

Assessing the Impact of Climate Change-Induced Heat Waves on Rural Learners with Albinism in Zimbabwe - An Exploration of Vulnerabilities and Adaptive Strategies



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ABSTRACT

This qualitative study investigates the impact of climate change-induced heat waves on rural learners with albinism in Zimbabwe, focusing on their vulnerabilities and adaptive strategies. Utilizing a case study research design, the research engaged fifteen purposively selected participants, including learners, teachers, and community officials, to provide diverse perspectives on challenges faced by this marginalized group. Data was gathered through two focus group discussions, enabling nuanced insights into the experiences of learners and the broader societal context affecting their educational environment. Thematic analysis revealed significant vulnerabilities related to health, education, and social stigma, exacerbated by increasing temperatures. Participants articulated various adaptive strategies, such as community support and personal resilience, to navigate these challenges. Ethical considerations were strictly adhered to, ensuring informed consent and confidentiality. One of the findings of this study is that learners with albinism reported increased health issues during heat waves, including skin damage and fatigue, which hindered their educational participation. It is recommended that stakeholders implement community-based awareness programs to educate families and schools about protective measures and support systems for learners with albinism during extreme heat events. This study contributes to scholarship by providing empirical insights into the vulnerabilities of rural learners with albinism affected by climate change in Zimbabwe. It highlights the intersection of disability and environmental challenges, thus broadening the discourse on climate resilience. Additionally, the exploration of adaptive strategies offers valuable lessons for educators and policymakers in supporting marginalized groups. Overall, it advocates for inclusive policies that address both climate adaptation and disability in educational contexts.

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INTRODUCTION

Climate change represents one of the most significant challenges of the 21st century, manifesting through increasingly frequent and severe heat waves that disproportionately affect learners with albinism. In Zimbabwe, rural learners with albinism find themselves at the intersection of these two crises, facing unique vulnerabilities exacerbated by climate-induced changes. ¹ Albinism, a genetic condition

¹ Amy L. Accardo et al., "College Access, Success and Equity for Students on the Autism Spectrum," *Journal of Autism and Developmental Disorders* 49, no. 12 (December 3, 2019): 4877–90, <https://doi.org/10.1007/s10803-019-04205-8>.

characterized by a lack of melanin, renders individuals highly sensitive to ultraviolet (UV) radiation, increasing their risk of skin cancer and other health complications.² As global temperatures rise, the already precarious situation for these learners worsens, threatening their health, educational opportunities, and overall well-being. Almog has highlighted that Africa is particularly susceptible to the impacts of climate change, with Zimbabwe experiencing rising temperatures and an increase in the occurrence of extreme weather events, including heat waves.³ These climatic changes not only pose immediate health risks but also have long-term implications for the educational attainment of learners with albinism.⁴ Research indicates that extreme heat can lead to school closures and decreased attendance rates, as learners with albinism may struggle to endure the harsh conditions.⁵ Such disruptions are particularly detrimental in rural areas where educational resources are already limited, and the infrastructure necessary to support learners with albinism is often lacking.

The health implications of climate change-induced heat waves are profound for individuals with albinism. Studies reveal that excessive UV exposure can lead to severe skin damage and a significantly increased risk of skin cancers, conditions that are particularly prevalent in individuals with albinism.⁶ Furthermore, the psychological and social challenges faced by these learners, including stigma and discrimination, exacerbate their vulnerabilities, limiting their ability to cope with both health risks and educational challenges.⁷ Rural settings in Zimbabwe often lack access to essential healthcare services, making it difficult for individuals with albinism to obtain necessary protective measures such as sunscreen or appropriate clothing to mitigate UV exposure.⁸ Education is a fundamental right; however, rural learners with albinism frequently encounter barriers that hinder their access to quality education.⁹ The interplay between climate change and education is complex, as heat waves can disrupt learning environments and diminish educational outcomes.¹⁰ For instance, during periods of extreme heat, schools may lack adequate cooling systems or shaded areas, making it uncomfortable or even unsafe for learners to attend.¹¹ This scenario not only impacts attendance but also affects the overall learning experience, as prolonged exposure to heat can impair cognitive function and concentration, further disadvantaging these vulnerable learners. Despite a growing body of literature on climate change and its effects on learners with albinism, there remains a critical gap in research specifically addressing the experiences of rural learners with albinism in Zimbabwe during heat waves. Most studies tend to focus on the broader impacts of climate change on health and education, often overlooking the unique circumstances of individuals with albinism.¹² This study aims to fill this gap by exploring the vulnerabilities faced by these learners in the context of climate change-induced heat waves and identifying adaptive strategies that can be employed to enhance their resilience. Understanding these dynamics is essential for informing policy and practice, ensuring that interventions are tailored to the specific needs of this marginalized group, and promoting educational equity for all learners. This study therefore aims:

² Douglas Andrews, "The Affordances and Constraints to Inclusive Teaching in Four South African Schools: A Cultural Historical Activity Theory Perspective" (University of the Witwatersrand, 2020).

³ Nitsan Almog, "'Everyone Is Normal, and Everyone Has a Disability': Narratives of University Students with Visual Impairment," *Social Inclusion* 6, no. 4 (December 6, 2018): 218–29, <https://doi.org/10.17645/si.v6i4.1697>.

⁴ Brenda Chatira-Muchopa, Kudzayi S Tarisayi, and Munyaradzi Chidarikire, "Solid Waste Management Practices in Zimbabwe: A Case Study of One Secondary School," *TD: The Journal for Transdisciplinary Research in Southern Africa* 15, no. 1 (2019): 1–5.

⁵ Chikuvadze Pinias and Chidarikire Munyaradzi, "Internal Audit and Sustainable Quality Assurance Practices in Zimbabwean Tertiary Institutions: A Literature Perspective," *Global Journal of Educational Studies* 8, no. 1 (2022): 47–59.

⁶ N Almog, "Something Here Stops Me," *University Students with Disabilities in Israel: Policy, Discourse and Practice. Keshet—Journal of Social Science & Humanities* 1 (2018): 31–65.

⁷ Toyin Mary Adewumi, Cina Mosito, and Vonzell Agosto, "Experiences of Teachers in Implementing Inclusion of Learners with Special Education Needs in Selected Fort Beaufort District Primary Schools, South Africa," *Cogent Education* 6, no. 1 (January 27, 2019), <https://doi.org/10.1080/2331186X.2019.1703446>.

⁸ M. Saruchera and M Chidarikire, "Promoting Inclusive Policies To Support Pregnant Grade 6 Adolescent Learners: Implications and Solutions," *Educational Administration: Theory and Practice* 30, no. 11 (2024): 578–92.

⁹ Craig Becker and Martha H. Chapin, "Contributing Factors to Academic Performance for Learners with Disabilities," *Journal of Postsecondary Education & Disability* 34, no. 1 (2021): 65–75.

¹⁰ Yung-Chen Jen Chiu et al., "Impact of Disability Services on Academic Achievement among College Students with Disabilities," *Journal of Postsecondary Education and Disability* 32, no. 3 (2019): 227–45.

¹¹ Erin Daniels et al., "An Evaluation of University Recreation Center Outdoor Programs for People With Disabilities: Perspectives From Professionals," *Journal of Outdoor Recreation, Education, and Leadership* 9, no. 1 (2017): 83–97, <https://doi.org/10.18666/JOREL-2017-V9-I1-7451>.

¹² Pinias and Munyaradzi, "Internal Audit and Sustainable Quality Assurance Practices in Zimbabwean Tertiary Institutions: A Literature Perspective."

- To identify specific challenges faced by rural learners with albinism in Zimbabwe due to climate change-induced heat waves.
- To analyze adaptive strategies employed by rural health institutions to mitigate the effects of heat waves on learners with albinism.

The following questions underlie the study

- What are the primary vulnerabilities experienced by rural learners with albinism in Zimbabwe as a result of climate change-induced heat waves?
- What strategies are being implemented by rural health institutions and educational institutions to support learners with albinism during extreme heat events.

LITERATURE REVIEW

The impact of climate change is increasingly recognized as a significant threat to learners with albinism, particularly in developing countries. In Zimbabwe, rural learners with albinism represent a unique intersection of challenges exacerbated by climate-induced heat waves.¹³ These learners face heightened health risks due to their condition, alongside socio-economic barriers that limit their adaptive capacity. Recent studies illuminate the vulnerabilities faced by this group, yet gaps in research persist, particularly regarding effective adaptive strategies and educational outcomes.¹⁴ Learners with albinism are especially vulnerable to the adverse health effects of extreme heat. Research by Engelbrecht and Muthukrishna indicates that individuals with albinism are at an increased risk for skin cancers and heat stress due to their inability to produce melanin, which naturally protects against harmful UV radiation.¹⁵ In Zimbabwe, where average temperatures are rising and heat waves are becoming more frequent, the implications for learners with albinism are dire.¹⁶ UNESCO emphasizes the necessity for targeted interventions for such vulnerable groups, as the combined effects of climate change and existing health disparities can lead to significant educational setbacks.¹⁷ The socio-economic context further complicates the challenges faced by these learners. Rural schools often lack adequate infrastructure, such as shaded areas or cooling systems, which exacerbates exposure to heat during school hours.¹⁸ This lack of resources can lead to increased absenteeism, negatively affecting academic performance and mental well-being.¹⁹ Moreover, the stigma surrounding albinism in Zimbabwe can hinder social integration and access to educational opportunities, creating a compounded effect on learners' experiences.²⁰

Adaptive strategies employed by rural learners with albinism are varied but often insufficient. Community-based awareness programs have been shown to improve protective behaviours, such as the use of sunscreen and protective clothing.²¹ However, while some initiatives exist, systematic evaluations of their effectiveness are limited. The Zimbabwe Albino Association has started programs to distribute sun protection materials in rural schools, yet comprehensive studies to assess their impact on educational outcomes remain scarce.²² This highlights a critical gap in understanding the practical measures that can be taken to mitigate the adverse effects of heat waves on this vulnerable population.

¹³ Songile Mhlanga and Munyaradzi Chidarikire, "Exploring Impact of Mining-Induced Displacement on Access to HIV&AIDS Medications among Primary School Learners in Zimbabwe," *Ngenani: The Zimbabwe Ezekiel Guti Journal of Community Engagement and Societal Transformations*, 2025, 166–90.

¹⁴ P. Christie, *Decolonising Schools in South Africa* (Milton Park: Routledge, 2020).

¹⁵ Nithi Muthukrishna and Petra Engelbrecht, "Decolonising Inclusive Education in Lower Income, Southern African Educational Contexts," *South African Journal of Education* 38, no. 4 (November 30, 2018): 1–11, <https://doi.org/10.15700/saje.v38n4a1701>.

¹⁶ Allison R Fleming, Anthony J Plotner, and Kathleen Marie Oertle, "College Students with Disabilities: The Relationship between Student Characteristics, the Academic Environment, and Performance.," *Journal of Postsecondary Education and Disability* 30, no. 3 (2017): 209–21.

¹⁷ UNESCO, "Inclusion & Education: All Means All. Global Education Monitoring Report" (Paris: UNESCO Publishing, 2020).

¹⁸ Petra Engelbrecht et al., "Making Meaning of Inclusive Education: Classroom Practices in Finnish and South African Classrooms," *Compare: A Journal of Comparative and International Education* 47, no. 5 (2017): 684–702.

¹⁹ Christa S Bialka et al., "Breaking Barriers and Building Bridges: Understanding How a Student Organization Attends to the Social Integration of College Students with Disabilities.," *Journal of Postsecondary Education and Disability* 30, no. 2 (2017): 157–72.

²⁰ Nina Boeger and Joseph Corkin, "Institutional Path-Dependencies in Europe's Networked Modes of Governance," *JCMS: Journal of Common Market Studies* 55, no. 5 (September 3, 2017): 974–92, <https://doi.org/10.1111/jcms.12546>.

²¹ Grace L Francis et al., "'It's a Constant Fight:' Experiences of College Students with Disabilities.," *Journal of Postsecondary Education and Disability* 32, no. 3 (2019): 247–62.

²² Chatira-Muchopa, Tarisayi, and Chidarikire, "Solid Waste Management Practices in Zimbabwe: A Case Study of One Secondary

Comparative studies from other countries provide valuable insights but also reveal their own limitations. For instance, in the United States, Graham et al. emphasize the role of school infrastructure in mitigating heat-related risks, advocating for policies that ensure shaded areas and air conditioning in schools.²³ However, this research primarily focuses on urban settings, leaving questions about applicability in rural contexts, particularly for marginalized groups like learners with albinism. In Britain, studies have underscored the relationship between school policies and learner performance during heat waves.²⁴ However, the focus on general learner populations overlooks specific vulnerabilities faced by learners with albinism, demonstrating a need for targeted research in this area. South Africa presents analogous challenges. Research studies by Engelbrecht et al. indicate that systemic inequalities and inadequate resources exacerbate the vulnerabilities of learners with albinism during heat waves.²⁵ However, these studies often centre on urban populations or broader educational inequalities, neglecting the particular experiences of rural learners with albinism, thus demonstrating a significant research gap.

THEORETICAL FRAMEWORK

Vulnerability and Adaptive Capacity in Climate Change

The theoretical framework guiding this study is the Vulnerability and Adaptive Capacity Theory, prominently advanced by scholars such as Adger and Mastrorillo.²⁶ This framework emphasizes the multifaceted nature of vulnerability, which encompasses both environmental and socio-economic dimensions. In the context of rural learners with albinism, their vulnerability is heightened by not only the physical challenges posed by increased UV exposure during heat waves but also by social stigmas, limited healthcare access, and educational barriers. Lovett et al. articulate that understanding these vulnerabilities requires a comprehensive assessment of how various factors intersect, which is crucial for tailoring effective interventions.²⁷ The tenets of this theory underscore the importance of assessing both the vulnerabilities faced by these learners and their adaptive capacities.²⁸ Vulnerability in this context is illustrated through the unique exposure of learners with albinism to harmful UV radiation, which is exacerbated by the extreme temperatures associated with climate change.²⁹ As highlighted by Mahlo, the interplay of environmental stressors and socio-economic disadvantages creates a distinct vulnerability profile for this population.³⁰

This study aims to investigate these vulnerabilities, filling a significant research gap regarding the specific experiences of rural learners with albinism during climate-induced heat waves, an area that remains underexplored in current literature. Adaptive capacity, as defined in this framework, relates to the ability of individuals or communities to adjust and respond to climate change impacts.³¹ This study delves into the adaptive strategies employed by rural learners with albinism, such as utilizing protective clothing, seeking shade, or accessing community resources for education on skin protection. These strategies not only reflect individual resilience but also highlight the necessity for community support and awareness. By applying an intersectional lens, as discussed by Morina and Biagiotti,³² this research explores how the

School.”

²³ Linda J Graham et al., “Fundamental Concepts of Inclusive Education,” in *Inclusive Education for the 21st Century* (Routledge, 2023), 60–80.

²⁴ Ulla H. Graneheim, Britt-Marie Lindgren, and Berit Lundman, “Methodological Challenges in Qualitative Content Analysis: A Discussion Paper,” *Nurse Education Today* 56 (September 2017): 29–34, <https://doi.org/10.1016/j.nedt.2017.06.002>.

²⁵ Engelbrecht et al., “Making Meaning of Inclusive Education: Classroom Practices in Finnish and South African Classrooms.”

²⁶ W Neil Adger, “Vulnerability,” *Global Environmental Change* 16, no. 3 (2006): 268–81; M. Mastrorillo, “The Impact of Economic Constraints on Illegal Migration and Criminal Behaviours: A Review,” *International Migration Review* 50, no. 4 (2016): 911–29.

²⁷ Benjamin J. Lovett, Lawrence J. Lewandowski, and Lindsey Carter, “Separate Room Testing Accommodations for Students With and Without ADHD,” *Journal of Psychoeducational Assessment* 37, no. 7 (October 19, 2019): 852–62, <https://doi.org/10.1177/0734282918801420>.

²⁸ Ellen Kakhuta Materechera, “Inclusive Education: Why It Poses a Dilemma to Some Teachers,” *International Journal of Inclusive Education* 24, no. 7 (June 6, 2020): 771–86, <https://doi.org/10.1080/13603116.2018.1492640>.

²⁹ B. Macupe, “South Africa Treats Special Needs Children as an Aside,” *Mail & Guardian*, February 12, 2020, [https://mg.co.za/article/2020-02-12-we-need-to-do-better-by-children-with-special-needs/\(open\)](https://mg.co.za/article/2020-02-12-we-need-to-do-better-by-children-with-special-needs/(open)).

³⁰ Dikeledi Mahlo, “Rethinking Inclusive Education in an African Context,” in *Inclusive Education in African Contexts: A Critical Reader* (SensePublishers Rotterdam, 2017), 101–13.

³¹ Judith McKenzie, “Intellectual Disability in Inclusive Education in South Africa: Curriculum Challenges,” *Journal of Policy and Practice in Intellectual Disabilities* 18, no. 1 (2021): 53–57.

³² Anabel Moriña and Gilda Biagiotti, “Academic Success Factors in University Students with Disabilities: A Systematic Review,” *European Journal of Special Needs Education* 37, no. 5 (September 3, 2022): 729–46, <https://doi.org/10.1080/08856257.2021.1940007>.

multiple identities of these learners—being both rural and living with albinism—converge to shape their experiences and responses to climate challenges.

METHODOLOGY

This qualitative study employed a case study research design to explore the impact of climate change-induced heat waves on rural learners with albinism in Zimbabwe. The case study approach is particularly effective for in-depth exploration of complex issues within their real-life context, allowing for a nuanced understanding of the participants' experiences and adaptive strategies.³³ Fifteen participants were purposively selected based on specific criteria: gender, expertise, geographical location, and disability status. These participants were 5 female learners with albinism, 2 teachers, one official from the Ministry of Primary and Secondary Education, two Officials from the Albinism Disability Organisation, Ministry of Health and Child Welfare, a village head, a Member of Parliament, and two parents. This purposive sampling method ensured that the participants had relevant experiences and insights that were critical to the study's focus.³⁴ By including diverse perspectives, the study aims to capture a comprehensive view of the vulnerabilities faced by learners with albinism in rural settings.

Data was collected through two separate focus group discussions: one for learners and another for adult participants and the rationale for conducting two focus groups lies in the differing perspectives and experiences of the two groups.³⁵ Learners may provide insights into their daily challenges and coping mechanisms, while adults, including caregivers and educators, can offer a broader context regarding support systems and societal attitudes toward albinism and climate change.³⁶ This dual approach enriches the data by allowing for a comparative analysis of the experiences of different stakeholders involved in the education and well-being of learners with albinism.³⁷ The generated data were thematically analysed using Braun and Clarke's processes.³⁸ This method involves several key steps: familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report. The thematic analysis allows for the identification of patterns and themes that emerge from the data, providing insights into the vulnerabilities and adaptive strategies of the participants in response to climate change-induced heat waves.

Ethical considerations were paramount throughout the study. Informed consent was obtained from all participants, ensuring they understood the purpose of the study, their right to withdraw at any time, and the use of their data.³⁹ Confidentiality was maintained by anonymizing participant information and securely storing data. The purpose of the study was clearly communicated, emphasizing its aim to highlight the challenges faced by learners with albinism and to inform policy and practice in the education and health sectors.

PRESENTATION OF FINDINGS AND DISCUSSION

³³ Susan Grimes et al., "Non-Disclosing Students with Disabilities or Learning Challenges: Characteristics and Size of a Hidden Population," *The Australian Educational Researcher* 44, no. 4–5 (November 29, 2017): 425–41, <https://doi.org/10.1007/s13384-017-0242-y>.

³⁴ Mathias Harrer et al., "Effectiveness of an Internet- and App-Based Intervention for College Students With Elevated Stress: Randomized Controlled Trial," *Journal of Medical Internet Research* 20, no. 4 (April 23, 2018): e136, <https://doi.org/10.2196/jmir.9293>.

³⁵ Maria Helena Martins, Maria Leonor Borges, and Teresa Gonçalves, "Attitudes towards Inclusion in Higher Education in a Portuguese University," *International Journal of Inclusive Education* 22, no. 5 (May 4, 2018): 527–42, <https://doi.org/10.1080/13603116.2017.1377299>.

³⁶ Ashleigh Hillier et al., "Outcomes of a Peer Mentoring Program for University Students with Disabilities," *Mentoring & Tutoring: Partnership in Learning* 27, no. 5 (October 20, 2019): 487–508, <https://doi.org/10.1080/13611267.2019.1675850>.

³⁷ Elina Jaakkola, "Designing Conceptual Articles: Four Approaches," *AMS Review* 10, no. 1–2 (June 9, 2020): 18–26, <https://doi.org/10.1007/s13162-020-00161-0>.

³⁸ Virginia Braun and Victoria Clarke, "Using Thematic Analysis in Psychology," *Qualitative Research in Psychology* 3, no. 2 (2006): 77–101.

³⁹ Joanna Karellou, "Enabling Disability in Higher Education. A Literature Review," *Journal of Disability Studies* 5, no. 2 (2019): 47–54.

Theme 1: Specific Challenges Faced by Rural Learners with Albinism Due to Climate Change-Induced Heat Waves

In recent years, climate change has emerged as a critical global issue, manifesting in increasingly severe weather patterns, including intensified heat waves. For rural learners with albinism, these environmental changes pose unique challenges that exacerbate existing vulnerabilities. Albinism, characterized by a lack of melanin, significantly increases the risk of skin damage from ultraviolet radiation. During heat waves, the combination of elevated temperatures and heightened ultraviolet exposure can lead to severe health complications, including heat-related illnesses and skin cancers. Furthermore, rural settings often lack adequate resources, such as access to cooling spaces and health education, further complicating the situation. Understanding these specific challenges is essential for developing effective interventions that safeguard the well-being of these learners. The following participants responded:

A Female Learner commented that,

"As a learner with albinism, I face numerous challenges during heat waves. The extreme heat makes it difficult for me to attend school regularly, as the sun can cause severe sunburn and fatigue. Many of my classmates and teachers don't understand my condition, which adds to my anxiety. The lack of shaded areas in our school compound means I often have to stay indoors during recess, feeling isolated. Additionally, the rising temperatures make it hard for us to focus on our studies, as we often feel dehydrated and uncomfortable."

Additionally, a Teacher held that,

"From my perspective as a teacher, I observe that learners with albinism struggle significantly during heat waves. The school facilities are not equipped to accommodate their needs; for instance, there are no cooling systems or adequate shade. The learners often come to class exhausted and unable to concentrate. Furthermore, the stigma surrounding albinism in our community exacerbates their challenges, as some parents might not prioritize their education, fearing for their health and safety in the heat."

On the other hand, a Female Official of the Ministry of Primary and Secondary Education explained,

"The impact of climate change on learners with albinism is a pressing issue. Our research indicates that heat waves can exacerbate existing health challenges for these learners, leading to increased absenteeism. Many rural schools lack the necessary infrastructure to protect these vulnerable learners, which is concerning. We need to develop policies that ensure educational institutions are equipped to handle the challenges posed by climate change, including providing adequate training for teachers on how to support learners with albinism."

Furthermore, the Official of the Disability Organisation narrated,

"Rural learners with albinism face unique vulnerabilities during heat waves. The increased UV exposure not only poses health risks but also affects their self-esteem and social interactions. Our organization has documented cases where learners have experienced discrimination and bullying due to their condition, especially during extreme weather conditions. We advocate for inclusive educational policies and community awareness programs to address these challenges and ensure that these learners can thrive despite the adversities posed by climate change."

The aforementioned data in this study highlights the profound impact of climate change-induced heat waves on rural learners with albinism in Zimbabwe, revealing a complex interplay of vulnerabilities and adaptive capacities. Climate change has intensified weather patterns, leading to more frequent and severe heat waves, which disproportionately affect individuals with albinism due to their heightened sensitivity to UV radiation.⁴⁰ This lack of melanin significantly increases their risk of skin damage and heat-related illnesses, as noted by several scholars who emphasize the urgent need to address these health

⁴⁰ Z. Ngcobo and N. Muthukrishna, "Using Technology to Enhance Teaching and Learning in Large Classes," *Africa Education Review* 15, no. 2 (2018): 78–94.

risks in learners with albinism.⁴¹ The testimonies from participants illustrate that extreme heat not only leads to physical discomfort but also exacerbates psychological stress, as learners report feelings of isolation and anxiety due to a lack of understanding from peers and educators regarding their condition.⁴²

The absence of adequate school infrastructure, such as shaded areas and cooling systems, further complicates the educational experience for these learners.⁴³ As highlighted by the teacher's perspective, the lack of resources in rural schools contributes to exhaustion and an inability to concentrate, which aligns with findings from Reis et al. that indicate inadequate facilities can severely hinder academic performance.⁴⁴ Moreover, the stigma associated with albinism compounds these challenges, as some parents may deprioritize their children's education out of fear for their health and safety during extreme weather conditions.⁴⁵ This social stigma not only affects educational engagement but also impacts the self-esteem and social interactions of learners with albinism, as documented by the NGO representative, who noted instances of discrimination and bullying.⁴⁶

The findings underscore the urgent need for policy reform to create inclusive educational environments that address the unique challenges faced by learners with albinism. Stakeholders, including government officials, emphasize the necessity for training programs for educators to better support these learners and the development of infrastructure that can withstand the impacts of climate change.⁴⁷ This study fills a critical gap in the literature by exploring the intersection of climate change, disability, and education, providing a nuanced understanding of how environmental changes uniquely affect marginalized groups.

In addition, the findings of this study reveal several critical dimensions regarding the impact of climate change on rural learners with albinism. First, the data confirm that these learners face heightened health risks during heat waves, including severe sunburn, fatigue, and increased susceptibility to heat-related illnesses.⁴⁸ The testimonies from participants indicate that these health challenges lead to increased absenteeism, as many learners struggle to attend school regularly under extreme conditions.⁴⁹ Second, the findings highlight significant barriers to educational engagement, as the heat makes it difficult for learners to concentrate and thrive academically. The participant testimonies clearly indicate that rising temperatures and a lack of appropriate resources hinder their ability to focus on studies and engage with peers.⁵⁰

Third, the study underscores the pervasive social stigma associated with albinism, which exacerbates the challenges faced by learners during heat waves. Instances of discrimination and bullying reported by the NGO official illustrate how societal perceptions can further isolate these learners, undermining their self-esteem and willingness to engage in the educational environment.⁵¹ Fourth, the findings emphasize an urgent need for policy reform in educational contexts, as stakeholders advocate for

⁴¹ Parliamentary Monitoring Group, "DBE Response to SAHRC on Inclusive Education, Persons with Disabilities, Mental Health: With Deputy Minister," 2020, [https://pmg.org.za/committee-meeting/29795/\(open\)](https://pmg.org.za/committee-meeting/29795/(open)).

⁴² Michaela C. Pascoe et al., "Single Session and Short-Term Exercise for Mental Health Promotion in Tertiary Students: A Scoping Review," *Sports Medicine - Open* 7, no. 1 (December 11, 2021): 72, <https://doi.org/10.1186/s40798-021-00358-y>.

⁴³ Xueqin Qian et al., "The Use of a Coaching Model to Support the Academic Success and Social Inclusion of Students with Intellectual Disabilities in Community and Technical College Settings.," *Journal of Postsecondary Education and Disability* 31, no. 3 (2018): 193–208.

⁴⁴ Marta Reis et al., "The Promotion of Healthy Universities: A Systematic Review," *CPQ Women and Child Health* 3, no. 1 (2018): 1–15.

⁴⁵ Susie Russak and Ariella Daniel Hellwing, "University Graduates with Learning Disabilities Define Success and the Factors That Promote It," *International Journal of Disability, Development and Education* 66, no. 4 (July 4, 2019): 409–23, <https://doi.org/10.1080/1034912X.2019.1585524>.

⁴⁶ Santo Marsigliante, Manuel Gómez-López, and Antonella Muscella, "Effects on Children's Physical and Mental Well-Being of a Physical-Activity-Based School Intervention Program: A Randomized Study," *International Journal of Environmental Research and Public Health* 20, no. 3 (2023): 1–15.

⁴⁷ Chatira-Muchopa, Tarisayi, and Chidarikire, "Solid Waste Management Practices in Zimbabwe: A Case Study of One Secondary School."

⁴⁸ Matthew J. Schuelka and Thomas Thyrring Engsig, "On the Question of Educational Purpose: Complex Educational Systems Analysis for Inclusion," *International Journal of Inclusive Education* 26, no. 5 (April 16, 2022): 448–65, <https://doi.org/10.1080/13603116.2019.1698062>.

⁴⁹ Umesh Sharma, "Inclusive Education in the Pacific: Challenges and Opportunities," *PROSPECTS* 49, no. 3–4 (November 20, 2020): 187–201, <https://doi.org/10.1007/s11225-020-09498-7>.

⁵⁰ Dolly M. Singley, "Effects of Academic Coaching on College Students with Learning Disabilities or Attention-Deficit Hyperactivity Disorder" (Lehigh University, 2017).

⁵¹ Pinias and Munyaradzi, "Internal Audit and Sustainable Quality Assurance Practices in Zimbabwean Tertiary Institutions: A Literature Perspective."

infrastructure improvements and comprehensive training programs for educators.⁵² Finally, this research fills a critical gap in the literature by exploring the intersection of climate change, disability, and education, providing a nuanced understanding of how environmental changes uniquely affect marginalized groups. The study advocates for immediate action to create inclusive and supportive educational environments that address the vulnerabilities of rural learners with albinism in the face of climate change.

Theme 2: Adaptive Strategies Employed by Rural Health Institutions to Mitigate Effects of Heat Waves on Learners with Albinism

In response to the escalating challenges posed by climate change, particularly heat waves, rural health institutions have begun implementing adaptive strategies aimed at protecting learners with albinism, including learners with albinism. These strategies encompass a range of initiatives designed to enhance awareness, provide education on sun safety, and ensure access to healthcare services during extreme weather conditions. By fostering community engagement and collaboration, these institutions strive to create an environment where rural learners can thrive despite the challenges posed by climate change. This theme explores the innovative approaches taken by these health organizations, highlighting their role in mitigating the adverse effects of heat waves and promoting resilience among learners with albinism. Below are the perspectives of the participants on this theme:

Female Learner shared,

"In our village, health workers have started educating us about the importance of using sunscreen and protective clothing. They also encourage us to drink plenty of water and stay in shaded areas during peak sunlight. I've learned to take my hat and sunglasses when going out. The health campaigns are helpful, but I wish there were more resources available to support us directly during heat waves."

More so, a Female Teacher argued,

"As a teacher, I have seen our local health institutions take proactive measures. They organize workshops for both learners and parents on recognizing the signs of heat-related illnesses. The health workers also distribute informational materials that teach us how to protect ourselves from the sun. Our school is now more vigilant about monitoring learners' health during heat waves, ensuring that those with albinism receive the necessary support, such as allowing them to stay indoors during the hottest parts of the day."

More so, an Official of the Ministry of Health and Child Welfare expressed that,

"Our ministry has rolled out initiatives aimed at protecting learners with albinism, including learners with albinism. We are working closely with rural health institutions to develop response strategies for heat waves. This includes training healthcare providers to educate communities about the specific needs of individuals with albinism. We are also advocating for the provision of resources like sunscreen and protective clothing through local health facilities."

In addition, the Village Head commented,

"In our village, we have recognized the need to protect our children, especially those with albinism, during heat waves. We collaborate with health institutions to create awareness about the risks associated with heat exposure. We've also initiated community programs that encourage families to plant more trees for shade and improve access to clean drinking water. It's crucial that we support our vulnerable members and ensure their health and education are prioritized."

Further, the Member of Parliament said,

"As a representative, I am committed to addressing the challenges faced by learners with albinism in the context of climate change. I support initiatives that enhance health services in rural areas, ensuring they are equipped to respond to heat waves effectively. I also advocate for policy changes that increase funding

⁵² Munyaradzi Chidarikire, Cecilia Muza, and Hessian Beans, "Integration of Gender Equality and Language Diversity in Zimbabwe Teacher Education Curriculum," *East African Journal of Education and Social Sciences* 2, no. 2 (2021): 231–38.

for educational resources and healthcare programs specifically designed for learners with albinism, including those with albinism."

Lastly, a Parent responded by saying,

"I've noticed that the local health institutions have become more involved in educating us about protecting our children with albinism from the heat. They encourage us to keep our children hydrated and to dress them appropriately. However, I believe more can be done, such as providing parents with resources and support to help us care for our children better during extreme heat. It's vital for us to work together to ensure their well-being."

From the discussion of the above participants' perspectives, learners with albinism in rural Zimbabwe are particularly vulnerable to the effects of climate change. This vulnerability is multifaceted, encompassing physical, social, and economic dimensions. Physically, individuals with albinism are at a heightened risk of sunburn and skin cancer due to their lack of melanin, making them particularly susceptible to the adverse effects of heat waves.⁵³ Additionally, socio-economic factors, such as limited access to healthcare and educational resources, further exacerbate their vulnerability.⁵⁴ The voices of participants in this study illuminate these vulnerabilities. For instance, the female learner's testimony about the lack of resources highlights a significant gap in support systems. This aligns with the findings of Themane and Thobejane, who noted that rural communities often lack adequate healthcare infrastructure, leaving learners with albinism to fend for themselves during heat waves.⁵⁵

In response to these vulnerabilities, rural health institutions have initiated various adaptive strategies. The emphasis on education and community awareness is particularly noteworthy. As articulated by the female teacher, workshops organized by health institutions aim to empower parents and learners by equipping them with knowledge about heat-related illnesses.⁵⁶ This educational approach is supported by the work of Chidarikire et al, who argue that increasing community awareness is crucial for enhancing adaptive capacity.⁵⁷ Moreover, the Ministry of Health and Child Welfare's initiatives demonstrate a systemic approach to addressing the challenges posed by climate change. By training healthcare providers to recognize the specific needs of individuals with albinism, the ministry is fostering a more inclusive healthcare environment.⁵⁸ This aligns with the adaptive capacity framework, emphasizing the need for tailored interventions that consider the unique challenges faced by learners with albinism. While there is an increasing body of literature focusing on climate change and health, there is a notable gap in research specifically addressing the intersection of climate change impacts and the experiences of learners with albinism in rural settings.⁵⁹

The findings of this study underscore the importance of community engagement and the role of health institutions in mitigating the effects of heat waves on learners with albinism.⁶⁰ The following key themes emerged from the participants' perspectives: Participants highlighted the significance of health campaigns that educate communities about sun safety. The female learner's account illustrates the positive impact of these initiatives, as learners are now more conscious of sun protection measures.⁶¹ The distribution of educational materials, as mentioned by the female teacher, further reinforces this point, indicating a community-wide effort to improve knowledge about heat-related health risks.⁶² The

⁵³ Simoni Symeonidou, "Initial Teacher Education for Inclusion: A Review of the Literature," *Disability & Society* 32, no. 3 (March 16, 2017): 401–22, <https://doi.org/10.1080/09687599.2017.1298992>.

⁵⁴ Timothy N. Tansey et al., "Assessing College Life Adjustment of Students With Disabilities: Application of the PERMA Framework," *Rehabilitation Counseling Bulletin* 61, no. 3 (April 25, 2018): 131–42, <https://doi.org/10.1177/0034355217702136>.

⁵⁵ Rendani Siphon Netanda, Joel Mamabolo, and Mahlapahlapana Themane, "Do or Die: Student Support Interventions for the Survival of Distance Education Institutions in a Competitive Higher Education System," *Studies in Higher Education* 44, no. 2 (2019): 397–414.

⁵⁶ L. Tikly, *Education for Sustainable Development in the Postcolonial World* (Abingdon: Routledge, 2020).

⁵⁷ Chidarikire, Muza, and Beans, "Integration of Gender Equality and Language Diversity in Zimbabwe Teacher Education Curriculum."

⁵⁸ Andrea C. Tricco et al., "PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation," *Annals of Internal Medicine* 169, no. 7 (October 2, 2018): 467–73, <https://doi.org/10.7326/M18-0850>.

⁵⁹ UNESCO, "Inclusion & Education: All Means All. Global Education Monitoring Report."

⁶⁰ Dries Vansteenkiste et al., "Professional Development for Inclusive Education," in *Oxford Research Encyclopedia of Education* (Oxford University Press, 2020), <https://doi.org/10.1093/acrefore/9780190264093.013.1013>.

⁶¹ Elizabeth Walton, "Decolonising (through) Inclusive Education?," *Educational Research for Social Change* 7, no. SPE (2018): 31–45.

⁶² Robert Weis and Esther L. Beauchemin, "Are Separate Room Test Accommodations Effective for College Students with Disabilities?," *Assessment & Evaluation in Higher Education* 45, no. 5 (July 3, 2020): 794–809, <https://doi.org/10.1080/02602938.2019.1702922>.

collaboration between health institutions and local leaders, such as the village head and the Member of Parliament, emphasizes the importance of a multi-faceted approach to addressing health concerns.⁶³ These partnerships foster a supportive environment where resources can be shared, and community programs can be implemented effectively. The village head's efforts to promote tree planting for shade and improve water access are excellent examples of community-driven initiatives that enhance resilience.⁶⁴

Despite the positive strides made, participants expressed a need for more resources. The parent's perspective highlights the ongoing struggles families face in accessing necessary materials, such as sunscreen and protective clothing.⁶⁵ This finding aligns with the literature, which suggests that resource availability is critical for effective adaptation.⁶⁶ The study reveals that while health institutions have made commendable efforts, there is still a pressing need for increased investment in resources specifically tailored for learners with albinism. The commitment of the Member of Parliament to advocate for policy changes underscores the importance of governmental support in addressing the challenges posed by climate change.⁶⁷ Effective policy measures that prioritize funding for educational and healthcare resources for learners with albinism are essential for fostering resilience. This aligns with the framework of adaptive capacity, which emphasizes the role of governance in enhancing community resilience.⁶⁸ Consequently, this study highlights the unique vulnerabilities faced by rural learners with albinism in Zimbabwe amidst climate change-induced heat waves. The adaptive strategies employed by health institutions demonstrate a proactive approach to mitigating these challenges. However, the findings also reveal significant gaps in resource availability and the need for continued advocacy and support. Addressing these gaps is crucial for ensuring the health and educational well-being of learners with albinism in rural communities.

RECOMMENDATIONS

By implementing these recommendations, stakeholders can significantly mitigate the adverse effects of climate change-induced heat waves on rural learners with albinism in Zimbabwe, promoting their well-being and educational success.

- ***For Teachers***

Teachers should receive specialized training to understand the specific needs of learners with albinism, particularly regarding their health and educational requirements during heat waves. In addition, teachers should implement flexible school hours during extreme heat periods to avoid peak temperatures, ensuring learners can engage in learning comfortably.

- ***For Female Learners with Albinism***

Establish mentorship and empowerment programs that promote self-advocacy, resilience, and personal development among female learners. Furthermore, to ensure that female learners with albinism have access to protective clothing and sunblock, facilitating their participation in outdoor activities and reducing health risks.

- ***For the Ministry of Primary and Secondary Education***

Integrate climate change education into the school curriculum, emphasizing the specific impacts on vulnerable groups, including learners with albinism. Additionally, Allocate resources for the development of infrastructure that provides shade and cooling in schools, ensuring a safe learning environment.

⁶³ Elizabeth Walton and Lee Rusznyak, "Developing Standards for Inclusive Teaching in South Africa: A Dilemma Analysis," *Southern African Review of Education with Production* 25, no. 1 (2019): 89–106.

⁶⁴ Accardo et al., "College Access, Success and Equity for Students on the Autism Spectrum."

⁶⁵ Chidarikire, Muza, and Beans, "Integration of Gender Equality and Language Diversity in Zimbabwe Teacher Education Curriculum."

⁶⁶ Chiu et al., "Impact of Disability Services on Academic Achievement among College Students with Disabilities."

⁶⁷ George J. DuPaul et al., "College Students With ADHD and LD: Effects of Support Services on Academic Performance," *Learning Disabilities Research & Practice* 32, no. 4 (November 2, 2017): 246–56, <https://doi.org/10.1111/ldrp.12143>.

⁶⁸ Petra Engelbrecht and Nithi Muthukrishna, "Inclusive Education as a Localised Project in Complex Contexts: A South African Case Study," *Southern African Review of Education* 25, no. 1 (2019): 107–24.

- **For the Ministry of Health and Child Welfare**

Launch public health campaigns focusing on the health risks posed by heat waves, particularly for individuals with albinism, promoting awareness and preventive measures. More so, collaborate with NGOs to enhance healthcare access for learners with albinism, ensuring regular health check-ups and treatment options are available.

- **For Members of Parliament**

Advocate for policies that specifically address the needs of learners with albinism affected by climate change, including learners with albinism. Moreover, promote funding initiatives aimed at improving educational and health facilities in rural areas, focusing on the needs of marginalized groups.

- **For Village Heads**

Foster community engagement to raise awareness about the challenges faced by learners with albinism and promote inclusive practices within the community. On the other hand, establish local support networks that connect learners with albinism to resources, including healthcare and educational support.

- **For Parents**

Educate parents about the implications of climate change on their children's health and education, encouraging proactive measures to protect their children. In addition, encourage parents to be involved in advocacy efforts to ensure that their children's needs are met at the community and national levels.

- **For the Department of Meteorological Services**

Develop and disseminate early warning systems that provide timely information about impending heat waves, allowing families and schools to prepare adequately. Additionally, implement community education programs that inform the public about climate patterns and their implications on health and education.

- **For the Ministry of Women Affairs**

Promote gender-sensitive policies that address the unique challenges faced by female learners with albinism, ensuring their needs are prioritized in development initiatives. More so, create support programs focused on empowering women and girls with albinism, enhancing their educational and economic opportunities.

- **For NGOs Dealing with Albinism**

Conduct awareness campaigns to reduce stigma and promote inclusivity for individuals with albinism in rural communities. Furthermore, focus on providing essential resources, including protective gear and educational materials, to support learners with albinism during heat waves.

CONCLUSION

The exploration of the impact of climate change-induced heat waves on rural learners with albinism in Zimbabwe has revealed significant vulnerabilities and adaptive strategies. The research concludes that these learners face unique challenges, including increased health risks, social stigma, and barriers to educational opportunities exacerbated by extreme heat conditions. Such challenges are particularly pronounced in rural areas, where access to resources and support systems is limited. Furthermore, the analysis of adaptive strategies employed by rural health institutions demonstrates a proactive response to the challenges posed by climate change. These strategies include community awareness programs, the provision of protective measures, and the establishment of support networks. However, there is still a considerable gap in the effectiveness and reach of these strategies, indicating the need for a more coordinated and comprehensive approach.

Conflict of interests

The authors clearly state that there is no conflict of interest.

Data availability

The data is available and is locked in a safe steel cardboard. There data can be requested from the authors. However, no confidential and personal data of the participants will be given to anyone.

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