but we are experiencing a new threat ... that the extended period of drought, where families lose cattle and this jeopardizes livelihoods at household level. In order to re-stock, families have resorted to secretly cutting and marrying off girls including across the border [in Tanzania]. It has become a survival mechanism ... The only way to avert this new trend is to ensure that we have a comprehensive way of mitigating the effects of climate change. (Esho et al., 2021, p. 6)

Educational disruption by environmental crises is also cited as a driver of both child marriage and FGM. One education officer described how ‘girls are at a high risk of dropping out of school as a result of taking part in searching for water, herding cattle to support their families’ (Esho et al., 2021, p. 6). A community elder draws the link from such disruption to the consequences of child marriage and FGM:

with little education girls are less likely to access formal employment and other related opportunities and this increases chances of being married off, and if one finds herself in a family that still believes in FGM chances of being cut are always high. (Esho et al., 2021, p. 6)

FGM practices are often closely linked to child marriage. The little evidence that exists on the relationship between environmental crises and FGM suggests there may be a link, one that is likely mediated by similar driving factors as the relationship between environmental crises and child marriage.

Discussion

Changes to the environment have profound implications for our health and wellbeing. The consequences of environmental crises for our sexual and reproductive health and rights are coming under increasing scrutiny (Camey et al., 2020; Starrs et al., 2018; Women Deliver, 2021). In this scoping review, we evaluated the literature for evidence of a relationship between child marriage and environmental crises, using both academic sources and ‘grey’ literature.

Despite several limitations that we outline below, the evidence presented in this review suggests a link between environmental crises and child marriage, a link mediated through environmental crises increasing pressure on existing drivers of child marriage. Environmental breakdown has inter-related effects on access to resources, education, sexual violence, and displacement and migration. In altering these various connected drivers, environmental crises appear to influence decisions about child marriage. In [Figure 1](#), we present a conceptual framework for understanding the relationship between environmental crises and child marriage based on the current literature.

Loss of resources is a central driver of child marriage after environmental crises through two main mechanisms. Firstly, families see child marriage as an economic coping strategy, reducing their financial burden and potentially receiving a bride price in return. In particular, for people and communities whose livelihoods are directly dependent on natural resources, such as farmers and fishers, economic and environmental shocks directly correspond. Secondly, loss of resources frequently disrupts education, removing a factor usually protective for child marriage (Ahmed

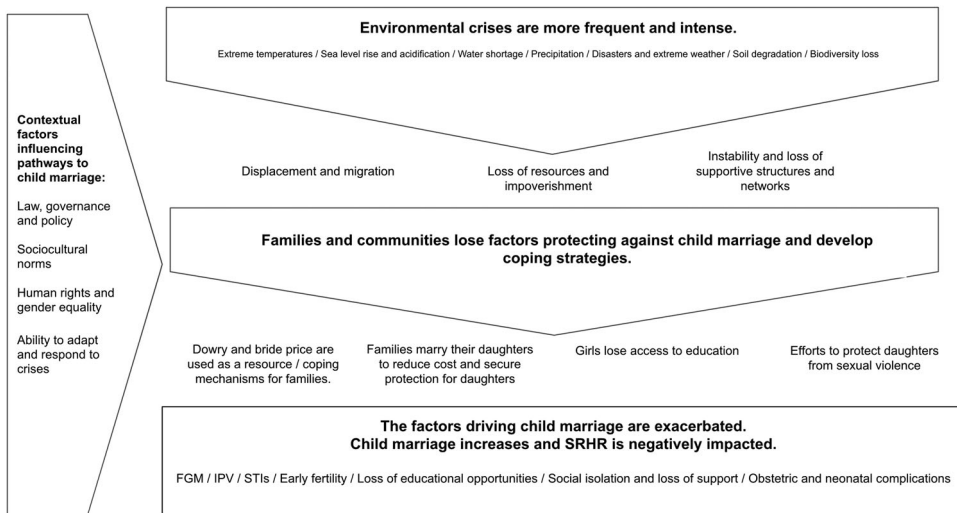


Figure 1. Conceptual framework for the relationship between environmental crises and child marriage. SRHR sexual and reproductive health and rights, FGM – female genital mutilation, IPV – interpersonal violence, STI – sexually transmitted infection.

et al., 2019; Dewi & Dartanto, 2019; Trinh & Zhang, 2020). Families cite the costs of education as a reason for removing their child from school (Ahmed et al., 2019; HRW, 2015). Notably, boys' education is commonly prioritised over girls' education in such situations (HRW, 2015; UNFPA, 2020), highlighting an aspect of the overarching gender inequality that is fundamental to many child marriages. Education is also disrupted more directly by environmental crises that destroy school infrastructure, as well as by the displacement of families affected by crises. Educational disruption often long outlasts the immediate aftermath of environmental disasters, with schools used as emergency shelters for displaced families for months or even years.

Local bride price or dowry practices seem to act as a lens through which the financial effects of environmental crises can affect child marriage rates. Bride price payments appear to incentivise child marriage after environmental crises (Corno et al., 2020; Corno & Voena, 2016; MRGI, 2019; Trinh & Zhang, 2020). For dowry, one study in Bangladesh suggests dowry costs are lower after environmental crises potentially incentivising child marriage (Ahmed et al., 2019). However, it is unclear to what extent this is the case, particularly in other contexts. For example, two studies in India (where dowry practices are common) show that reduced likelihood following environmental crises (Corno et al., 2020; Trinh & Zhang, 2020). Eliciting the intricacies of the relationship between environmental crises, dowry and bride price practice, and child marriage should be a focus of future research.

Increases in conflict and violence, including sexual violence, after environmental crises are common and occur through multiple mechanisms including competition over dwindling resources and forced migration (Camey et al., 2020; Levy et al., 2017). Within this context, sexual violence or the threat of sexual violence is commonly cited as a driver of child marriage. Families see child marriage as a means to not only protect their daughter from abuse, but also maintain their 'family honour' (Ahmed et al., 2019; Alston et al., 2014). A link to displacement is again present, with families highlighting the lack of privacy and long distances to toilets in temporary shelters (Swarup et al., 2011).

Parental bereavement from environmental crises is described as contributing to child marriage in one study (Chamberlain et al. 2017). Such loss of the child's support network could also occur as a consequence of forced displacement after crises, with children socially disconnected from their families.

Importantly, local contextual factors such as socio-cultural norms, existence and enforcement of laws and policies, and capacity for adaptation to environmental crises are a lens through which the driving factors outlined above influence child marriage practices. Local bride price or dowry practices clearly exhibit how regional socio-cultural differences can shape how environmental crises affect child marriage. However, the current literature does not examine how cultural or regional differences shape other driving factors for how environmental crises affect child marriage. This represents a key area for future research.

Environmental crises exacerbate existing global inequalities in access to resources and opportunities for education (Haines & Ebi, 2019; Islam & Winkel, 2017) and can result in bereavement, increases in sexual violence, and displacement of people from their homes (Abubakar et al., 2018). The evidence presented in this review suggests that in affecting these interconnected drivers, environmental crises may increase rates of child marriage. However, there are several important limitations of the current evidence base.

Limitations and future directions

Firstly, due to the nature of the topic, the quantitative work reviewed here can only be correlational. Inferences on causality are therefore challenging, particularly given the complexity of factors that influence decisions to marry.

Secondly, many of the quantitative studies described in this review use a single meteorological variable (e.g. rainfall) as a proxy for the full complexity of the local climate and environment. Examining the many different and interconnected aspects of the climate and their effect on social outcomes at a population level is challenging. While using single variables as a proxy is imperfect, it provides a starting point in evaluating how extremes of one particular weather pattern are associated with child marriage rates.

Thirdly, several studies used cohorts who were married decades ago rendering them susceptible to recall bias. However, studies using more recent or current cohorts had broadly similar findings to those using older cohorts, making recall bias unlikely to be a major limitation of the current evidence base.

A significant proportion (13/24) of the evidence reviewed here is derived from 'grey' literature that has not undergone a formalised peer review process. While it provides valuable insights into the relationship between environmental crises and child marriage, this undoubtedly represents a limitation and future work should aim to be subject to the highest academic standards.

While we present some studies from Sub-Saharan Africa, much of the evidence described in this review is taken from South Asia, and specifically Bangladesh. This focus is understandable in that Bangladesh has high rates of child marriage and is one of the most vulnerable countries to the effects of climate change. However, the degree to which this evidence can be generalised to other contexts is limited given how dependent child marriage is on local norms and traditions. Future work in other locations and cultural settings would be beneficial in allowing a broader understanding of the relationship between environmental crises and child marriage. Investigating the effects of a wider variety of ecological and environmental changes should also feature in future work, with much of the evidence described here focussing on the effects of drought, heatwaves and flooding.

Despite well-established links between child marriage and FGM (Karumbi et al., 2017), there is a paucity of research on how environmental crises affect FGM. The links between FGM and child marriage are complex, including that they share common driving factors and that FGM can be a prerequisite for marriage. Increasing rates of child marriage after environmental crises may therefore be linked with increases in FGM, though further work is needed to better understand these linkages.

Looking forwards, one particular finding of interest is that disaster early warning systems were protective against child marriage after natural disasters in a study in Indonesia (Dewi & Dartanto,

2019). While this association is not further explored in their work, it undoubtedly represents an interesting link that merits further attention.

Conclusion

The existing literature suggests a link between environmental crises and child marriage. What becomes evident is that the existing drivers of child marriage are made worse by climate shocks and impacts, furthering the understanding of climate change as increasing vulnerability and exacerbating inequalities. While there are several limitations of the evidence presented here, environmental crises seem to push families to marry their daughters early through loss of assets and opportunities for income generation, displacement of people from their homes, educational disruption, and the creation of settings in which sexual violence and the fear of sexual violence increase.

Many of the areas with the currently highest rates of child marriage are also those facing the gravest environmental threats from climate change and ecological breakdown. Efforts to adapt to climate change must address the link between environmental crises and sexual and reproductive health and rights, including the link to child marriage presented in this review. Similarly, action to tackle child marriage should consider how local and global environmental crises may affect the drivers of child marriage and associated harmful practices such as FGM.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was funded by the United Nations Population Fund (UNFPA).

References

- Abubakar, I., Aldridge, R. W., Devakumar, D., Orcutt, M., Burns, R., Barreto, M. L., Dhavan, P., Fouad, F. M., Groce, N., Guo, Y., Hargreaves, S., Knipper, M., Miranda, J. J., Madise, N., Kumar, B., Mosca, D., McGovern, T., Rubenstein, L., Sammonds, P., ... Zhou, S. (2018). The UCL-Lancet Commission on migration and health: The health of a world on the move. *The Lancet*, 392(10164), 2606–2654. [https://doi.org/10.1016/S0140-6736\(18\)32114-7](https://doi.org/10.1016/S0140-6736(18)32114-7)
- 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*, 40(3), 303–324. <https://doi.org/10.1007/s11111-019-0312-3>
- Ainul, S., & Amin, S. (2015). *Environmental vulnerability and early marriage in Southern Bangladesh*. Population Council.
- Alston, M., Whittenbury, K., Haynes, A., & Godden, N. (2014). Are climate challenges reinforcing child and forced marriage and dowry as adaptation strategies in the context of Bangladesh? *Women's Studies International Forum*, 47, 137–144. <https://doi.org/10.1016/j.wsif.2014.08.005>
- Amin, S., Asadullah, M. N., Hossain, S., & Wahhaj, Z. (2017). Eradicating child marriage in the commonwealth: Is investment in girls' education sufficient? *The Round Table*, 106(2), 221–223. <https://doi.org/10.1080/00358533.2017.1299461>
- Asadullah, M. N., Islam, K. M. M., & Wahhaj, Z. (2020). Child marriage, climate vulnerability and natural disasters in coastal Bangladesh. *Journal of Biosocial Science*, 1–20. <https://doi.org/10.1017/S0021932020000644>
- Asadullah, M. N., & Wahhaj, Z. (2019). Early marriage, social networks and the transmission of norms. *Economica*, 86(344), 801–831. <https://doi.org/10.1111/ecca.12291>
- Avogo, W. A., & Somefun, O. D. (2019, June 13). Early marriage, cohabitation, and childbearing in West Africa [Research Article]. *Journal of Environmental and Public Health; Hindawi*. <https://doi.org/10.1155/2019/9731756>
- Camey, I. C., Sabater, L., Owren, C., Boyer, A. E., & Wen, J. (2020). *Gender-based violence and environment linkages – the violence of inequality*. International Union for Conservation of Nature.
- Chamberlain, G. (2017). Why climate change is creating a new generation of child brides. *The Guardian*. <http://www.theguardian.com/society/2017/nov/26/climate-change-creating-generation-of-child-brides-in-africa>.

- Chamberlain, G., Udrescu, M., & Beller, M. (2017). *Brides of the sun – an investigation into how climate change is creating a generation of child brides*. Retrieved March 8, 2021, from <https://bridesofthesun.com/>.
- Corno, L., Hildebrandt, N., & Voena, A. (2020). Age of marriage, weather shocks, and the direction of marriage payments. *Econometrica*, 88(3), 879–915. <https://doi.org/10.3982/ECTA15505>
- Corno, L., & Voena, A. (2016). *Selling daughters: Age of marriage, income shocks and the bride price tradition*. Institute for Fiscal Studies.
- Dewi, L. P. R. K., & Dartanto, T. (2019). Natural disasters and girls vulnerability: Is child marriage a coping strategy of economic shocks in Indonesia? *Vulnerable Children and Youth Studies*, 14(1), 24–35. <https://doi.org/10.1080/17450128.2018.1546025>
- Esho, T., Komba, E., Richard, F., & Shell-Duncan, B. (2021). Intersections between climate change and female genital mutilation among the Maasai of Kajiado county, Kenya. *Journal of Global Health*, 11(1), 04033. <https://doi.org/10.7189/jogh.11.04033>.
- Fagbamigbe, A. F., Morhason-Bello, I. O., Kareem, Y. O., & Idemudia, E. S. (2021). Hierarchical modelling of factors associated with the practice and perpetuation of female genital mutilation in the next generation of women in Africa. *PLOS ONE*, 16(4), e0250411. <https://doi.org/10.1371/journal.pone.0250411>
- Felten-Biermann, C. (2006). Gender and natural disaster: Sexualized violence and the tsunami. *Development*, 49(3), 82–86. <https://doi.org/10.1057/palgrave.development.1100276>
- Fischer, A. (2016). *Hope dries up? Women and girls coping with drought and climate change in Mozambique*. CARE International.
- Ganchimeg, T., Ota, E., Morisaki, N., Laopaiboon, M., Lumbiganon, P., Zhang, J., Yamdamsuren, B., Temmerman, M., Say, L., Tunçalp, Ö, Vogel, J. P., Souza, J. P., Mori, R., & WHO Multicountry Survey on Maternal Newborn Health Research Network. (2014). Pregnancy and childbirth outcomes among adolescent mothers: A World Health Organization multicountry study. *BJOG: An International Journal of Obstetrics and Gynaecology*, 121 (Suppl 1), 40–48. <https://doi.org/10.1111/1471-0528.12630>
- Girls Not Brides. (2021). *Adolescent pregnancy and child marriage*. Girls Not Brides. <https://www.girlsnotbrides.org/learning-resources/child-marriage-and-health/adolescent-pregnancy-and-child-marriage/#:~:text=Child%20marriage%20is%20both%20a,unintended%20pregnancy%20drives%20child%20marriage.>
- Glinski, A., Sexton, M., & Meyers, L. (2015). Child, early and forced marriage resource guide. USAID. https://www.usaid.gov/sites/default/files/documents/1865/USAID_CEFM_Resource-Guide.PDF.
- Glynn, J. R., Caraël, M., Auvert, B., Kahindo, M., Chege, J., Musonda, R., Kaona, F., Buvé, A., & Study Group on the Heterogeneity of HIV Epidemics in African Cities. (2001). Why do young women have a much higher prevalence of HIV than young men? A study in Kisumu, Kenya and Ndola, Zambia. *Aids (London, England)*, 15(Suppl.4), S51–S60. <https://doi.org/10.1097/00002030-200108004-00006>
- Government of Malawi. (2015). *Malawi 2015 flood post disaster needs assessment report*.
- Government of Uganda. (2007). *Uganda national adaptation programmes of action (NAPA)*. <https://unfccc.int/resource/docs/napa/uga01.pdf>.
- Haines, A., & Ebi, K. (2019). The imperative for climate action to protect health. *New England Journal of Medicine*, 380(3), 263–273. <https://doi.org/10.1056/NEJMr1807873>
- Hsiang, S. M., Burke, M., & Miguel, E. (2013). Quantifying the influence of climate on human conflict. *Science*, 341 (6151), 6151. <https://doi.org/10.1126/science.1235367>
- Human Rights Watch. (2015). *Marry before your house is swept away – child marriage in Bangladesh*. Human Rights Watch.
- IPCC. (2014). *Climate change 2014: Synthesis report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*.
- IPCC. (2021). In V. Masson-Delmotte, P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, & B. Zhou (Eds.), *Climate change 2021: The physical science basis. Contribution of Working Group I to the sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press.
- Irani, M., & Roudsari, R. L. (2019). Reproductive and sexual health consequences of child marriage: A review of literature. *Journal of Midwifery and Reproductive Health*, 7(1), 1491–1497. <https://doi.org/10.22038/jmrh.2018.31627.1342>
- Islam, M. M., Khan, M. N., & Rahman, M. M. (2021). Factors affecting child marriage and contraceptive use among Rohingya girls in refugee camps. *The Lancet Regional Health – Western Pacific*, 12. <https://doi.org/10.1016/j.lanwpc.2021.100175>
- Islam, S. N., & Winkler, J. (2017). *Climate change and social inequality*. Working Papers 152. United Nations Department of Economic and Social Affairs. Available at: <https://www.un.org/development/desa/publications/working-paper/wp152>.
- Jensen, R., & Thornton, R. (2003). Early female marriage in the developing world. *Gender and Development*, 11(2), 9–19. <https://doi.org/10.1080/741954311>

- Karumbi, J., Gathara, D., & Muteshi, J. (2017). *Exploring the association between FGM/C and early/child marriage: A review of the evidence (evidence to End FGM/C Programme consortium report)*. Population Council. http://www.popcouncil.org/uploads/pdfs/2017RH_FGMC-ChildMarriage.pdf.
- Khalif, A. (2011). Traditional practices suffer in Kenya's drought. *Thomson Reuters Foundation News*. <https://news.trust.org/item/20111209104500-fxloz/>.
- Lemmon, G. T. (2014). *Fragile states, fragile lives: Child marriage amid disaster and conflict*. Council on Foreign Relations. <https://www.cfr.org/sites/default/files/pdf/2014/07/Child%20Brides%20Global%20Consequences.pdf>.
- Levy, B. S., Sidel, V. W., & Patz, J. A. (2017). Climate change and collective violence. *Annual Review of Public Health*, 38(1), 241–257. <https://doi.org/10.1146/annurev-publhealth-031816-044232>
- Lloyd, C. B., & Mensch, B. S. (2008). Marriage and childbirth as factors in dropping out from school: An analysis of DHS data from sub-Saharan Africa. *Population Studies*, 62(1), 1–13. <https://doi.org/10.1080/00324720701810840>
- Malhotra, A., & Elnakib, S. (2021). 20 years of the evidence base on what works to prevent child marriage: A systematic review. *Journal of Adolescent Health*, 68(5), 847–862. <https://doi.org/10.1016/j.jadohealth.2020.11.017>
- 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 & Mozambique. *Columbia Journal of Gender and Law*, 38(1), 96–145. <https://doi.org/10.7916/cjgl.v38i1.4604>
- Minority Rights Group International. (2019). *Minority and indigenous trends 2019 – focus on climate justice*. <https://minorityrights.org/trends2019/kenya/>.
- Mudavanhu, C. (2014). The impact of flood disasters on child education in Muzarabani district, Zimbabwe. *Journal of Disaster Risk Studies*, 6(1). <https://doi.org/10.4102/jamba.v6i1.138>
- Myers, J. (2013). *Untying the knot – exploring early marriage in fragile states*. World Vision.
- Nour, N. M. (2006). Health consequences of child marriage in Africa. *Emerging Infectious Diseases*, 12(11), 1644–1649. <https://doi.org/10.3201/eid1211.060510>
- Olamijuwon, E., Chisumpa, V., & Akinyemi, J. (2017). Unveiling the realities of marrying too young: Implications of child marriage on sexual and reproductive health of girls and infant survival in Sub-Saharan Africa. *African Population Studies*, 31(1), 3602–3618. <https://doi.org/10.11564/31-1-1026>
- Otzelberger, A. (2014). *Tackling the double injustice of climate change and gender inequality*. CARE International.
- Pasten, R., Figueroa, E., Munoz, D., & Colther, C. (2020). *Not a dream wedding: The hidden nexus between climate change and child marriage*. University of Chile.
- Plesons, M., Travers, E., Malhotra, A., Finnie, A., Maksud, N., Chalasani, S., & Chandra-Mouli, V. (2021). Updated research gaps on ending child marriage and supporting married girls for 2020–2030. *Reproductive Health*, 18(1), 152. <https://doi.org/10.1186/s12978-021-01176-x>
- Psaki, S. R., Melnikas, A. J., Haque, E., Saul, G., Misunas, C., Patel, S. K., Ngo, T., & Amin, S. (2021). What are the drivers of child marriage? A conceptual framework to guide policies and programs. *Journal of Adolescent Health*, 69(6, Supplement), S13–S22. <https://doi.org/10.1016/j.jadohealth.2021.09.001>
- Raj, A., Jackson, E., & Dunham, S. (2018). Girl child marriage: A persistent Global Women's Health and human rights violation. *Global Perspectives on Women's Sexual and Reproductive Health Across the Lifecourse*, 3–19. https://doi.org/10.1007/978-3-319-60417-6_1
- Spencer, D. (2015). *To protect her honour. Child marriage in emergencies – the fatal confusion between protecting girls and sexual violence*. CARE International UK.
- Starrs, A. M., Ezeh, A. C., Barker, G., Basu, A., Bertrand, J. T., Blum, R., Coll-Seck, A. M., Grover, A., Laski, L., Roa, M., Sathar, Z. A., Say, L., Serour, G. I., Singh, S., Stenberg, K., Temmerman, M., Biddlecom, A., Popinchalk, A., Summers, C., & Ashford, L. S. (2018). Accelerate progress—sexual and reproductive health and rights for all: Report of the Guttmacher–Lancet commission. *The Lancet*, 391(10140), 2642–2692. [https://doi.org/10.1016/S0140-6736\(18\)30293-9](https://doi.org/10.1016/S0140-6736(18)30293-9)
- Swarup, A., Dankelman, I., Ahluwalia, K., & Hawrylyshyn, K. (2011). *Weathering the storm: Adolescent Girls and climate change*. Plan International.
- Trinh, T.-A., & Zhang, Q. (2020). Adverse shocks, household expenditure and child marriage: Evidence from India and Vietnam. *Empirical Economics*. <https://doi.org/10.1007/s00181-020-01907-2>
- Tsaneva, M. (2020). The effect of weather variability on child marriage in Bangladesh. *Journal of International Development*, 32(8), 1346–1359. <https://doi.org/10.1002/jid.3507>
- UNFPA. (2012). *Marrying too young*. United Nations Population Fund. <https://www.unfpa.org/sites/default/files/pub-pdf/MarryingTooYoung.pdf>.
- UNFPA. (2015). *Girlhood not motherhood: Preventing adolescent pregnancy*. United Nations Population Fund. <https://www.unfpa.org/publications/girlhood-not-motherhood>.
- UNFPA. (2020). *State of the world population 2020*. United Nations Population Fund. <https://www.unfpa.org/pcm/swop-2020>.
- UNFPA. (2021a). *Child marriage*. United Nations Population Fund. <https://www.unfpa.org/child-marriage>.
- UNFPA. (2021b). *Female genital mutilation*. United Nations Population Fund. [https://www.unfpa.org/female-genital-mutilation#:~:text=Female%20genital%20mutilation%20\(FGM\)%20is,as%20a%20human%20rights%20violation.](https://www.unfpa.org/female-genital-mutilation#:~:text=Female%20genital%20mutilation%20(FGM)%20is,as%20a%20human%20rights%20violation.)

- UNICEF. (2013). *Female genital mutilation/cutting: A statistical overview and exploration of the dynamics of change*.
- UNICEF. (2017). *Kenya baseline study report on FGM and child marriage among the Rendille, Maasai, Pokot, Samburu and Somali communities in Kenya*.
- UNICEF. (2020). *Child marriage*. <https://data.unicef.org/topic/child-protection/child-marriage/>.
- UNICEF. (2021). *Understanding the relationship between child marriage and female genital mutilation: a statistical overview of their co-occurrence and risk factors*. UNICEF. <https://data.unicef.org/resources/understanding-the-relationship-between-child-marriage-and-fgm/>.
- Wadekar, N. (2020). Climate change is undermining Kenya's efforts to end child marriage. *TIME Magazine*. <https://time.com/5878719/climate-change-kenya-child-marriage/>.
- Wadekar, N., & Swanson, W. (2020). Climate change pushes girls in Northern Kenya back to early marriage and female genital mutilation. *Pulitzer Centre Projects*. <https://pulitzercenter.org/projects/climate-change-pushes-girls-northern-kenya-back-early-marriage-and-female-genital>.
- WHO. (2016). *Causes of death among adolescents*. World Health Organization. https://www.who.int/maternal_child_adolescent/data/causes-death-adolescents.
- WHO. (2021). *Adolescent pregnancy factsheet*. World Health Organization. <https://www.who.int/news-room/factsheets/detail/adolescent-pregnancy>.
- Women Deliver. (2021). The link between climate change and sexual and reproductive health and rights – an evidence review. *Women Deliver*. <https://womensdeliver.org/publications/climate-change-and-srhr/>.