Climate change injustice and school attendance and absenteeism: proximal and distal ecological links

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Climate change has been linked to a myriad of problems related to human functioning, with a particular scientific emphasis on economic, physical damage, and health sectors. Less attention, however, has been given to the links between climate change and problems in the educational sector, such as school attendance problems, which represent practical and everyday manifestations of the effects of climate change. This is unfortunate given that children, and particularly those in Black and Brown communities and in the majority world, are expected to bear the greatest burden from climate change now and in the future. One fundamental right of children is the right to an education and to attend school, and this right is threatened particularly for vulnerable populations in different ways by climate change. Narrative synthesis of key terms (e.g., climate change, school absenteeism) for literature review was conducted to identify key patterns that produced the primary themes represented in this article: physical health, mental health, violence, school environment, school displacement and migration, and economic challenges. These themes were organized along a general proximal-to-distal spectrum. The descriptions of each theme also illustrate mechanisms connecting these issues that may help inform future mitigation efforts.

KEYWORDS

climate change, school attendance, health, violence, school environment, school displacement

1 Introduction

Climate change due to anthropogenic global warming has been deemed an existential threat to a high level of functioning across global civilizations over the next century. Climate change is expected to affect areas of global civilization differently, with some areas bearing a disproportionately greater negative effect (Chigwanda, 2024; Levy and Patz, 2015). Climate change has and should continue to unduly and unjustly affect Black and Brown communities and peoples of the Global South, particularly as more populations are pushed into climate-driven extreme poverty in sub-Saharan Africa and South Asia and as countries in South America and Latin America grapple with substantially increased economic costs (Sharma, 2023). Children remain particularly vulnerable to the negative effects of climate change. Nearly half of the world's children, about 1 billion, live in 1 of 33 countries classified as "extremely high risk" due to impacts of climate change (UNICEF, 2021). Climate change has been linked to a myriad of problems related to human functioning, with a particular scientific emphasis on economic, physical damage, and health sectors (Tol, 2018). Common broad areas of focus include worsened productivity, agricultural and forestry and species loss, sea level rise, and increased morbidity and mortality (Auffhammer, 2018).

Science linking climate change to problems in the educational sector remains in a nascent stage (Prentice et al., 2024). This is unfortunate given that education is a fundamental human right and because climate change can have practical and everyday manifestations with respect to children's ability to attend school and complete even a fundamental and primary educational process. Already, less than three-quarters of children globally complete school at a lower secondary school level, and this rate is particularly problematic for sub-Saharan Africa (38%), northern Africa and western Asia (72%), central and southern Asia (75%), and Latin America and the Caribbean (76%) compared to northern hemispheric countries in Europe and North America (98%) (UNESCO, 2019). Climate change is expected to exacerbate these inequalities over time, and the specific avenues of this process are described in this article.

2 Purpose and methodology

The purpose of this article is to conceptualize proximal and distal factors associated with climate change that have specific ramifications for school attendance, and particularly for students in Black and Brown communities and the Global South. Although direct work involving climate change and school attendance problems remains emerging, particularly for these vulnerable populations, this article draws upon existing and related work in both fields to illustrate mechanisms connecting the two issues that may inform future mitigation efforts. Broader and more specific effects of climate change with respect to schooling and school attendance are presented.

This article represents a narrative review designed to provide a comprehensive overview of existing publications on climate change and school attendance problems. Given the wide range of articles in this area, many of which are more descriptive in nature, inclusion criteria included publications found via key term searches that coalesced "climate change," "climate variability," "climate warming," "global warming," "school absenteeism," and "school attendance problems." Exclusion criteria included non-peer-reviewed publications, conference proceedings, and articles deemed tangential or far afield of the key terms. Narrative synthesis was then conducted to identify key patterns that produced the primary themes represented here: physical health, mental health, violence, school environment, school displacement and migration, and economic challenges. These themes were organized along a general proximal-to-distal spectrum.

3 Physical health

Climate change is expected to exacerbate physical health problems in children, particularly for problems that are already disproportionately represented among Black and Brown populations. Examples are provided here. From *air pollution*, health problems include increased rates of asthma and other respiratory diseases, birth defects, and lung cancer and decreased lung function. From *floods and droughts*, health problems include increased rates of child physical trauma, injury, and effects from near-drowning experiences. From *excessive heat*, health problems include renal and respiratory diseases, fever, and electrolyte imbalances. From *exposure to toxic elements*, health problems include immune and neural system dysfunction, cancer, and reproductive disorders. From *food and water changes*, health problems include malnutrition and intestinal disorders. In addition, increased mortality and allergic and infectious diseases are expected from many climate change events, and particularly in the majority world (Xu et al., 2012). Currie et al. (2009) found that school absences increase in particular when carbon monoxide (CO) levels exceed AQS (air quality system) and when CO is 75–100% of AQS.

Climate change is expected to lead to greater physical health problems in children in more indirect ways as well. Malnutrition and undernutrition via extensive food and water insecurity and vulnerable agricultural systems produce elevated rates of child stunting, wasting, underweight status, and anemia, especially in developing countries (Mahapatra et al., 2021). Exposure to extreme temperatures and other effects of climate change negatively impact fetal health in multiple ways as well (Ngo and Horton, 2016). Climate change events also disrupt many healthcare facilities for children, particularly in vulnerable areas already predisposed to outbreaks such as malaria (World Health Organization, 2020). Climate change events increase the likelihood of parental deaths as well, which can exacerbate child isolation from proper health care (Garcia and Sheehan, 2016).

Physical ailments are closely related to school attendance problems worldwide. The most common physical health problems associated with school attendance include abdominal and dental pain, asthma, chronic fatigue and pain, diabetes, fractures, gastroenteritis, headache, influenza, obesity, poor oral health, seizures, and streptococcal pharyngitis (Allison et al., 2019). In addition, school attendance problems are associated with many different forms of somatic complaints such as dizziness, heart palpitation, nausea, muscular or joint ache, and vomiting (Li et al., 2021). School attendance patterns related to absenteeism are also commonly used as part of epidemiologically-oriented early warning systems to surveil and help control infectious diseases and other illness outbreaks (Bates, 2017). Illness-related school absenteeism is a central focus of early warning systems because children and schools are central transmitters of infection and because illness often leads to immediate school absence (Donaldson et al., 2021). Illness-related school absenteeism is particularly exacerbated when days exceed 18°C (Conte Keivabu, 2024).

Mechanisms linking physical ailments with school attendance problems often intersect with effects from climate change, and particularly so among vulnerable populations. Examples include increased home-based mold, asthma and respiratory conditions among family members, irritability and family conflict, elevated hemoglobin A1c and poor glucose monitoring, anxiety and depression, impaired coping skills, social isolation and withdrawal, sleep problems, sensitivity to school-based stressors, traumatic brain and other injury, and need for ill family members to keep a child home from school for caretaking purposes (World Health Organization, 2021). Other intersecting mechanisms include unmet therapeutic care or substantial barriers to care, particularly if a school lacks medical services, that may aggravate disease burden due to suboptimal symptom control and increased pain and complications (Ebi et al., 2021; Kearney et al., 2023). Such barriers could also include stigma, long distances to school-based care, and less access to external or emergency assistive devices, medication, or medical appointments and care (Xu et al., 2020).

4 Mental health

Climate change and its events are expected to have substantial impacts on mental health in the coming decades via immediate (e.g., heat wave), short-term (e.g., natural disaster), and long-term (e.g., extended drought) effects (Cianconi et al., 2020). The many stressors generated from climate change and its events are expected to trigger traumatic reactions, emotional disorders, grief reactions (including ecological grief), suicidal behavior, substance use, survivor guilt, recovery fatigue, and reduced well-being and quality of life (Evans, 2019). Natural disasters in particular have long been linked to posttraumatic stress disorder and depression, though studies tend to focus on those who experienced a high degree of exposure to an event (Beaglehole et al., 2018). Specific symptoms often surround fear, panic, sorrow, agitation, sleep and concentration problems, and feeling unsettled, particularly if current circumstances are highly uncertain (Novia et al., 2020). The latter often includes situations involving strong threat of harm or death to oneself or a large group of people, disrupted health services and social networks, and communal loss of resources (Saeed and Gargano, 2022).

Researchers have also explored the mechanisms that may explain the relationship between climate change/events and mental health challenges. Prominent examples include loss of work and routine, disrupted sense of personal and cultural identity, feelings of grief or helplessness/hopelessness, family conflict, loss of social support, lack of control over possessions, role disturbance, shock, and humiliation (Makwana, 2019). Others have noted the role of anger, less social capital, poor coping skills, forced relocation, and inadequate disaster preparedness and recovery in this regard (Fu et al., 2021; Matsuoka et al., 2023). Anticipatory anxiety regarding impending disaster, such as watching a growing wildfire or intense rainfall prior to flooding or a tsunami, can trigger mental health challenges as well (Foster, 2022). In related fashion, the term "solastalgia" refers to distress caused by environmental transformation and degradation of one's home environment (Albrecht, 2020). Secondary exposure to natural disasters via media exposure as well as distress related to climate effects on future generations can also lead to mental health problems (Hopwood et al., 2019). Conversely, protective mechanisms are also important and include resilience, sense of control, community support, and early intervention (Paton and Johnston, 2017).

Climate-oriented mental health challenges affect children as well. Numerous studies detail severe and long-term mental health problems such as posttraumatic stress disorder in children following natural disasters (e.g., Roberts et al., 2010). Mental disorders more specific to children, such as attachment disorders, may become more prevalent as well (Burke et al., 2018). Children with female gender, existing mental health problems, and/or lower socioeconomic status and education often experience worsened symptoms during climate events (Hrabok et al., 2020). Reduced mental health services and recreational activities, alterations of children's thermoregulation abilities vis-à-vis the effect of psychiatric medications, and changes in sleeping and eating habits are expected to exacerbate climate-impacted mental disorders as well (van Nieuwenhuizen et al., 2021). Key influencing factors surrounding children's mental health responses to climate events include being trapped during a disaster, bereavement, community connection, coping strategies, cultural identity, degree of death toll and distress at time of the event, family factors, parenting style, fear, perceived threat, personal injury or loss, proximity to the event, social support, and witnessing injury or death during a disaster (Clemens et al., 2022; Ma et al., 2022).

Mental health problems in children have long been linked to school attendance problems. Students with a mental disorder experience significantly more school absences over time compared to students without a mental disorder, and absences due to a mental disorder account for 13.4% of all days absent from school (Lawrence et al., 2019). Psychiatric conditions most commonly associated with school absenteeism include developmental disorders, emotional disorders (e.g., anxiety, depression), disruptive behavior disorders, substance use, and traumatic disorders (Kearney et al., 2023). Many of the mechanisms that link mental health problems with school absenteeism intersect with the climate change-based literature. Examples include sleep and concentration problems, changes in cognitive performance, inadequate coping abilities, lack of social and academic support, and stress, among others (e.g., John et al., 2022). Others have discussed mechanisms that more closely link climate-change-related exposures to increased mental health vulnerability and disrupted learning via a cascading effect of risk factors through different developmental stages. These include prenatal/*in utero* (e.g., via environmental toxins, shorter gestation period), early childhood (e.g., via insect-borne disease, malnutrition), middle childhood (e.g., via school closures, fear), and adolescent (e.g., via despair, reduced employment opportunities) stages that convey increasingly exacerbated risk of mental and learning problems with age. Other risk factors such as trauma are superimposed on all of these developmental stages (Vergunst and Berry, 2022).

5 Violence

Climate change has been linked to increased rates of self-inflicted, interpersonal, and collective violence, the latter of which can include armed conflict, state-sponsored violence such as genocide, and organized violent crime. Such violence, often disproportionately evident in Global South countries, can have direct and indirect effects, the latter of which can include infrastructure damage, forced displacement, and diversion of resources, among other consequences (Levy et al., 2017). Variables that link climate processes and events to violent conflict likely involve economic shocks, resource scarcity, migration, political instability, institutional weaknesses, and various ethno-cultural conditions (Sakaguchi et al., 2017). Climate change and especially rapid-onset disaster events are also associated with greater civil unrest that can involve violent acts (Nardulli et al., 2015). Climate change may increase rates of domestic violence as well (Manning and Clayton, 2018).

Specific aspects of climate change have also been examined vis-à-vis violence. For example, a link between excessive heat and violence has been noted for centuries, with key mechanisms involving increased irritability, lower threshold for provocation, aggressive thoughts, hostile perceptions of others, criminal behavior, adrenaline production, substance use, and more outdoor activities (Miles-Novelo and Anderson, 2019). In addition, women in flood-prone areas and displaced shelter facilities have been reported to experience physical and emotional violence, and flood exposure has been found to be associated with greater support for the use of violence (Memon, 2020; von Uexkull et al., 2023). Drought and agricultural failure have also been linked specifically to water-related political violence in

several areas of the world (Gleick and Shimabuku, 2023). Acute air pollution exposure has been linked to increased violent but not property crime, and toxicant exposure and environmental contaminants may indirectly impact rates of slow violence as well (Berman et al., 2019).

Climate change is a significant predictor of violence against children. Key mechanisms of this process include disruptions in family and community bonds, maltreatment, orphaning, transactional sex and other exploitation, torture, and forced labor, marriage, or recruitment into armed groups. In addition, climate change can lead to fewer sources of protection for children, such as school settings (Cuartas et al., 2023). Women and children are often tasked more frequently with collecting water and firewood for a household, which can mean longer distances and higher likelihood of sexual assault and missing school in areas of climate-based deprivation (Allen et al., 2023). Food insecurity and malnutrition rooted in climate change events and violence disproportionately affect children as well (Brown et al., 2020). Others have also speculated that climate-based violence could predispose children to become violent in adulthood (Miles-Novelo and Anderson, 2019).

Less direct evidence specifically links climate-related violence to school attendance problems *per se*, but broader mechanisms such as forced displacement certainly play a role. At a more granular level, many forms of violence are key predictors of school attendance problems and school suspension, and many of these forms of violence in certain areas of the world can be partly attributed to climate events. Forms of violence linked to school attendance problems include neighborhood violence, family and domestic violence, dangerous transportation avenues to school, unsafe school environments (including interpersonal violence), child maltreatment, and victimization via bullying and other methods (Laith and Vaillancourt, 2022; Orr et al., 2023). In addition, school safety is an integral aspect of school climate, and lack of safety is a commonly reported reason for students to miss school, including areas most affected by climate change (Meyer et al., 2018). Multiple adverse child experiences including violence have also been found to substantially increase chances for chronic school absenteeism (Stempel et al., 2017). Violence is a common reason for permanent school dropout as well, particularly among minoritized youth (Peguero, 2011).

6 School environment

A school environment refers broadly to physical facilities, teaching and learning practices, curriculum, in-house supports, and policies designed for student education (Bonell et al., 2013). Climate change is expected to substantially alter the nature of school environments in multiple ways in the coming decades. With respect to physical facilities, brick-and-mortar school buildings are large energy consumers that will likely need to shift toward a reduced carbon footprint by utilizing energy-efficient appliances and electric vehicles, engaging in recycling and less paper usage, eliminating single-use plastics, reducing energy waste, adopting renewable energy, and providing greater mass transportation options to schools (Bangay and Blum, 2010; Bauld, 2021). Climate change is also expected to increase educational costs to help schools better withstand extreme weather events, provide air conditioning or improved ventilation, upgrade food and water distribution systems, and relocate or close during certain times of the year (Sheffield et al., 2017). Schools are

also expected to invest heavily in distance learning infrastructure and technology so that students can remain home or in available community settings for their education (Johnson et al., 2023). Such investment will also be needed to better track students who will be shifting rapidly and frequently between in-person and distance learning due to extreme weather events (Chalupka and Anderko, 2019).

Climate change is also expected to impact school curricula because education is considered to be a key response strategy (Chang and Pascua, 2017). Current curricula regarding climate change in many schools often offer vague or narrow explanations, impacts, and mitigating strategies in this regard, if any information at all (Eilam, 2022). Examples of possible climate change-oriented curriculum endeavors include science projects, lessons, and field experiences on topics related to causes, maintaining factors, and solutions (e.g., greenhouse effects, movement of pollutants, sustainable development) (Ferguson et al., 2021). Climate change education in developing countries will likely need to focus on more direct applications such as agricultural adaptation (Anderson et al., 2020). Future curricula will also likely need to emphasize future careers that align closely with climate change such as bioremediation, carbon market analysis, climatology, emergency management, environmental engineering and law, geoscience, and renewable energy, among others (Klein, 2023).

Climate-based education intersects with school attendance as well. Benoit et al. (2022) discussed several avenues of this intersection, including questioning the importance of achieving educational milestones such as graduation if the climate collapses and if schools fail to engage in curricular innovation or mitigating strategies regarding climate change. In addition, environmental activism often involves student protests that include missing school, and arguments have been made to support flexibility in this regard. Examples include greater participation in public institutions, ability to seek permission to attend a climate rally, classroom visits to activist events, nuanced disciplinary reactions to school absences for activism, mutual coordination of student and school administration interests, classroom-based social media projects, experiential learning, and civic education (Clarke et al., 2022). Environmental activism also appears to enhance a sense of agency among youth and may attenuate symptoms of mental health challenges, which may facilitate school attendance (Schwartz et al., 2023).

School environmental facilities have also been examined vis-à-vis school attendance, with particular respect to retrofitting (e.g., for air quality improvement) and design transformation to green schools to reduce ecological footprint (Thapa et al., 2024; Vakalis et al., 2021). Issa et al. (2011) found that student, teacher and staff absenteeism improved by up to 7.5% and that student performance improved by 8–19% in green schools compared to conventional schools. Others have noted that positive findings regarding academic outcomes relate to greenness, tree cover, and green land cover at distances up to 2,000 m around schools (Browning and Rigolon, 2019). Mechanisms that may help explain this relationship include improved student mental health and neurocognitive development, greater physical and recreational activity, reduced noise and traffic, less screen time and stress, better surrounding air quality, and more social interactions (Vanaken and Danckaerts, 2018). Unfortunately, schools in intensely developed urban areas with disadvantaged populations often have little vegetation or green spaces (Hodson and Sander, 2017). Environmental justice and collective community efforts will be needed to reduce disparities in this regard (van Velzen and Helbich, 2023).

7 School displacement and migration

Schools across much of the Global South and in Black and Brown communities have been displaced, destroyed, repurposed, or closed for long periods of time due to sea level rise and extreme weather events such as cyclones, drought, floods, landslides, typhoons, and wind (Hanna and Oliva, 2016; Mfon, 2024; Ofem et al., 2024). More than 250 million children are out of school globally, with the bulk of this number in Global South countries that experience disproportionate effects from climate change events (UNESCO, 2019). In addition, climate change events can draw government and other resources away from schools, which means less funding for educational infrastructure and repairs, limited supplies of learning materials, fewer qualified teachers, longer distances to another school, and greater family expense for educating children (Hallegatte et al., 2016). Climate change events often intersect as well with communicable and noncommunicable disease and less access to health care, both of which drain resources and create additional barriers to school attendance (Frumkin and Haines, 2019).

School attendance problems are closely linked to school closures, and rapid closures of schools in certain geographical areas due to economic, demographic, or other reasons often disproportionately affect minoritized students (Lee and Lubienski, 2017). School closures, especially in Black and Brown communities, introduce many new barriers to future school attendance, especially when lengthy periods of time are required for students and their families to be reassigned to new modes of transportation and to a new school facility (Hopson et al., 2022). In addition, school closures increase the likelihood that students will become academically and socially disengaged from school, that students will have to navigate lengthier and potentially more dangerous avenues to school, and that families will experience greater transportation vulnerability and disruptions to work and life schedules (Lehmann et al., 2021). School reassignments can also be delayed if families cannot produce mandated documentation (Evans et al., 2020).

Climate change has also produced mass migration in certain geographical areas, more so in Global South countries, which can vary depending on the severity of a climate event, access to water, and a household's ability to relocate (Devonald et al., 2024). Climate shocks have been found to affect household capacity to migrate in nonlinear ways depending on financial resources and initial level of poverty. Climate-induced migration is more prevalent for long-distance domestic than international moves and for slow-onset climate changes such as droughts (Kaczan and Orgill-Meyer, 2020). Other mechanisms of climate-induced migration include decreased or lost wages (or remittances), lower agricultural output, political and social instability, and weak institutional responses (Cattaneo et al., 2019). Climate-induced migration also intersects with greater health risks (Mazhin et al., 2020).

Movement of families has been shown to be closely related to school attendance problems in different ways. First, residential and other movement during the academic year is a significant predictor of later school absenteeism and educational gaps (Green et al., 2019). Second, seasonal migration due to shifting labor demands often leads to intermittent school attendance and premature withdrawal from school (Das, 2020). Constant worries about deportation and wariness of sending a child to school are common among seasonal migration groups as well (Rubinstein-Avila, 2017). Third, many students who migrate to a new geographical area and school must contend with different cultural practices, languages, and curriculum choices, all of which can foster disengagement if school support is lacking (Göbel and Preusche, 2019).

Fourth, migrant students and their families often face discrimination and prejudicial practices from school officials. Examples include assignment of inaccurate and pejorative labels (e.g., identifying a problem as behavioral as opposed to mental health), negative assumptions regarding parent accessibility and skill, pathologizing unconventional or culturally different behaviors (including a broader lack of cultural awareness), use of racist clichés, denial of certain educational opportunities, neglect of trauma, and disproportional orientation toward vocational classes (Martin et al., 2020; Rosenthal et al., 2020). Such practices amplify fear of attending school and erode parent-school official communications, peer-teacher relationships, social connections, and equitable access to administrative, health, and academic supports (Yilmazel and Atay, 2023). Long-term cascading effects for migrants may include impaired social positioning and employment in the new country (Darmody et al., 2014).

8 Economic challenges

Economic pressures and damages from climate change include recovery costs from natural disasters, reduced agricultural yield, demand for cooling and other energy, lower incomes and increased poverty, higher prices for certain goods and services, impaired growth and development, commercial contractions, large-scale biodiversity loss, and community protection needs, among other challenges (e.g., Tol, 2024). For example, a 1.0 percentage point increase in climate change vulnerability has been associated with a deterioration of 1.5 percent in income inequality (Cevik and Jalles, 2023). These challenges are expected to be most heavily concentrated in low-income and tropical areas such as Africa, Latin America, and the Indian subcontinent as well as coastal states (Nordhaus, 2019). Climate change is expected to have substantial effects on labor markets as well, including greater inequality and polarization in employment, lost labor hours and job loss, placement of workers in dangerous weather, and increased ratio of working to leisure hours (Huang et al., 2020).

Climate change is expected to impact the child labor market as well (Caruso et al., 2024). Climate change in conjunction with other broader factors such as the absence of social and employment protection policies is expected to lead to a substantial increase in child labor and particularly in agriculture as more workers are needed to replace those stricken by heat strain and exhaustion as well as vector-borne diseases (Greenfield, 2022). Environmental degradation and unsustainable extraction of resources also lead to scarcity and inefficiency that require industries to pursue cheaper labor to remain profitable (Sparks et al., 2021). Modern slavery including child labor is also a threat multiplier to climate change via disproportionate ecologically toxic activities related to biodiversity loss, brick making, carbon sink reduction, clear-cut deforestation, pesticides, pollution from manufacturing and resource extraction, precious-woods logging, and strip mining in the Global South (Bales and Sovacool, 2021). Climate change also affects children via health and economic effects that are placed unduly on future generations (Currie and Deschênes, 2016).

Economic challenges that propel child labor also include pressures to leave school and abandon educational attainment to support families (Meza-Cordero, 2023). School achievement scores are lowered as well (Gunnarsson et al., 2006). In addition, economic challenges and reduced income from climate change make it less likely for many families to afford school for their children (Sanson et al., 2022). In general, children

from low-income families withdraw from school before other-income families, particularly during periods of economic surge, which can also draw middle-income children (Kruger, 2007). Specific mechanisms and mediators of these relationships are also receiving research focus. Ango et al. (2022), for example, examined coffee production and crop guarding tasks and found that children living closer to forests and who engaged in these tasks missed more school than children living in villages far from forests. This situation worsened school attendance especially for boys, and coercive measures to mitigate this situation often aggravated already difficult economic conditions for impoverished families.

School attendance problems and school dropout even in developed countries relate closely to the need to support families economically (Borgna and Struffolino, 2017). Intensive employment and dropout are more common among disadvantaged youth (Staff et al., 2020), and working even part-time (>20 h per week) increases risk of dropout as much as full-time work (Hovdhaugen, 2015). Ironically, students who drop out of school are much more likely to be unemployed later as adults than school completers (McFarland et al., 2016). Common economic pull factors include plentiful employment opportunities that do not require a high school graduation, a strong informal labor market, the need to financially support a new child, and employment requirements that overlap with school hours (Boylan and Renzulli, 2017). Such pull factors may be more relevant to specific trajectories of school dropout. McDermott et al. (2018) found, for example, that pull factors were more relevant to students experiencing a high number of adverse events (e.g., delinquency; consequences of delinquent behavior such as arrest and expulsion; and high mobility due to foster care or homelessness) and who thus may be already predisposed to leave school. Black and Brown communities are often most affected by exclusionary discipline practices in schools.

9 Conclusion

As mentioned, research into climate change and its relationship to educational variables remains in a nascent stage. Publications in this area often refer to general school-based outcomes but precision with respect to statistical data often lags behind studies that examine economic, physical damage, and health sector effects of climate change. Research is needed with respect to specific statistical models that link climate change events with days missed from school, in addition to other explicit educational outcomes such as school dropout or graduation rates. In particular, statistical models that illuminate "tipping points" in these processes would be helpful.

Many researchers and other stakeholders focus on specific student and family variables when investigating and addressing school attendance problems, but school absenteeism is increasingly seen as a highly complex problem involving multiple ecological levels

and contributing factors. In addition, social justice themes are increasingly a part of understanding this complexity as researchers continue to shed light on key disparities that drive threats to education. Climate change injustice is undoubtedly one of these themes, particularly for students in Black and Brown communities and the majority world. This effect becomes even more salient considering the fact that many rural areas of the Global South utilize schools as a central nexus point for cultural, civic, and social activities in addition to student education. Threats to schools and education thus represent a key link in the chain of cascading effects from climate change. At the same time, the preservation of schools and education is likely the best tool that humanity has to combat climate change. Will we make this a priority?

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CK: Conceptualization, Writing – original draft, Writing – review & editing. KE: Conceptualization, Writing – original draft, Writing – review & editing. VA: Conceptualization, Writing – original draft, Writing – review & editing.

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Conflict of interest

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References

Albrecht, G. A. (2020). Negating solastalgia: an emotional revolution from the anthropocene to the symbiocene. *American Imago* 77, 9–30. doi: 10.1353/aim.2020.0001

Allen, E. M., Munala, L., and Ward-Rannow, J. (2023). Do gender-based violence interventions consider the impacts of climate change? A systematic review. *Trauma Violence Abuse* 25, 2421–2435. doi: 10.1177/15248380231214793

Allison, M. A., Attisha, E., Lerner, M., De Pinto, C. D., Beers, N. S., Gibson, E. J., et al. (2019). The link between school attendance and good health. *Pediatrics* 143:e20183648. doi: 10.1542/peds.2018-3648

Anderson, R., Bayer, P. E., and Edwards, D. (2020). Climate change and the need for agricultural adaptation. *Curr. Opin. Plant Biol.* 56, 197–202. doi: 10.1016/j.pbi.2019.12.006

Ango, T. G., Börjeson, L., Wisborg, P., Senbeta, F., and Alem, H. (2022). Coffee, child labour, and education: examining a triple social–ecological trade-off in an Afromontane forest landscape. *Int. J. Educ. Dev.* 95:102681. doi: 10.1016/j.ijedudev.2022.102681

Auffhammer, M. (2018). Quantifying economic damages from climate change. *J. Econ. Perspect.* 32, 33–52. doi: 10.1257/jep.32.4.33

Bales, K., and Sovacool, B. K. (2021). From forests to factories: how modern slavery deepens the crisis of climate change. *Energy Res. Soc. Sci.* 77:102096. doi: 10.1016/j. erss.2021.102096

Bangay, C., and Blum, N. (2010). Education responses to climate change and quality: two parts of the same agenda? *Int. J. Educ. Dev.* 30, 359–368. doi: 10.1016/j. ijedudev.2009.11.011

Bates, M. (2017). Tracking disease: digital epidemiology offers new promise in predicting outbreaks. *IEEE Pulse* 8, 18–22. doi: 10.1109/MPUL.2016.2627238

Bauld, A. (2021). Why schools need to look at their own carbon footprint. Cambridge, MA: Harvard Graduate School of Education.

Beaglehole, B., Mulder, R. T., Frampton, C. M., Boden, J. M., Newton-Howes, G., and Bell, C. J. (2018). Psychological distress and psychiatric disorder after natural disasters: systematic review and meta-analysis. *Br. J. Psychiatry* 213, 716–722. doi: 10.1192/ bjp.2018.210

Benoit, L., Thomas, I., and Martin, A. (2022). Ecological awareness, anxiety, and actions among youth and their parents–a qualitative study of newspaper narratives. *Child Adolesc. Mental Health* 27, 47–58. doi: 10.1111/camh.12514

Berman, J. D., Burkhardt, J., Bayham, J., Carter, E., and Wilson, A. (2019). Acute air pollution exposure and the risk of violent behavior in the United States. *Epidemiology* 30, 799–806. doi: 10.1097/EDE.0000000000001085

Bonell, C., Parry, W., Wells, H., Jamal, F., Fletcher, A., Harden, A., et al. (2013). The effects of the school environment on student health: a systematic review of multi-level studies. *Health Place* 21, 180–191. doi: 10.1016/j.healthplace.2012.12.001

Borgna, C., and Struffolino, E. (2017). Pushed or pulled? Girls and boys facing early school leaving risk in Italy. *Soc. Sci. Res.* 61, 298–313. doi: 10.1016/j. ssresearch.2016.06.021

Boylan, R. L., and Renzulli, L. (2017). Routes and reasons out, paths back: the influence of push and pull reasons for leaving school on students' school reengagement. *Youth Soc.* 49, 46–71. doi: 10.1177/0044118X14522078

Brown, M. E., Backer, D., Billing, T., White, P., Grace, K., Doocy, S., et al. (2020). Empirical studies of factors associated with child malnutrition: highlighting the evidence about climate and conflict shocks. *Food Secur.* 12, 1241–1252. doi: 10.1007/ s12571-020-01041-y

Browning, M. H., and Rigolon, A. (2019). School green space and its impact on academic performance: a systematic literature review. *Int. J. Environ. Res. Public Health* 16:429. doi: 10.3390/ijerph16030429

Burke, S. E., Sanson, A. V., and Van Hoorn, J. (2018). The psychological effects of climate change on children. *Curr. Psychiatry Rep.* 20, 1–8. doi: 10.1007/ s11920-018-0896-9

Caruso, G., de Marcos, I., and Noy, I. (2024). Climate changes affect human capital. *Econ. Disasters Climate Change* 8, 157–196. doi: 10.1007/s41885-023-00140-2

Cattaneo, C., Beine, M., Fröhlich, C. J., Kniveton, D., Martinez-Zarzoso, I., Mastrorillo, M., et al. (2019). Human migration in the era of climate change. *Rev. Environ. Econ. Policy* 13, 189–206. doi: 10.1093/reep/rez008

Cevik, S., and Jalles, J. T. (2023). For whom the bell tolls: climate change and income inequality. *Energy Policy* 174:113475. doi: 10.1016/j.enpol.2023.113475

Chalupka, S., and Anderko, L. (2019). Climate change and schools: implications for children's health and safety. *Creat. Nurs.* 25, 249–257. doi: 10.1891/1078-4535.25.3.249

Chang, C. H., and Pascua, L. (2017). The curriculum of climate change education: a case for Singapore. *J. Environ. Educ.* 48, 172–181. doi: 10.1080/00958964.2017.1289883

Chigwanda, E. (2024). A changing climate: impact on adolescent girls. *Sustain. Climate Change* 17, 97–102. doi: 10.1089/scc.2024.0051

Cianconi, P., Betrò, S., and Janiri, L. (2020). The impact of climate change on mental health: a systematic descriptive review. *Front. Psych.* 11:74. doi: 10.3389/fpsyt.2020.00074

Clarke, P. T., Anderson, M., and Yoh, A. (2022). "Hey mom, I missed school today to save the planet!": mandatory attendance and student activism—a Canadian perspective. *Int. J. Educ. Reform* 31, 3–24. doi: 10.1177/10567879211031553

Clemens, V., von Hirschhausen, E., and Fegert, J. M. (2022). Report of the intergovernmental panel on climate change: implications for the mental health policy of children and adolescents in Europe—a scoping review. *Eur. Child Adolesc. Psychiatry* 31, 701–713. doi: 10.1007/s00787-020-01615-3

Conte Keivabu, R. (2024). Temperature and school absences: evidence from England. *Popul. Environ.* 46:6. doi: 10.1007/s11111-024-00448-5

Cuartas, J., Bhatia, A., Carter, D., Cluver, L., Coll, C., Donger, E., et al. (2023). Climate change is a threat multiplier for violence against children. *Child Abuse Negl.* 106430:106430. doi: 10.1016/j.chiabu.2023.106430

Currie, J., and Deschênes, O. (2016). Children and climate change: introducing the issue. *Futur. Child.* 26, 3–9. doi: 10.1353/foc.2016.0000

Currie, J., Hanushek, E. A., Kahn, E. M., Neidell, M., and Rivkin, S. G. (2009). Does pollution increase school absences? *Rev. Econ. Stat.* 91, 682–694. doi: 10.1162/ rest.91.4.682

Darmody, M., Byrne, D., and McGinnity, F. (2014). Cumulative disadvantage? Educational careers of migrant students in Irish secondary schools. *Race Ethn. Educ.* 17, 129–151. doi: 10.1080/13613324.2012.674021

Das, P. (2020). Child labour, seasonal migration and school exclusion: a sad story of tribal girls in rural India. *J. Rural. Dev.* 39, 504–518. doi: 10.25175/jrd/2020/v39/ i4/147530

Devonald, M., Jones, N., Iyasu Gebru, A., and Yadete, W. (2024). Rethinking climate change through a gender and adolescent lens in Ethiopia. *Clim. Dev.* 16, 176–186. doi: 10.1080/17565529.2022.2032568

Donaldson, A. L., Hardstaff, J. L., Harris, J. P., Vivancos, R., and O'Brien, S. J. (2021). School-based surveillance of acute infectious disease in children: a systematic review. *BMC Infect. Dis.* 21, 1–10. doi: 10.1186/s12879-021-06444-6

Ebi, K. L., Vanos, J., Baldwin, J. W., Bell, J. E., Hondula, D. M., Errett, N. A., et al. (2021). Extreme weather and climate change: population health and health system implications. *Annu. Rev. Public Health* 42, 293–315. doi: 10.1146/annurev-publhealth-012420-105026

Eilam, E. (2022). Climate change education: the problem with walking away from disciplines. *Stud. Sci. Educ.* 58, 231–264. doi: 10.1080/03057267.2021.2011589

Evans, G. W. (2019). Projected behavioral impacts of global climate change. *Annu. Rev. Psychol.* 70, 449–474. doi: 10.1146/annurev-psych-010418-103023

Evans, K., Perez-Aponte, J., and McRoy, R. (2020). Without a paddle: barriers to school enrollment procedures for immigrant students and families. *Educ. Urban Soc.* 52, 1283–1304. doi: 10.1177/0013124519894976

Ferguson, T., Roofe, C., and Cook, L. D. (2021). Teachers' perspectives on sustainable development: the implications for education for sustainable development. *Environ. Educ. Res.* 27, 1–17. doi: 10.1080/13504622.2021.1921113

Foster, S. J. (2022). Eco-anxiety in everyday life: facing the anxiety and fear of a degraded earth in analytic work. *J. Anal. Psychol.* 67, 1363–1385. doi: 10.1111/1468-5922.12860

Frumkin, H., and Haines, A. (2019). Global environmental change and noncommunicable disease risks. *Annu. Rev. Public Health* 40, 261–282. doi: 10.1146/ annurev-publhealth-040218-043706

Fu, M., Guo, J., Zhang, Q., and Hall, B. J. (2021). Mediating role of post-traumatic growth in the relationship between inadequate disaster recovery and mental health outcomes: long-term evidence from the Wenchuan earthquake. *Eur. J. Psychotraumatol.* 12:1855902. doi: 10.1080/20008198.2020.1855902

Garcia, D. M., and Sheehan, M. C. (2016). Extreme weather-driven disasters and children's health. *Int. J. Health Serv.* 46, 79–105. doi: 10.1177/0020731415625254

Gleick, P. H., and Shimabuku, M. (2023). Water-related conflicts: definitions, data, and trends from the water conflict chronology. *Environ. Res. Lett.* 18:034022. doi: 10.1088/1748-9326/acbb8f

Göbel, K., and Preusche, Z. M. (2019). Emotional school engagement among minority youth: the relevance of cultural identity, perceived discrimination, and perceived support. *Intercult. Educ.* 30, 547–563. doi: 10.1080/14675986.2019.1616263

Green, G., DeFosset, A., and Kuo, T. (2019). Residential mobility among elementary school students in Los Angeles County and early school experiences: opportunities for early intervention to prevent absenteeism and academic failure. *Front. Psychol.* 10:2176. doi: 10.3389/fpsyg.2019.02176

Greenfield, M. H. (2022). An urgent need to reassess climate change and child labour in agriculture. *Lancet Planet. Health* 6, e456–e457. doi: 10.1016/ S2542-5196(22)00118-8

Gunnarsson, V., Orazem, P. F., and Sánchez, M. A. (2006). Child labor and school achievement in Latin America. *World Bank Econ. Rev.* 20, 31–54. doi: 10.1093/ wber/lhj003

Hallegatte, S., Bangalore, M., Bonzanigo, L., Fay, M., Kane, T., Narloch, U., et al. (2016). Shock waves: managing the impacts of climate change on poverty. Washington, DC: World Bank.

Hanna, R., and Oliva, P. (2016). Implications of climate change for children in developing countries. *Futur. Child.* 26, 115–132. doi: 10.1353/foc.2016.0006

Hodson, C. B., and Sander, H. A. (2017). Green urban landscapes and school-level academic performance. *Landsc. Urban Plan.* 160, 16–27. doi: 10.1016/j. landurbplan.2016.11.011

Hopson, L. M., Lidbe, A. D., Jackson, M. S., Adanu, E., Li, X., Penmetsa, P., et al. (2022). Transportation to school and academic outcomes: a systematic review. *Educ. Rev.* 76, 648–668. doi: 10.1080/00131911.2022.2034748

Hopwood, T. L., Schutte, N. S., and Loi, N. M. (2019). Anticipatory traumatic reaction: outcomes arising from secondary exposure to disasters and large-scale threats. *Assessment* 26, 1427–1443. doi: 10.1177/1073191117731815

Hovdhaugen, E. (2015). Working while studying: the impact of term-time employment on dropout rates. *J. Educ. Work.* 28, 1–21. doi: 10.1080/13639080.2013.869311

Hrabok, M., Delorme, A., and Agyapong, V. I. (2020). Threats to mental health and well-being associated with climate change. *J. Anxiety Disord.* 76:102295. doi: 10.1016/j. janxdis.2020.102295

Huang, K., Zhao, H., Huang, J., Wang, J., and Findlay, C. (2020). Then impact of climate change on the labor allocation: empirical evidence from China. *J. Environ. Econ. Manag.* 104:102376. doi: 10.1016/j.jeem.2020.102376

Issa, M. H., Rankin, J. H., Attalla, M., and Christian, A. J. (2011). Absenteeism, performance and occupant satisfaction with the indoor environment of green Toronto schools. *Indoor Built Environ.* 20, 511–523. doi: 10.1177/1420326X11409114

John, A., Friedmann, Y., DelPozo-Banos, M., Frizzati, A., Ford, T., and Thapar, A. (2022). Association of school absence and exclusion with recorded neurodevelopmental disorders, mental disorders, or self-harm: a nationwide, retrospective, electronic cohort study of children and young people in Wales, UK. *Lancet Psychiatry* 9, 23–34. doi: 10.1016/S2215-0366(21)00367-9

Johnson, C. C., Walton, J. B., Strickler, L., and Elliott, J. B. (2023). Online teaching in K-12 education in the United States: a systematic review. *Rev. Educ. Res.* 93, 353–411. doi: 10.3102/00346543221105550

Kaczan, D. J., and Orgill-Meyer, J. (2020). The impact of climate change on migration: a synthesis of recent empirical insights. *Clim. Chang.* 158, 281–300. doi: 10.1007/s10584-019-02560-0

Kearney, C. A., Dupont, R., Fensken, M., and Gonzálvez, C. (2023). School attendance problems and absenteeism as early warning signals: review and implications for health-based protocols and school-based practices. *Front. Educ.* 8:1253595. doi: 10.3389/feduc.2023.1253595

Klein, A. (2023). Students want to know more about careers in climate change-now. Bethesda, MD: Education Week.

Kruger, D. I. (2007). Coffee production effects on child labor and schooling in rural Brazil. *J. Dev. Econ.* 82, 448–463. doi: 10.1016/j.jdeveco.2006.04.003

Laith, R., and Vaillancourt, T. (2022). The temporal sequence of bullying victimization, academic achievement, and school attendance: a review of the literature. *Aggress. Violent Behav.* 64:101722. doi: 10.1016/j.avb.2022.101722

Lawrence, D., Dawson, V., Houghton, S., Goodsell, B., and Sawyer, M. G. (2019). Impact of mental disorders on attendance at school. *Aust. J. Educ.* 63, 5–21. doi: 10.1177/0004944118823576

Lee, J., and Lubienski, C. (2017). The impact of school closures on equity of access in Chicago. *Educ. Urban Soc.* 49, 53–80. doi: 10.1177/0013124516630601

Lehmann, J., Lechner, V., and Scheithauer, H. (2021). School closures during the COVID-19 pandemic: psychosocial outcomes in children-a systematic review. *Int. J. Dev. Sci.* 15, 85–111. doi: 10.3233/DEV-220322

Levy, B. S., and Patz, J. A. (2015). Climate change, human rights, and social justice. *Ann. Glob. Health* 81, 310–322. doi: 10.1016/j.aogh.2015.08.008

Levy, B. S., Sidel, V. W., and Patz, J. A. (2017). Climate change and collective violence. *Annu. Rev. Public Health* 38, 241–257. doi: 10.1146/annurev-publhealth-031816-044232

Li, A., Guessoum, S. B., Ibrahim, N., Lefèvre, H., Moro, M. R., and Benoit, L. (2021). A systematic review of somatic symptoms in school refusal. *Psychosom. Med.* 83, 715–723. doi: 10.1097/PSY.0000000000000956

Ma, T., Moore, J., and Cleary, A. (2022). Climate change impacts on the mental health and wellbeing of young people: a scoping review of risk and protective factors. *Soc. Sci. Med.* 301:114888. doi: 10.1016/j.socscimed.2022.114888

Mahapatra, B., Walia, M., Rao, C. A. R., Raju, B. M. K., and Saggurti, N. (2021). Vulnerability of agriculture to climate change increases the risk of child malnutrition: evidence from a large-scale observational study in India. *PLoS One* 16:e0253637. doi: 10.1371/journal.pone.0253637

Makwana, N. (2019). Disaster and its impact on mental health: a narrative review. *J. Family Med. Prim. Care* 8, 3090–3095. doi: 10.4103/jfmpc.jfmpc_893_19

Manning, C., and Clayton, S. (Eds.) (2018). Psychology and climate change: human perceptions, impacts, and responses. London: Academic Press.

Martin, R., Benoit, J. P., Moro, M. R., and Benoit, L. (2020). A qualitative study of misconceptions among school personnel about absenteeism of children from immigrant families. *Front. Psych.* 11:202. doi: 10.3389/fpsyt.2020.00202

Matsuoka, Y., Haseda, M., Kanamori, M., Sato, K., Amemiya, A., Ojima, T., et al. (2023). Does disaster-related relocation impact mental health via changes in group participation among older adults? Causal mediation analysis of a pre-post disaster study of the 2016 Kumamoto earthquake. *BMC Public Health* 23:1982. doi: 10.1186/s12889-023-16877-0

Mazhin, S. A., Khankeh, H., Farrokhi, M., Aminizadeh, M., and Poursadeqiyan, M. (2020). Migration health crisis associated with climate change: a systematic review. *J. Educ. Health Promot.* 9:97. doi: 10.4103/jehp.jehp_4_20

McDermott, E. R., Anderson, S., and Zaff, J. F. (2018). Dropout typologies: relating profiles of risk and support to later educational re-engagement. *Appl. Dev. Sci.* 22, 217–232. doi: 10.1080/10888691.2016.1270764

McFarland, J., Stark, P., and Cui, J. (2016). Trends in high school dropout and completion rates in the United States: 2013. Compendium report. NCES 2016-117. Washington, DC: National Center for Education Statistics.

Memon, F. S. (2020). Climate change and violence against women: study of a flood-affected population in the rural area of Sindh, Pakistan. *Pak. J. Women's Stud.* 27, 65–85. doi: 10.46521/pjws.027.01.0039

Meyer, S. R., Yu, G., Hermosilla, S., and Stark, L. (2018). School violence, perceptions of safety and school attendance: results from a cross-sectional study in Rwanda and Uganda. *J. Global Health Rep.* 2:e2018020. doi: 10.29392/joghr.2.e2018020

Meza-Cordero, J. A. (2023). Conditional cash transfers tools to combat child labor: evidence from a randomized controlled trial in Costa Rica. *Rev. Dev. Econ.* 27, 220–246. doi: 10.1111/rode.12949

Mfon, U.-Y. (2024). "Climate change outcomes and educational development: implications of flooding on children's well-being and school attendance in Bayelsa State, Nigeria" in The climate-health-sustainability nexus: understanding the interconnected impact on populations and the environment. eds. P. Singh and N. Yadov (New York: Springer), 483–503.

Miles-Novelo, A., and Anderson, C. A. (2019). Climate change and psychology: effects of rapid global warming on violence and aggression. *Curr. Clim. Chang. Rep.* 5, 36–46. doi: 10.1007/s40641-019-00121-2

Nardulli, P. F., Peyton, B., and Bajjalieh, J. (2015). Climate change and civil unrest: the impact of rapid-onset disasters. *J. Confl. Resolut.* 59, 310–335. doi: 10.1177/0022002713503809

Ngo, N. S., and Horton, R. M. (2016). Climate change and fetal health: the impacts of exposure to extreme temperatures in new York City. *Environ. Res.* 144, 158–164. doi: 10.1016/j.envres.2015.11.016

Nordhaus, W. (2019). Climate change: the ultimate challenge for economics. *Am. Econ. Rev.* 109, 1991–2014. doi: 10.1257/aer.109.6.1991

Novia, K., Hariyanti, T., and Yuliatun, L. (2020). The impact of natural disaster on mental health of victims lives: systematic review. *Int. J. Soc.* 2, 65–85. doi: 10.54783/ijsoc.v2i3.128

Ofem, U. J., Nworgwugwu, E. C., Ovat, S. V., Anake, P. M., Anyin, N. N., Udeh, M. I., et al. (2024). Predicting affective and cognitive learning outcomes: a quantitative analysis using climate change vectors. *Eurasian J. Sci. Environ. Educ.* 4, 1–12. doi: 10.30935/ejsee/14405

Orr, C., Fisher, C., Bell, M., O'Donnell, M., Martin, K., Glauert, R., et al. (2023). Exposure to family and domestic violence is associated with lower attendance and higher suspension in school children. *Child Abuse Negl.* 142:105594. doi: 10.1016/j.chiabu.2022.105594

Paton, D., and Johnston, D. (2017). Disaster resilience: an integrated approach. *2nd Edn.* Springfield, IL: Charles C. Thomas.

Peguero, A. A. (2011). Violence, schools, and dropping out: racial and ethnic disparities in the educational consequence of student victimization. *J. Interpers. Violence* 26, 3753–3772. doi: 10.1177/0886260511403764

Prentice, C. M., Vergunst, F., Minor, K., and Berry, H. L. (2024). Education outcomes in the era of global climate change. *Nat. Clim. Chang.* 14, 214–224. doi: 10.1038/s41558-024-01945-z

Roberts, Y. H., Mitchell, M. J., Witman, M., and Taffaro, C. (2010). Mental health symptoms in youth affected by hurricane Katrina. *Prof. Psychol. Res. Pract.* 41, 10–18. doi: 10.1037/a0018339

Rosenthal, L., Moro, M. R., and Benoit, L. (2020). Migrant parents of adolescents with school refusal: a qualitative study of parental distress and cultural barriers in access to care. *Front. Psychol.* 10:942. doi: 10.3389/fpsyt.2019.00942

Rubinstein-Avila, E. (2017). Immigration and education: what should K-12 teachers, school administrators, and staff know? *The Clearing House: J. Educ. Strateg. Issues Ideas* 90, 12–17. doi: 10.1080/00098655.2016.1234817

Saeed, S. A., and Gargano, S. P. (2022). Natural disasters and mental health. *Int. Rev. Psychiatry* 34, 16–25. doi: 10.1080/09540261.2022.2037524

Sakaguchi, K., Varughese, A., and Auld, G. (2017). Climate wars? A systematic review of empirical analyses on the links between climate change and violent conflict. *Int. Stud. Rev.* 19, 622–645. doi: 10.1093/isr/vix022

Sanson, A. V., Malca, K. P., Van Hoorn, J., and Burke, S. (2022). Children and climate change. Cambridge: Cambridge University Press.

Schwartz, S. E., Benoit, L., Clayton, S., Parnes, M. F., Swenson, L., and Lowe, S. R. (2023). Climate change anxiety and mental health: environmental activism as buffer. *Curr. Psychol.* 42, 16708–16721. doi: 10.1007/s12144-022-02735-6

Sharma, M. S. (2023). Climate change and health: exploring the global south's leadership. New York: The Rockefeller Foundation.

Sheffield, P. E., Uijttewaal, S. A., Stewart, J., and Galvez, M. P. (2017). Climate change and schools: environmental hazards and resiliency. *Int. J. Environ. Res. Public Health* 14:1397. doi: 10.3390/ijerph14111397

Sparks, J. L. D., Boyd, D. S., Jackson, B., Ives, C. D., and Bales, K. (2021). Growing evidence of the interconnections between modern slavery, environmental degradation, and climate change. *One Earth* 4, 181–191. doi: 10.1016/j.oneear.2021.01.015

Staff, J., Yetter, A. M., Cundiff, K., Ramirez, N., Vuolo, M., and Mortimer, J. T. (2020). Is adolescent employment still a risk factor for high school dropout? *J. Res. Adolesc.* 30, 406–422. doi: 10.1111/jora.12533

Stempel, H., Cox-Martin, M., Bronsert, M., Dickinson, L. M., and Allison, M. A. (2017). Chronic school absenteeism and the role of adverse childhood experiences. *Acad. Pediatr.* 17, 837–843. doi: 10.1016/j.acap.2017.09.013

Thapa, R., Gough, A., and Cooper, G. (2024). Understanding the impact of climate change on Bhutanese school communities: challenges and responses. *Interdis. J. Environ. Sci. Educ.* 20:e2413. doi: 10.29333/ijese/14692

Tol, R. S. (2018). The economic impacts of climate change. *Rev. Environ. Econ. Policy* 12, 4–25. doi: 10.1093/reep/rex027

Tol, R. S. (2024). A meta-analysis of the total economic impact of climate change. *Energy Policy* 185:113922. doi: 10.1016/j.enpol.2023.113922

UNESCO (2019). Combining data on out-of-school children, completion and learning to offer a more comprehensive view on SDG 4. Montreal: UNESCO Institute for Statistics.

UNICEF (2021). The climate crisis is a child rights crisis: introducing the children's climate risk index. New York: UNICEF.

Vakalis, D., Lepine, C., MacLean, H. L., and Siegel, J. A. (2021). Can green schools influence academic performance? *Crit. Rev. Environ. Sci. Technol.* 51, 1354–1396. doi: 10.1080/10643389.2020.1753631

van Nieuwenhuizen, A., Hudson, K., Chen, X., and Hwong, A. R. (2021). The effects of climate change on child and adolescent mental health: clinical considerations. *Curr. Psychiatry Rep.* 23, 88–89. doi: 10.1007/s11920-021-01296-y

van Velzen, C., and Helbich, M. (2023). Green school outdoor environments, greater equity? Assessing environmental justice in green spaces around Dutch primary schools. *Landsc. Urban Plan.* 232:104687. doi: 10.1016/j.landurbplan.2023.104687

Vanaken, G. J., and Danckaerts, M. (2018). Impact of green space exposure on children's and adolescents' mental health: a systematic review. *Int. J. Environ. Res. Public Health* 15:2668. doi: 10.3390/ijerph15122668

Vergunst, F., and Berry, H. L. (2022). Climate change and children's mental health: a developmental perspective. *Clin. Psychol. Sci.* 10, 767–785. doi: 10.1177/21677026211040787

von Uexkull, N., Loy, A., and d'Errico, M. (2023). Climate, flood, and attitudes toward violence: Micro-level evidence from Karamoja, Uganda. *Reg. Environ. Change* 23:57. doi: 10.1007/s10113-023-02054-x

World Health Organization (2020). The potential impact of health service disruptions on the burden of malaria: a modelling analysis for countries in sub-Saharan Africa. Geneva: Author.

World Health Organization (2021). COP26 special report on climate change and health: the health argument for climate action. Geneva: Author.

Xu, Z., Sheffield, P. E., Hu, W., Su, H., Yu, W., Qi, X., et al. (2012). Climate change and children's health—a call for research on what works to protect children. *Int. J. Environ. Res. Public Health* 9, 3298–3316. doi: 10.3390/ijerph9093298

Xu, R., Yu, P., Abramson, M. J., Johnston, F. H., Samet, J. M., Bell, M. L., et al. (2020). Wildfires, global climate change, and human health. *N. Engl. J. Med.* 383, 2173–2181. doi: 10.1056/NEJMsr2028985

Yilmazel, G., and Atay, D. (2023). Challenges of migrant students in Turkish higher education. *Diaspora Indigen. Minor. Educ.* 17, 132–145. doi: 10.1080/15595692.2022.2066077