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Review

The psychosocial impacts of slow onset climate change events among youth in LMICs: A rapid evidence review

Clara Marty[a,*], Samy Amghar[b], Andrés Barrera Patlan[c], Alayne Adams[d]

[a] Department of Cognitive Sciences, McGill University, Montreal, Canada
[b] Department of Medicine, McGill University, Montreal, Canada
[c] Department of Equity, Ethics and Policy, McGill University, Montreal, Canada
[d] Department of Family Medicine, McGill University, Montreal, Canada

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ABSTRACT

Introduction: Recent research has sought to understand the complex experiences of climate change distress, which are highly prevalent among youth and in low- and middle-income countries (LMICs). However, most studies have focused on acute climate disasters and clinically diagnosable psychological responses, leaving a gap in understanding about how gradual climate change events impact broader psychosocial health.
Methods: This review examined how slow-onset events relate to psychosocial distress among youth in climate-vulnerable LMICs using the PRISMA Rapid Review methodology. Four databases were searched, namely Scopus, Web of Science, MEDLINE, and Cochrane.
Results: The initial search yielded 853 results, of which 14 articles met the inclusion criteria for data extraction and analysis, which employed a framework synthesis approach. Studies identified direct impacts of slow onset events (e.g., changing precipitation patterns), as well as indirect impacts on communities (e.g., housing instability) and resources (e.g., loss of livestock). These disruptions are often compounded by pre-existing vulnerabilities such as public debt and inadequate basic services. Faced by these challenges, youth employed many coping strategies such as religion and meaning-focused coping, to help minimize psychosocial distress. Psychosocial responses varied from feelings of worry and numbness to severe outcomes like suicidal ideation.
Conclusion: This review reveals the diversified experiences of climate change, which are closely tied to social and community contexts. A robust research agenda on the psychosocial effects of slow-onset environmental changes is vital to better understand and mitigate its long-term mental health impact on youth.

1. Rationale and background

Climate change refers to long-term shifts in temperature and weather patterns [1]. These changes can manifest as extreme weather events, such as hurricanes, and as slow onset events (SOEs), such as rising sea levels. Climate change is a pressing issue as the WHO projected it could lead to an additional 250,000 annual deaths arising from malnutrition, malaria, diarrhea and heat stress alone [2]. Developing countries are particularly vulnerable to climate change due to their weaker infrastructures and limited support [3]. Beyond its impact on physical health, climate change also impacts mental well-being. Researchers have sought to define the complex experiences of climate change distress through concepts such as eco-anxiety, ecological grief and solastalgia [4]. These terms share a common focus on the often overwhelming negative emotions accompanying worsening environmental conditions.

Berry et al. (2010) highlighted the direct and indirect pathways through which climate change impacts mental health [5]. Direct pathways of climate change include personal experiences of climate change effects, often harming physical health and consequently mental health. For instance, the direct impacts of climate change can be seen during acute weather events, such as natural disasters, which are associated with injury as well as post-traumatic stress disorder, anxiety, and depression [6]. In comparison, indirect pathways encompass the ongoing influences of climate change on people's lives. For example, chronic events, such as the gradual rise in sea levels, impact agriculture and housing, with implications for food and housing insecurity, and distress [5].

Youth and vulnerable populations, such as those in low- and middle-income countries (LMICs), are disproportionately affected by these changes. Saeed et al. (2023) define climate vulnerability as the

* Correspondence author at: McGill University, 2001 McGill College Avenue, H3A 1G1, Montreal, Canada.
E-mail addresses: clara.marty@mail.mcgill.ca (C. Marty), samy.amghar@mail.mcgill.ca (S. Amghar), andres.barrerapatlan@mcgill.ca (A. Barrera Patlan), alayne.adams@mcgill.ca (A. Adams).

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cumulation of exposure, sensitivity, and adaptive capacities. Youth in LMICs face a double burden of climate change due to heightened vulnerability to environmental changes, such as weather events, coupled with limited adaptive capacity [7,8]. It has also been argued that young people share a greater awareness of climate change's impacts compared to adults [9]. The prospect of lifelong exposure to climate repercussions contributes to a growing fear of instability in the environments, homes, and futures of young people [10].

There is an extensive body of evidence on climate-related disasters, such as acute weather events, and their direct psychological impacts, such as post-traumatic stress disorder [11]. However, research on slow-onset events (SOEs) and their consequences is relatively lacking. SOEs are slow incremental environmental changes, like increases in temperature and sea levels, which over time have devastating effects [12]. Compared to sudden natural disasters, which tend to have specific and immediate impacts, SOEs have consistent, ongoing effects, making it difficult to apprehend their complex influences on mental health.

Furthermore, climate change research has primarily focused on individual psychological factors, such as anxiety, with less attention on the intersectional impacts of social relationships and community environments on mental health [13]. Although researchers agree that climate change mental health impacts are not pathological and therefore should not be medicalized, interventions remain at the individual level [9]. Chen et al. (2020) argue that community factors such as societal cohesion and employment, have important protective roles in coping with climate distress [14], It follows that greater attention to psychosocial responses to climate change will provide a more comprehensive understanding of the nature of youth distress and its potential mitigation.

2. Objectives

This review examines the literature on the relationship between SOEs and psychosocial distress among youth in climate-vulnerable LMICs with a focus on: 1) understanding pathways of influence, 2) identifying facilitators and barriers for coping with psychosocial distress during SOEs, and 3) capturing the experiences of youth. This review also seeks to clarify the terminology used to describe psychosocial distress as this varies broadly between research articles and disciplines.

3. Methods

With the increasing demand for timely, relevant evidence in public health decisions, rapid reviews have become an efficient method to quickly synthesize evidence on various topics [15]. Drawing from systematic review methods, rapid reviews aim to produce in-depth analyses of existing literature to draw new conclusions. The Rapid Review Guide developed by the National Collaborating Centre for Methods and Tools was used to direct the study's implementation [15].

3.1. Data sources and search strategy

The study protocol for this review (Appendix 1) followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Rapid Review (PRISMA-RR), as shown in Fig. 1 [16]. Our search strategy was informed by previous systematic reviews on climate change and mental health and developed collaboratively between authors. A final list of search terms was reviewed by an experienced global health librarian which included: adolescence, psychosocial distress, SOEs, and LMICs (Table 1). The LMICs list developed was based on Cochrane's LMIC filter and the World Bank (WB) yearly updated country classification (Appendix 2). These search terms were run through four search engines, i.e., *Scopus, Web of Science, MEDLINE, and Cochrane*.

3.2. Operational definitions

Key concepts underpinning the study question were defined as follows: i) SOEs [12]: environmental climate change threats which gradually develop or increase in frequency or intensity over many years; ii) psychosocial distress [17,18]: persistent stress that adversely affects an individual's everyday well-being and mental health; iii) climate vulnerable [7]: communities that face high exposure and have high sensitivity to climate change events and low adaptive capacities to mitigate the effects; iv) LMIC [19]: low and middle income countries identified by the World Bank based on social, economic, environmental and institutional indicators, s; v) youth [20]: individuals between the ages of 15 and 24, although this age range was expanded to age 39 due to the limited body of literature on this topic. Despite this broadened scope, study findings largely focus on the transition from childhood to adulthood, and the experiences of individuals under 24.

3.3. Eligibility criteria

Original peer-reviewed research studies and systematic reviews published from the year 2000 onwards in English were included in this review. We chose this timeframe as, in the past 20 years, climate change and mental health have gained substantial public and global attention. We included studies using quantitative, mixed methods, and qualitative approaches. Since our review aims to highlight the voices of youth in climate-vulnerable LMICs facing SOEs, we excluded studies if they focused solely on acute weather events, high-income countries, and infants or older adults. Included studies were ones that addressed the broader psychosocial impacts of SOEs among youth, and were not limited to clinical mental health disorders.

3.4. Data extraction and synthesis

The initial search (July 2024) yielded 500 titles or abstracts, which were screened by two reviewers (C.M. & S.A.) separately according to the eligibility criteria. Full texts were screened independently by the same reviewers for final inclusion. Conflicts in the screening process were resolved through discussion among research group members. This study used Covidence software (Veritas Health Innovation) for title, abstract, de-duplication and full-text screening. A total of 14 articles were included for data extraction and analysis in Dedoose using the framework synthesis approach [21–23]. Both reviewers coded each article independently according to the objectives of the study. The defined codes included pathways of SOEs to psychosocial distress, barriers to coping with psychosocial distress during SOEs, facilitators to coping with psychosocial distress during SOEs, and the experiences of youth. The synthesized evidence revealed three key themes—inadequate community services and support, disrupted livelihoods, and coping strategies—which were further analyzed by sub-themes (Table 2).

4. Results

4.1. Study characteristics

As shown in Fig. 2, the 14 articles included in this review were conducted in or drawing from work in the following countries: Tanzania, Philippines, Brazil, India, Tuvalu, Nigeria, Indonesia, Morocco, Malaysia, Kenya, the Caribbean, Mexico, Uganda, Bangladesh, Nepal, Pakistan, Bhutan, Maldives, Afghanistan, and Sri Lanka.

Study designs included three descriptive quantitative studies, a cluster randomized trial, three qualitative studies, two mixed

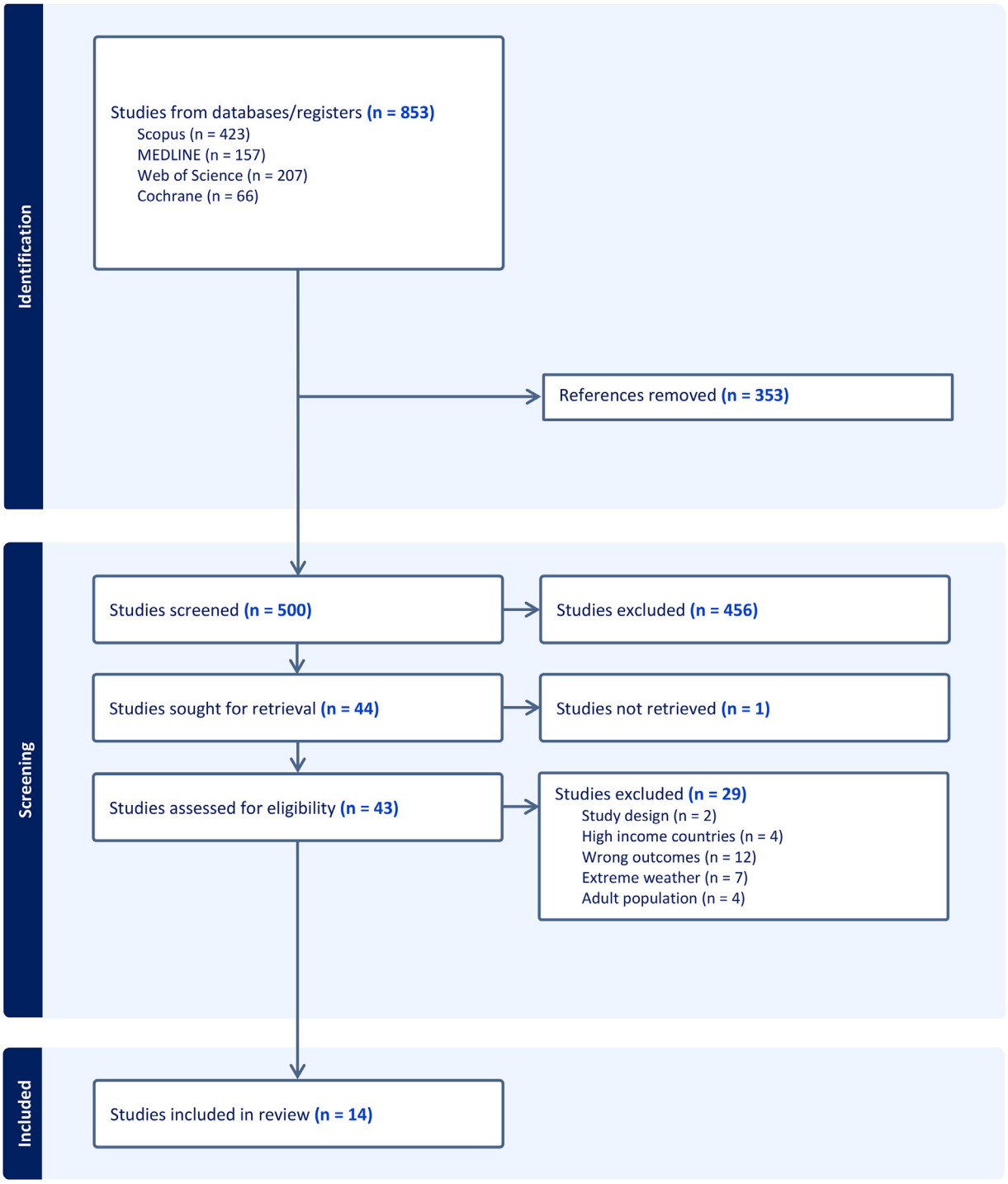

Fig. 1. PRISMA-RR Flow Diagram.

methods studies, and a narrative review. Four studies used surveys, three employed qualitative interviews, and two were opinion pieces. The number of participants varied significantly across studies depending on the study design, ranging from as few as 5 for interviews to as many as 168,407 for surveys. Study characteristics, themes and findings are presented in Table 3.

4.2. Inadequate community services and support

Many of the studies in this review found that inadequate community services intensified pre-existing vulnerabilities to SOEs and limited support to youth experiencing psychosocial distress. In this regard, government action is crucial to reducing the impacts of SOEs, through investments in improving young people's access to community services, inclusive of infrastructure, transportation, and healthcare, and increasing public awareness about issues like climate change. Concomitantly, many studies noted that when national and local governments fail to act, cascading harms result for communities and youth in particular. For example, cities with weak infrastructure were found to be more susceptible to the impacts of SOEs on youth, an example being disrupted access to education for young people due to damaged bridges and roads [24]. As summarized by Mahudin

Table 1
Key terms used for searching electronic databases. Note: a,b,c groups and LMIC list were combined with Boolean operator 'AND'.

Adolescence (combined by 'OR') (a)	Psychosocial distress (combined by 'OR') (b)	Slow onset events (combined by 'OR') (c)
Adolescents	Stress	Climate change
Young adult	Mental health	Climate impact
Emerging adult	Psychosocial functioning	Environmental change
Young people	Psychological distress	Environmental impact
Teenager	Wellbeing	Global warming
Child	Psychosocial adaptation	Rise in sea level
	Distress	SOE
	Emotional exhaustion	Slow onset impact
	Financial stress	Slow impact
	Occupational stress	Flow on effect
	Psychological burnout	Gradual effect
	Psychological stress	Gradual change
		Effect of increasing sea level
		Effect of increasing temperature
		Effect of ocean acidification
		Effect of glacial retreat
		Effect of salinization
		Effect of land degradation
		Effect of forest degradation
		Effect of loss of biodiversity
		Effect of desertification

and Hakim's (2023), youth in climate-vulnerable LMICs are increasingly frustrated with problems related to government corruption, abuses of freedom of expression, lack of transparency, and widespread claims of government mismanagement [25]. These forms of mismanagement affect youth's daily lives given their adverse impacts on infrastructure, transportation, public debt, and healthcare. Without access to needed community services, youth are ill-prepared to cope with the effects of SOEs. One of the selected articles quotes a 20-year-old who describes the distress that results:

> "I feel really scared hearing all this on the radio about climate change. You never know if it will come true. Maybe we won't be prepared. We just sit there and wait to die" [11].

Further, even when professional care for mental distress is needed, access for youth is limited due to inadequately resourced healthcare systems and social norms related to gender, age, and socioeconomic status that inhibit care-seeking.

4.3. Disrupted livelihoods

Disrupted livelihoods was one of the main direct pathways to psychosocial distress among youth. The articles reviewed found that financial hardship and the loss of agricultural land and productivity due to SOEs were frequent causes of disrupted livelihoods. Indeed, for households dependent on agriculture these two challenges were interconnected as SOEs often led to crop loss, thereby undermining household livelihood, and further limiting adaptive capacity [3,24,26–29]. For instance, one article documented the concerns of Lokut, a 25-year-old Ugandan miner and cattle trader, who said:

> "We are worried as a community, due to these climate changes, because they are too crucial in our livelihood" [28].

Food and water insecurity were also common themes across multiple articles and were linked to higher rates of depression [29]. Many studies highlighted the lack of agency among youth as they struggle to develop effective coping strategies due to their heightened vulnerability and familial financial stress [30]. Furthermore, because of SOEs, affected communities often experience damaged housing, which in worst cases, may result in displacement. Disrupted livelihood can also lead to further disruptions in education, access to nature, and disconnection from community [31,32]. For example, Karmaoui (2022) suggested that many Moroccan youth will choose

Table 2
Themes and sub-themes for framework analysis.

Themes	Sub-themes	Examples of codes used
Inadequate community services and support	Poor healthcare	• Health services, policy
	Limited water supply	• Resources
	Weak infrastructure	• Infrastructure
	Government inaction	• Government
	Public debt	• Economic conditions
	Lack of transportation	• Transportation
	Lack public environmental knowledge	• Public awareness
	Inequalities in social principles	• Gender norms, age norms, socioeconomic norms
Disrupted livelihoods	• Damaged housing	• Housing, living situation
	• Displacement	• Migration, move
	• Loss of social connections	• Socialization, friendship, family
	• Financial hardship	• Economic loss
	• Loss of agriculture	• Crops, livestock
	• Lack of agency	• Self-efficacy
	• Food/water insecurity	• Resource insecurity
	• Loss of education	• Education
	• Extreme working conditions	
Coping strategies	• Meaning-focused coping	• Optimism, support
	• Religion	• God, prayers
	• Youth activism	• Activism, social justice, conflict resolution, civic engagement
	• Adult environmental self-efficacy	• Agency, confidence
	• Reduce carbon footprint	• Lifestyle changes
	• Decolonization	• Structural changes, decolonization

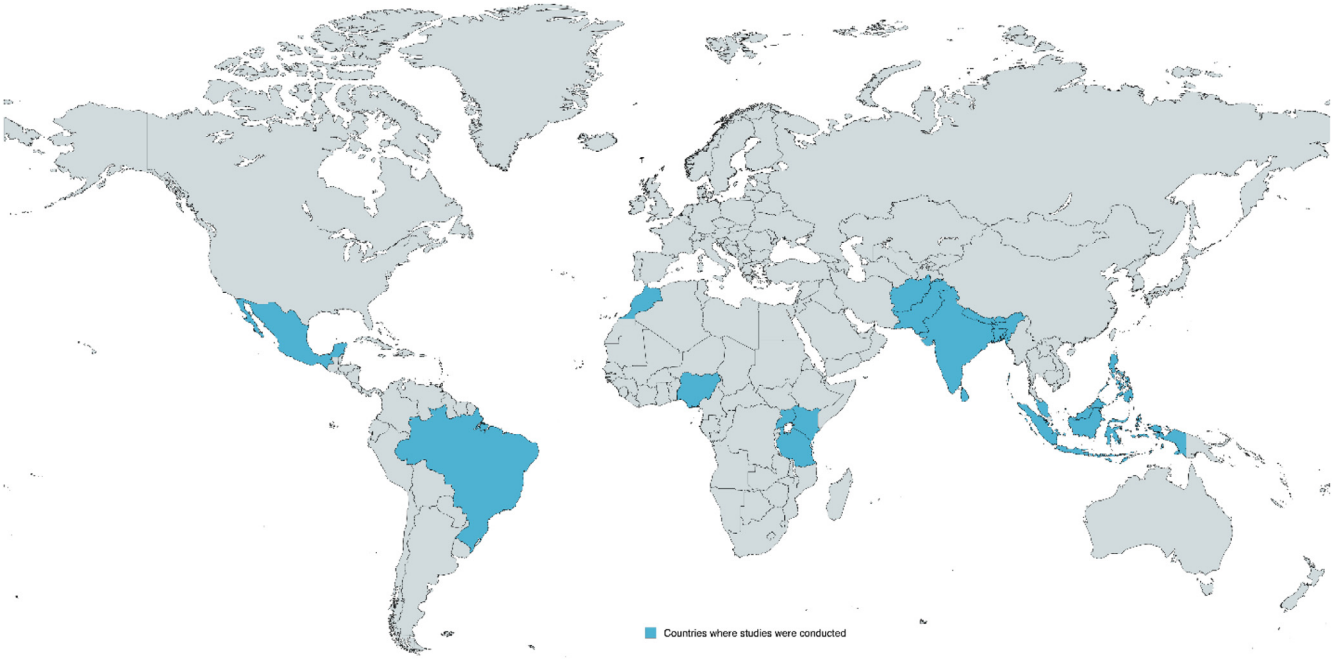

Fig. 2. Map of countries where studies were conducted highlighted in blue [46].

to migrate to bigger cities and abroad to alleviate the psychological impacts of climate change [26].

4.4. Coping strategies

Studies in this review highlighted various coping strategies that youth in LMICs utilize to mitigate the psychosocial effects of climate change. Youth activism, including actions to decolonize, was shown to enhance well-being by empowering youth to engage and to assume an active role in addressing the climate crisis [33]. Activism around decolonization was also shown to address current decision-making imbalances by uplifting the voices of previously unheard groups and by integrating forms of non-dominant knowledge into climate policy. Notably, in Nepal, climate change activism was promoted in the education system. Agency was fostered by creating opportunities for young people to discuss climate change experiences and organize action [24], and by integrating education on how to react to and cope with various climate-related changes like floods within school curriculum. Although Prencipe et al. (2023) found that religion was associated with increased distress in the context of SOEs, religion also emerged as a crucial coping mechanism, as emphasized by Barford (2023) who noted that Ugandan youth use religion to buffer the negative impacts of ecological distress [28]. In the study by Alam et al. (2018), one young person explained:

> "As Javanese people we surrender and accept the circumstances, praying to the Almighty, which is all we can do for now. We live in a city that is changing every day and we can't harbor much hopes, but only offer more prayers" [32].

Berse (2017) similarly suggested that many youth adopt meaning-focused coping to remain optimistic and seek solutions [31]. Adult role models, such as parents and teachers, are also important influences on how and whether youth successfully mitigate the adverse psychosocial effects of climate change. Chou et al. (2023) showed that pro-environmental behaviors, such as reducing carbon footprints, amongst youth and their adult role models, serve as an effective coping mechanism [34].

5. Discussion

Based on our analysis, we identified three pathways through which SOEs lead to psychosocial distress among youth in LMICs (Fig. 3): 1) direct weather impacts, 2) indirect impacts on resources, and 3) indirect impacts on communities. These pathways were mediated by pre-existing vulnerabilities and facilitators, which influenced the outcomes of psychosocial distress experiences. We also identified many terms to represent psychosocial distress across the studies, demonstrating inconsistencies in research on climate change distress.

5.1. Ripple effects: unseen community consequences

Due to the direct impacts of SOEs and the intensification of extreme weather, youth in climate-vulnerable LMICs are ten times more likely to experience the indirect effects of climate change [35]. Our findings highlight significant community-level impacts that lead to psychosocial distress within families. Using the socioecological model, we observe that when communities face SOEs, caregivers—and by extension, youth—suffer challenges such as housing instability and social isolation. For youth, this distress is intensified by their limited autonomy, making them more vulnerable to the impacts of climate change. For example, many articles discussed the indirect effects on education, with youth frequently being withdrawn from school due to displacement, the loss of school records due to floods, or the need to contribute financially to their families [24,25,31]. These findings align with the broader literature, which shows that disruptions in schooling are more prevalent among children in climate-vulnerable LMICs and are linked to increased social isolation [36]. In this regard, community-wide interventions that foster social cohesion and agency could have a positive ripple effect on youth's mental well-being.

5.2. Indirect resource impacts: navigating a climate-altered landscape

Youth's reliance on their community, school, and family renders them particularly vulnerable to psychosocial distress when adverse

Table 3
Summary of studies exploring different dimensions of inadequate community services, livelihood and coping strategies.

Author; year [ref]	Type of study	Settings	Themes/sub-themes	Findings
Prencipe; 2023 [29]	Cluster RCT	2053 Tanzanian youth (18–25 y.o.) from Mbeya & Iringa regions of Tanzania	**Inadequate community services and support** • Inadequate water supply • Weak infrastructure **Disrupted livelihood** • Food/water insecurity • Extreme working conditions	• Higher distress observed among females, more educated, more religious, older youth, greater awareness of climate changes and those working in extreme heat conditions. • Higher depression rates in individuals with water and food insecurity.
Berse; 2017 [31]	Qualitative focus group interviews	38 adults and 45 children (9–15 y.o.) in Malolos, Philippines	**Inadequate community services and support** • Inadequate water supply • Weak infrastructure • Poor healthcare **Disrupted livelihood** • Loss of education • Loss of social connections • Financial hardship **Coping strategies** • Meaning-focused coping • Religion	• Youth adopt problem- and meaning-focus coping. • Religion and community support, particularly neighbors, are important for dealing with climate change.
Hickman; 2021 [45]	Global survey	4000 young people (16–25 y.o.) surveyed from Brazil, India, Nigeria and Philippines	**Inadequate community services** • Government inaction • Weak infrastructure	• Government and adults' inaction leads to distress and a feeling of betrayal among youth.
Alam; 2018 [32]	Ethnographic interviews	5 young people interviewed who have lived in the city of Yogyakarta, Indonesia, for >20 years	**Inadequate community services and support** • Weak infrastructure **Disrupted livelihood** • Loss of agriculture • Loss of social connections **Coping strategies** • Religion	• Youth suffer from many losses due to climate change. • Increasingly difficult for youth to do outdoor activities, and their land farming is affected.
Karmaoui; 2022 [26]	Multi-factor data valuation method	290 Moroccan high school students affected by drought and 290 affected by desertification	**Inadequate community services and support** • Lack public environmental knowledge **Disrupted livelihood** • Loss of agriculture • Displacement	• Drought and desertification greatly affect Moroccan youth psycho-social well-being. • Main pathway leading to climate distress is the loss of crops.
Gibson; 2020 [11]	Mixed methods	49 Tuvaluan (Small Island Developing State in the Pacific) youth structured interviews: 23 interviews with 18–24 y.o. and 26 interviews with 25–39 y.o.	**Inadequate community services and support** • Limited water supply **Disrupted livelihood** • Financial hardship • Damaged housing • Food/water insecurity	• Rising sea levels has caused housing insecurity, financial loss and water insecurity, leading to greater distress.
Sanson; 2019 [3]	Opinion Piece	Children in low-and-middle income countries (not specified)	**Inadequate community services** • Weak infrastructure • Limited water supply • Lack of transportation **Disrupted livelihood** • Loss of agriculture • Lack of agency **Coping strategies:** • Adult environmental self-efficacy	• Communities in LMICs are more vulnerable to climate change due to weaker infrastructures and less support. • Youth are more vulnerable because they depend on adults, have a less mature physiological defense system, and accumulation of these stresses over their lifetime.
Mahudin; 2023 [25]	Cross sectional study, online survey	150 youth (19–25 y.o.) surveyed in Malaysia	**Inadequate community services** • Government inaction • Weak infrastructure **Disrupted livelihood** • Loss of education • Financial hardship • Damaged housing • Lack of agency	• Youth are frustrated by their local governments dismissing climate change and therefore not providing the needed support (i.e. validation, resources). • Youth depend on their parents, making their education vulnerable to family conditions, such as financial hardships.

(*continued*)

Table 3 (*Continued*)

Author; year [ref]	Type of study	Settings	Themes/sub-themes	Findings
Ndetei; 2024 [27]	Cross sectional study; high school survey	2652 high school students (13–20 y.o.) surveyed across 10 Kenyan schools	**Inadequate community services** • Gendered norms **Disrupted livelihood** • Loss of social connection • Lack of agency • Financial hardship • Loss of agriculture • Food/water insecurity	• Climate vulnerable LMICs experience inequalities in the burden of climate disasters on rural communities and women experience more climate distress. • Youth experience impacts of climate change firsthand, resulting in peer problems, heightened worry, and suicidal thoughts.
Holdswoth; 2023 [33]	Opinion Piece	Children (10–19 y.o.) in Small Island Developing States in the Caribbean	**Inadequate community services** • Government inaction • Public debt • Poor healthcare **Disrupted livelihood** • Lack of agency **Coping strategies** • Youth activist • Decolonization	• Public debt in the Caribbean exacerbates struggles to access mental health services, which are a low healthcare priority. • Youth activists work to promote community disaster planning and decolonization.
Patel; 2023 [24]	Narrative review	Adolescents (10–19 y.o.) in Bangladesh, India, Pakistan, Nepal, Bhutan, Maldives, Afghanistan, Sri Lanka	**Inadequate community services** • Lack of transportation • Weak infrastructure **Disrupted livelihood** • Loss of agriculture • Financial hardship • Displacement • Food/water insecurity • Loss of education **Coping strategies** • Youth activism	• Climate vulnerable LMICs struggle to adapt to the climate crisis due to poor transportation and infrastructures, which limits their ability to sell agricultural products. • In Nepal, climate change disaster management has been incorporated into the education system, promoting activism among youth.
Chou; 2023 [34]	Qualitative focus group interviews	13 focus groups (5–18 y.o.) in Brazilian regions of Sao Paulo, Salvador and Ilha de Itaparica	**Inadequate community services** • Lack of public environmental knowledge • Inequalities in social principles **Disrupted livelihood** • Displacement • Loss of social connection **Coping strategies** • Adult environmental self-efficacy • Reduce carbon footprint	• Based on age and socioeconomic status, youth categorized as unaware, disengaged and engaged regarding climate change. • Youth from higher socioeconomic backgrounds have greater awareness and knowledge of climate change but more likely to downplay its impacts. • Adults' environmental self-efficacy is key to encourage youth to develop such behaviors and coping strategies as well.
Pinchoff; 2023 [30]	Online platform survey	168,407 youth (15–24 y.o.) surveyed across Mexico with an online platform	**Inadequate community services** • Government inaction • Public debt • Poor healthcare **Disrupted livelihood** • Lack of agency • Financial hardship • Displacement • Food/water insecurity **Coping strategies** • Youth activism	• Youth feel that the Mexican government fails to prioritize climate change, leading to a lack of support services. • Given youth's vulnerability and exposure to high financial stress within families, they lack agency and struggle to develop coping skills for climate change.
Barford; 2023 [28]	Survey co-designed with including quantitative and qualitative components	1214 youth (18–30 y.o.) surveyed combined with 111 in depth interviews in the regions of Karamoja and Busoga, Uganda	**Inadequate community services** • Government inaction **Disrupted livelihood** • Loss of agriculture • Financial hardship • Displacement • Lack of agency **Coping strategies** • Youth activism • Religion	• Farmers in Uganda have low incomes and rely heavily on agriculture, which limits their ability to respond to the impacts of climate change. • Youth are attempting to solve such distress by diversifying their livelihoods and turning to religion to buffer the negative impacts.

impacts of SOEs are being experienced. Research shows that lower income countries will continue to be disproportionately affected by climate change due to their higher exposure to rising temperatures and reliance on climate-sensitive sectors like agriculture [37]. Several studies highlighted that financial hardship, often resulting from climate change-induced crop failures and livestock losses, intensified stress within families, directly impacting children's wellbeing. This aligns with findings by Crandon et al. (2022), which show that financial strain can also weaken youth's social connections at school [38]. Social networks are vital for children's development, and disruptions in school attendance can lead to long-term psychosocial consequences [36]. Furthermore, food, water, and health insecurities – often intensified by SOEs and acute weather events – are major contributors to distress. For example, Walinski et al. (2023) linked food insecurity, exacerbated by climate-related crop failures, to impaired cognition and mental health symptoms such as fatigue,

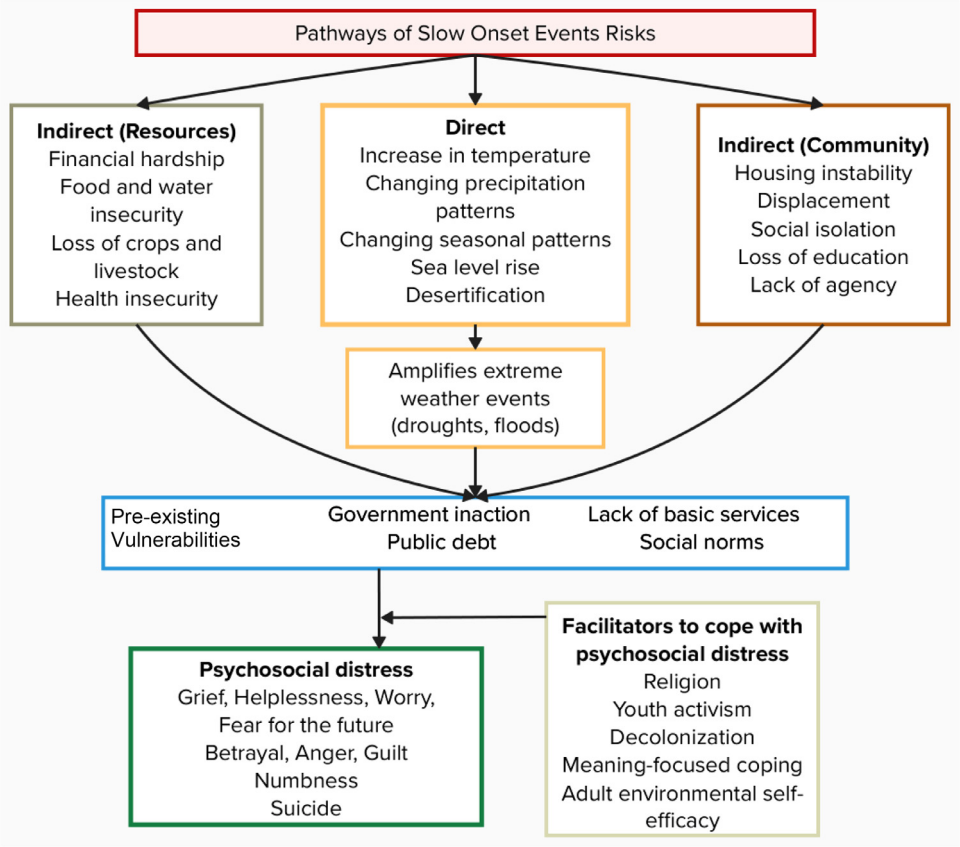

Fig. 3. Pathways of SOEs.

lethargy, depression, mania, and psychosis [39]. Frequent, long-term resource insecurities stemming from climate impacts can create significant vulnerabilities in youth, such as malnutrition, cognitive impairments, and a lack of energy, further affecting their physical and mental well-being [40].

5.3. Pre-existing and interconnected vulnerabilities

Vulnerability to climate disasters is defined by a country's high exposure, high sensitivity, and low adaptive capacity [7]. The interaction of exposure (e.g., geographic location and weather events), sensitivity (e.g., access to basic services, ecosystem health), and adaptive capacity (e.g., maintaining livelihoods and mitigating impacts) is shaped by pre-existing community conditions. Our findings show that limited access to basic services, such as inadequate healthcare and poor infrastructure, makes communities particularly vulnerable to climate impacts. This is further intensified by social norms, such as gender expectations around expressing mental distress, which undermine the coping capacities of communities and families. As Karaliuniene et al. (2022) noted, political stability is also critical in the face of SOEs and acute weather events and government corruption was identified as an indirect cause of psychosocial distress among youth [41]. This aligns with our findings, where government inaction fosters feelings of helplessness and powerlessness in youth, whose persistent concerns about SOEs are dismissed by authorities. Feelings of powerlessness are also heightened by high public debt levels, which are often a function of corruption and poor financial management [30,33].

5.4. Unpacking the psychosocial impacts of climate change

The literature on youth emotions regarding climate change and SOEs employed varied terms to describe the mental health impacts of climate change, with no universally agreed-upon definition. Based on our review, psychosocial distress in youth can manifest in diverse feelings including grief, numbness, or anger. Coffey et al. (2021) identified key emotional responses to climate change, such as ecological grief and solastalgia, which are "non-pathological" [4,9]. This means they are natural and understandable reactions, rather than signs of psychological disorders [9]. Ecological grief, or mourning losses due to climate change, was evident in several studies. According to Ojala et al. (2021), grief can also arise from anticipating future losses due to changing weather patterns [42], and this worry was a common emotion highlighted in the included studies (see Table 3). Gender differences were also noted, with girls showing higher susceptibility to distress due to greater emotional awareness [6]. Feelings of betrayal and helplessness often stemmed from government and adult inaction, evolving into anger. Caribbean youth, for example, expressed feeling neglected by policymakers [4,33]. Numbness and even suicidal ideation were also linked to psychosocial distress, underscoring the urgent need to listen to youth and provide appropriate mental health and psychosocial support to mitigate these intense emotions.

5.5. From distress to resilience

Despite the disproportionately high burden of psychosocial distress faced by youth in climate-vulnerable LMICs, these young people demonstrated resilience and commitment to mitigating the effects of climate change. As SOEs continue to evolve, youth develop and adapt their coping strategies to navigate the direct and indirect challenges posed by climate change. Our findings aimed to identify key facilitators for coping with psychosocial distress to guide interventions that address youth needs and highlight effective strategies. The primary facilitator discussed across the articles was youth activism. Youth climate activist groups offered young people a platform to engage in

discussions about climate issues, amplifying their voices while cultivating a sense of community and mutual support. Consistent with Brophy et al. (2023), adult role models' awareness of climate change and its connection to decolonization, empowered youth with knowledge, allowing them to maintain a stronger sense of agency and hope [9]. Additionally, the review found that meaning-focused coping strategies, such as revisiting goals, were more effective in alleviating psychosocial distress compared to problem-focused approaches like changing lifestyle habits or reducing carbon footprints [31]. Despite religion being associated with increased distress [29], our review revealed that religion played an important role in helping youth find hope and acceptance amid climate-related disasters and disruptions to their livelihoods. Overall, these findings underscore the importance of culturally and contextually tailored interventions that harness youth's lived experiences and strengths to promote mental well-being in the face of climate adversity.

5.6. Limitations

The present review exclusively considered published scientific literature from the databases Scopus, Web of Science, MEDLINE, and Cochrane. Reports from the grey literature could have offered valuable details regarding policies and recommendations to further our contextual understanding of youth in climate-vulnerable LMICs. As well, only articles published in English were included, thereby excluding studies published in other languages. Finally, due to capacity and resource limitations, this review was limited to the screening of 500 articles through Covidence which were analyzed by two researchers. Resource limitations also precluded opportunities to include the perspectives of youth in reviewing our main study findings.

5.7. Implications

Youth in LMICs face heightened vulnerability to climate change, with multiple pathways (i.e. direct and indirect pathways) leading to psychosocial distress. Immediate, coordinated efforts are essential, with policymakers integrating youth voices into decisions. Parents and teachers also play a key role in fostering hope and social empowerment. To address climate change related impacts, a multi-sectoral approach is needed, targeting barriers and pre-existing vulnerabilities across all system levels—communities, neighborhoods, national governments and international organizations. A stronger research agenda focused on the psychosocial effects of slow-onset environmental changes, which remains under-researched compared to acute disasters, is vital to better understand and mitigate the long-term mental health impacts on youth.

Governance reforms are also urgently needed to address inequities in mental health, particularly in giving LMICs more decision-making power within institutions like the International Monetary Fund (IMF) [43]. The establishment of the IMF's Resilience and Sustainability Trust is a positive first step toward supporting LMICs' adaptation to climate change, but LMICs need greater representation in shaping policies, as they are among the most affected. As the Intergovernmental Panel on Climate Change warned, the "window of opportunity to secure a livable and sustainable future for all" is "rapidly closing." [44]. Therefore, we must act decisively and collaboratively to ensure far-reaching positive and just impacts for the generations to come.

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Clara Marty: Writing – original draft, Visualization, Software, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Samy Amghar:** Writing – original draft, Validation, Software, Investigation, Formal analysis. **Andrés Barrera Patlan:** Writing – review & editing, Resources, Conceptualization. **Alayne Adams:** Writing – review & editing, Supervision, Resources.

Supplementary materials

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